Microwave Spectra of Molecules of Astrophysical Interest. XXIV. Methanol (CH_3OH and $^{13}CH_3OH$)

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The available microwave and millimeter-wave spectra of methanol, CH_3OH, and its most abundant isotopomer, $^{13}CH_3OH$, are critically reviewed and supplemented with spectral frequency calculations derived from rotation-internal rotation analyses. For both species, global analyses of the torsional ground state, $\nu_t=0$, and the first excited torsional state, $\nu_t=1$, have been carried out in which all observed spectral lines are reproduced to within their measurement uncertainties. References are given for all data included. The primary objective of this review is to provide radio astronomers with complete spectral coverage of rotational transitions from 500 MHz to 1 THz, including the lower state energy and line strength for each transition, over the range in rotational quantum number J from 0 to 26. © *1997 American Institute of Physics and American Chemical Society.* [S0047-2689(97)00101-3]

Key words: Internal rotation (or torsion); interstellar molecule; isotopomer; line strength; methanol; microwave and millimeter-wave spectra; radio astronomy; rotational transitions.

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1. Introduction

The present work is a critical review of the rotational spectra of the CH_3OH and $^{13}CH_3OH$ methanol isotopomers that is intended to update and augment the previous survey.[1] It is part of a series of critical reviews for molecules identified in interstellar molecular clouds. Predicted and observed transition frequencies, lower state energy values of the transitions, and line strengths are provided for all rotational transitions among levels with $J\leqslant 26$, $K\leqslant 14$. Rotational transitions are included for both the $\nu_t=0$ ground state and $\nu_t=1$ excited torsional state over the frequency region from 500 MHz to 1 THz. This extends the range of tabulated data well beyond that of Ref. 1, which included only $\nu_t=0$ transitions up to 200 GHz and had an energy cutoff of 125 cm^{-1} above the lowest levels of 127.817 cm^{-1} and 133.307 cm^{-1} for A and E symmetry species, respectively. Although Refs. 2–6 on CH_3OH and $^{13}CH_3OH$ cover a wider range in ν_t and J quantum numbers than the present review, the current predictive accuracy is higher than these earlier studies due to higher quality fits and more comprehensive data. It is felt that the present quantum number limit and frequency cutoff are generous enough to allow for the presentation of all methanol transitions from the $\nu_t=0$ and 1 torsional states which might be observed by existing telescopes. The calculated uncertainties from the new global fits are presented for predicted transitions with very much improved predictive accuracy compared to prior reviews.

2. Organization of Tables

In order to reduce transcription errors, the tables of spectra have been reproduced directly from computer output wher-

ever possible. The open literature has been searched to March, 1996, for information relating to the laboratory spectra of the CH_3OH and $^{13}CH_3OH$ forms of methanol.

2.1. Molecular Parameters

The rotational parameters, centrifugal distortion parameters, internal rotation parameters and interaction parameters coupling internal rotation and overall rotation are presented in Table 1 for CH_3OH and in Table 2 for $^{13}CH_3OH$. They were obtained from nonlinear least squares fits of microwave, millimeter-wave and terahertz spectra and Fourier-transform far-infrared measurements in the first two torsional states ($v_t=0$ and 1) of CH_3OH and $^{13}CH_3OH$[7–9] using a program[10] based on the formalism of Herbst *et al.*[11] For CH_3OH, a unitless weighted standard deviation of 1.032 was achieved using 56 adjustable and 8 fixed parameters to fit a total of 6655 transitions. The high precision data in the range $K\leqslant 12$, $J\leqslant 20$, included a set of 909 microwave and millimeter-wave lines, most with an assigned measurement uncertainty of 50 kHz, plus 197 tunable far-infrared terahertz lines mostly assigned 100 kHz or 200 kHz uncertainties. In the range $K\leqslant 14$, $J\leqslant 20$, the data set included a further 5549 Fourier-transform far-infrared lines with a larger assigned uncertainty of 0.0002 cm^{-1} (6 MHz). For $^{13}CH_3OH$, a unitless weighted standard deviation of 0.961 was achieved using 55 adjustable and 2 fixed parameters to fit a total of 7008 transitions (725 microwave and millimeter-wave lines in the range $K\leqslant 8$, $J\leqslant 20$, mostly assigned a 50 kHz measurement uncertainty, plus 6283 Fourier-transform far-infrared lines in the range $K\leqslant 14$, $J\leqslant 20$, assigned a 0.0002 cm^{-1} uncertainty). The data used in the analyses included essentially all available Fourier-transform observations and frequency-measured transitions involving torsional levels below and straddling the barrier for both CH_3OH and $^{13}CH_3OH$ species at the time this work was initiated. At the last stage of this review, two new terahertz studies have been reported for CH_3OH, one employing a backward-wave oscillator (BWO) as the source of radiation[12] and the other using the tunable far-infrared (TuFIR) technique[13] in which a microwave source is mixed with two frequency-stabilized CO_2 lasers. The results of the BWO study are well calculated by our parameters; however, the new TuFIR measurements deviate from our calculations by significant amounts compared to their estimated uncertainties; see the discussion of this point in Ref. 7. Therefore, we have not included the newly observed terahertz transitions in the current review since a significant improvement over the present analysis is not expected.

In our rotation-internal rotation analysis, the expectation value of each operator in the Hamiltonian is calculated in a "Rho Axis Method" (RAM) system which has been discussed in detail in Ref. 14. The final Hamiltonian chosen is a version slightly extended from those in the literature.[11,15–18] The use of a non-Principal Axis Method (PAM) system has the consequence that the present rotational and centrifugal distortion parameters as well as the dipole moment components must be appropriately transformed by a rotation between the two axis systems when comparing them with the corresponding parameters defined in the PAM system. The RAM axis system is obtained by a rotation about the y-axis from the principal axes through the angle given by

$$\tan^{-1}(\rho_x/\rho_z)=\frac{1}{2}\tan^{-1}\left\{\frac{D_{ab}}{(A-B)/2}\right\},$$

which has a magnitude of 0.0697° for CH_3OH and 0.0734° for $^{13}CH_3OH$.

The set of constants presented in Tables 1 and 2 are *effective* fitting constants[9] which provide accurate $v_t=0$ and 1 rotational levels and transition frequencies. A number of parameters were constrained at values determined with a smaller data set. Floating these parameters (or fixing them at zero) using a larger number of parameters always led to divergence. Furthermore, these constants are statistically highly correlated, so that many of the least-squares fits were unstable in the sense that increasing the number of lines in the data set, increasing the number of parameters, or even changing the weights of various transitions led to divergent fits. Future analysis, which will include the $v_t=2$ data, may give better stability to the fits and eliminate the need to fix several parameters. A discussion of the intensity calculation and dipole moments (see Table 3 for a survey of literature values) is given in Sec. 2.2.

2.2. Microwave Transitions

The predicted and observed rotational transitions for CH_3OH and $^{13}CH_3OH$ are compiled in Tables 4 and 5, respectively. The quantum numbers are presented first for each spectral line in two five-column groups containing the upper and lower level values of v_t,J,K_a,K_c, and P, where v_t is the torsional state, and J,K_a, and K_c designate the rotational state in asymmetric rotor notation. The parity symbol, P, is + or − for the A symmetry species ($\sigma=0$), following Dennison's convention as adopted in Refs. 7–9. Note that this differs from the true parity which is given by $(-1)^{J+v_t}$ assuming a totally symmetric electronic and vibrational ground state.[16] For the E symmetry species ($\sigma=1$), we use a signed $K=K_a$ quantum number, with the convention that a $|K|$ E state corresponds to E_1 symmetry and a $-|K|$ E state to E_2 symmetry in the notation of Lees and Baker.[16] In Tables 4 and 5, the quantum numbers for a given transition are followed by the observed transition frequency with the assigned experimental uncertainty in MHz shown in parentheses. The next column contains the calculated frequencies as evaluated from the molecular parameters of Table 1 or 2 with the calculated uncertainty in parentheses. The uncertainties quoted are twice the standard deviations from the least-squares analyses (i.e., 95 percent confidence levels or expanded uncertainty with coverage factor $k=2$) and were estimated from the variance-covariance matrix as described by

Kirchhoff.[19] The next column lists the square of the transition dipole matrix element, proportional to the transition intensity. (The absolute nuclear spin statistical weight factors, the absolute partition function and the Boltzmann factors were suppressed.) For a transition $J'_{\nu_t',K_a',\sigma} \leftarrow J''_{\nu_t'',K_a'',\sigma}$, the total torsion-rotational line strength is calculated as:

$$|\langle \nu_t', J', K_a', \sigma | \alpha_{Za}\mu_a + \alpha_{Zb}\mu_b | \nu_t'', J'', K_a'', \sigma \rangle|^2,$$

where α is the direction cosine matrix. The subscript Z refers to the direction of polarization and a and b refer to RAM axes. The corresponding dipole moment component, μ_g, is defined by Eq. 19 of Ref. 14 in the case of an internal rotor molecule, and was restricted to the first term for μ_a and μ_b in our intensity calculation due to limitations in the intensity program. For the pure rotation transitions in the ground vibrational state considered here, the μ_g are simply represented by the permanent dipole moments $\mu_a = 2.999\times10^{-30}$ C m (0.899 D) and $\mu_b = -4.803\times10^{-30}$ C m (−1.44 D) in the Internal Axis Method (IAM) system for both CH_3OH and $^{13}CH_3OH$ as quoted in several prior reviews.[3,4] (The value for μ_a is positive and that for μ_b is negative due to the negative value of D_{ab}.) The intensities are presented in "F"-format for easier reading with four places after the decimal point in order to provide values for weaker transitions. The number of significant figures, however, is more realistically about two (perhaps 5% accuracy). Because the D_{ab} value of methanol is so small, the angles between the PAM, IAM, and RAM axis systems are essentially negligible so the above dipole moment values in the IAM system could be adopted directly in our calculation. The total lower-state rotational and torsional energy for each transition is shown in the next column in cm^{-1}, with the torsional zero-point energy subtracted. The zero-point energy is taken to be the energy of the $0_{0,0}$ A state, which is 128.10687 cm^{-1} for CH_3OH and 128.15005 cm^{-1} for $^{13}CH_3OH$. The final column of the table gives the references to the original laboratory measurements.

There is some variation in the literature concerning the dipole moment values of methanol and its dependence on rotational state and torsional state. Table 3 summarizes the dipole moment values in the literature. Since it was unclear to us which set was most reliable, and since the variations were smaller than our estimated 5% uncertainty in the intensity calculation, with about 2% originating from the dipole moment uncertainty, the values quoted in the earlier reviews[3,4] were used to provide a means of comparing the calculations. The μ_a value used here is between the values of $\nu_t=0$ and 1 reported by Sastry *et al.* [SAS81] and Amano [AMA81] shown in Table 3, and thus, may provide a realistic representation of the intensities for the two states.

The previous reports on methanol[7–9] contain considerable detail on the measurements and methods of analysis, as well as statistics on the various data sets employed, while the previous methanol review[1] contains some information on the ^{18}O methanol isotopomer and previous reviews[2–8] cover $\nu_t=2$ and higher J transitions. The reader is encouraged to consult these references for more details.

2.3. List of Symbols and Conversion Factors

a,b,c — Axis labels (used for "Rho Axis" (RAM) labels and also for the original axes used in the derivation of the RAM).

I_a, I_b, I_c, I_{ab} — I_x are the moments of inertia and I_{ab} is the product of inertia in the a,b,c-axis system whose a-axis is parallel to the internal rotation axis with the sign choice of Ref. 17.

I_α — Moment of inertia of the CH_3 internal rotor.

A,B,C,D_{ab} — Rotational parameters $A \geq B \geq C, D_{ab}$ in the RAM axis system (see Eqs. 2–29 of Ref. 17 interchanging the a and c-axes):

$$A = \frac{h^2}{8\pi^2}\left(\frac{I_a+I_b}{I_aI_b-I_{ab}^2} - \frac{I_b}{I_b^2+I_{ab}^2}\right),$$

$$B = \frac{h^2}{8\pi^2}\frac{I_b}{I_b^2+I_{ab}^2},$$

$$C = \frac{h^2}{8\pi^2}\frac{1}{I_c},$$

$$D_{ab} = \frac{h^2}{8\pi^2}\frac{I_{ab}}{I_b^2+I_{ab}^2}.$$

$\Delta_J, \Delta_{JK}, \Delta_K, \delta_J, \delta_K$ — Quartic centrifugal distortion constants multiplying operators defined according to Watson.[20]

$H_{JK}, H_{KJ}, H_K, H_J, h_{JK}$ — Sextic centrifugal distortion constants multiplying operators defined according to Watson.[20]

ρ — Internal rotation interaction constant:[17]

$$\rho = I_\alpha \frac{(I_b^2+I_{ab}^2)^{1/2}}{I_aI_b-I_{ab}^2}.$$

F — Internal rotation constant:[17]

$$F = \frac{h^2}{8\pi^2}\frac{I_aI_b-I_{ab}^2}{I_\alpha(I_aI_b-I_\alpha I_b-I_{ab}^2)}.$$

V_3, V_6, V_9 — Threefold, sixfold, and ninefold components of the torsional barrier:

$$V(\alpha) = \frac{V_3}{2}(1-\cos 3\alpha) + \frac{V_6}{2}(1-\cos 6\alpha) + \frac{v_9}{2}(1-\cos 9\alpha).$$

μ_a, μ_b, μ_c — Components of the electric dipole moment along the RAM axes.

J — Total rotational angular momentum quantum number.

K_a — Projection of J along the principal a-axis in the limiting prolate symmetric top.

K_c	Projection of J along the principal c-axis in the limiting oblate symmetric top.
ν_t	Torsional quantum number in the high barrier limit.
A (i.e., A_1 or A_2), E	Torsion-rotation symmetry species, representing irreducible representations of the symmetry group of the internal rotational Hamiltonian.
P', P''	Parity quantum number, + and −, for the A species. $A+$ and $A-$ labels correspond to A_1 and A_2, respectively, of the G_6 group for even $J+\nu_t$ and to A_2 and A_1 for odd $J+\nu_t$ in the ground vibrational state.
P	Total rotational angular momentum.
P_a, P_b, P_c	Projection on the RAM a,b,c-axes of the total rotational angular momentum.
P_α	Torsional angular momentum.
α	Torsional angle around internal rotation axis.
Conversion factor:	1 cm^{-1}=29,979.2458 MHz.

2.4. Acknowledgments

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3. Methanol Spectral Tables

The torsion-rotation parameters obtained in the global fit of transitions for the ν_t=0 and 1 torsional state are listed in Table 1 for CH_3OH and in Table 2 for $^{13}CH_3OH$. Table 3 summarizes the dipole moment values in the literature. The calculated spectra for CH_3OH and $^{13}CH_3OH$ are shown in Tables 4 and 5, respectively. These tables cover a frequency range of 500 MHz to 1 THz and quantum numbers $J \leqslant 26$, $K \leqslant 14$ for the ν_t=0 and 1 torsional states with intensity and uncertainty cutoffs of $1.0E-7$ and 10 MHz, respectively. In Tables 4 and Table 5, an asterisk (*) in the observed column indicates transitions not included in the fit and a double asterisk (**) in the observed column indicates transitions overlooked in our earlier global fitting publications.[7,9]

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TABLE 1. The 64 torsion-rotation parameters used in the global fit of transitions involving levels of the $v_t=0$ and 1 torsional states of methanol (CH_3OH)

Operator [a]	Parameter [a]	Value (cm^{-1}) [b]	Operator [a]	Parameter [a]	Value (cm^{-1}) [b]
$(1/2)(1-\cos 3\alpha)$	V_3	373.59447(736)	P_α^6	k_{4B}	$1.04449(181)\times 10^{-5}$
P_α^2	F	27.6468188(159)	$P_\alpha^5 P_a$	k_{3B}	$6.93126(737)\times 10^{-5}$
$P_\alpha P_a$	ρ	0.8102060140(110)	$P_\alpha^4 P^2$	M_v	$8.6329(791)\times 10^{-8}$
P_a^2	A	4.25372424(238)	$P_\alpha^4 P_a^2$	K_1	$1.86290(117)\times 10^{-4}$
P_b^2	B	0.823576681(195)	$P_\alpha^4\{P_a,P_b\}$	$\Delta\Delta_{ab}$	2.544467×10^{-10} (fixed)
P_c^2	C	0.792538986(282)	$(1-\cos 6\alpha)P^2$	N_v	$-4.395(256)\times 10^{-6}$
$\{P_a,P_b\}$	D_{ab}	$-4.17149(405)\times 10^{-3}$	$(1-\cos 6\alpha)P_a^2$	K_2	$-1.8869(350)\times 10^{-4}$
P_α^4	k_4	$-8.98475(107)\times 10^{-3}$	$(1-\cos 6\alpha)(P_b^2-P_c^2)$	c_{11}	$-6.675(279)\times 10^{-6}$
$(1/2)(1-\cos 6\alpha)$	V_6	$-1.5973(506)$	$(1-\cos 6\alpha)\{P_a,P_b\}$	dd_{ab}	$1.5507(462)\times 10^{-4}$
$P_\alpha^3 P_a$	k_3	$-3.507184(345)\times 10^{-2}$	$P_\alpha^3 P_a^3$	K_3	$2.618332(888)\times 10^{-4}$
$P_\alpha^2 P^2$	G_v	$-1.1885285(402)\times 10^{-4}$	$P_\alpha^3 P_a P^2$	k_{3J}	$3.2954(237)\times 10^{-7}$
$P_\alpha^2 P_a^2$	k_2	$-5.190647(417)\times 10^{-2}$	$P_\alpha^3\{P_a,(P_b^2-P_c^2)\}$	c_{12}	$-2.106(787)\times 10^{-9}$
$2P_\alpha^2(P_b^2-P_c^2)$	c_1	$-1.4253(120)\times 10^{-4}$	$P_\alpha^3\{P_a^2,P_b\}$	$\delta\delta_{ab}$	-8.789613×10^{-10} (fixed)
$P_\alpha^2\{P_a,P_b\}$	Δ_{ab}	$1.888(101)\times 10^{-4}$	$\{(1-\cos 3\alpha),P_a^3 P_\alpha\}$	K_6	$2.0241(650)\times 10^{-4}$
$\sin 3\alpha\{P_a,P_c\}$	D_{ac}	$1.5215(124)\times 10^{-2}$	$P_\alpha^2 P^4$	g_v	$1.1252(117)\times 10^{-9}$
$\sin 3\alpha\{P_b,P_c\}$	D_{bc}	$-1.0192(149)\times 10^{-3}$	$P_\alpha^2 P_a^2 P^2$	k_{2J}	$4.9269(243)\times 10^{-7}$
$(1-\cos 3\alpha)P^2$	F_v	$-2.3879604(820)\times 10^{-3}$	$P_\alpha^2 P_a^4$	k_{2K}	$2.041113(286)\times 10^{-4}$
$(1-\cos 3\alpha)P_a^2$	k_5	$1.118256(110)\times 10^{-2}$	$2P_\alpha^2 P^2(P_b^2-P_c^2)$	c_5	-5.776100×10^{-13} (fixed)
$(1-\cos 3\alpha)(P_b^2-P_c^2)$	c_2	$-7.5971(314)\times 10^{-5}$	$2P_\alpha^2\{P_a^2,(P_b^2-P_c^2)\}$	c_8	$-1.49(380)\times 10^{-10}$
$(1-\cos 3\alpha)\{P_a,P_b\}$	d_{ab}	$9.04772(248)\times 10^{-3}$	$(1-\cos 3\alpha)P^4$	f_v	$6.2655(671)\times 10^{-9}$
$P_\alpha P_a P^2$	L_v	$-1.9028914(912)\times 10^{-4}$	$(1-\cos 3\alpha)P_a^2 P^2$	k_{5J}	$-5.323(173)\times 10^{-7}$
$P_\alpha P_a^3$	k_1	$-3.45888(129)\times 10^{-2}$	$(1-\cos 3\alpha)P_a^4$	f_k	$3.282(105)\times 10^{-4}$
$P_\alpha\{P_a,(P_b^2-P_c^2)\}$	c_4	$-1.9144(121)\times 10^{-4}$	$(1-\cos 3\alpha)\{P_a^2,(P_b^2-P_c^2)\}$	c_9	-1.201302×10^{-8} (fixed)
$P_\alpha(P_a^2 P_b+P_b P_a^2)$	δ_{ab}	$6.649(205)\times 10^{-4}$	$P_\alpha P_a^5$	l_k	8.396111×10^{-5} (fixed)
$-P^4$	Δ_J	$1.6862676(461)\times 10^{-6}$	$P_\alpha P_a^3 P^2$	λ_v	$3.5108(209)\times 10^{-7}$
$-P^2 P_a^2$	Δ_{JK}	$8.47980(235)\times 10^{-5}$	$P_\alpha P_a P^4$	l_v	$1.3384(133)\times 10^{-9}$
$-P_a^4$	Δ_K	$8.7734(105)\times 10^{-3}$	$P_\alpha P^2\{P_a,(P_b^2-P_c^2)\}$	c_7	6.996616×10^{-11} (fixed)
$-2P^2(P_b^2-P_c^2)$	δ_J	$5.87305(230)\times 10^{-8}$	P^6	H_J	-1.446260×10^{-12} (fixed)
$-\{P_a^2,(P_b^2-P_c^2)\}$	δ_K	$5.24072(728)\times 10^{-5}$	$P^4 P_a^2$	H_{JK}	$4.5322(613)\times 10^{-10}$
$\{P_a,P_b\}P^2$	D_{abJ}	$1.2648(588)\times 10^{-7}$	$P_a^4 P^2$	H_{KJ}	$1.0345(123)\times 10^{-7}$
$\{P_a^3,P_b\}$	D_{abK}	$4.644(113)\times 10^{-4}$	P_a^6	H_K	$1.426386(173)\times 10^{-5}$
$(1/2)(1-\cos 9\alpha)$	V_9	1.037(198)	$P^2\{P_a^2,(P_b^2-P_c^2)\}$	h_{JK}	8.756918×10^{-11} (fixed)

[a]Notation of Ref. 11. $\{A,B\}\equiv AB+BA$. The product of the parameter and operator from a given row yields the term actually used in the vibration-rotation-torsion Hamiltonian, except for F,ρ, and A, which occur in the Hamiltonian in the form $F(P_\alpha+\rho P_a)^2+AP_a^2$.
[b]All values are in cm^{-1}, except ρ, which is unitless. Uncertainties are shown as one standard deviation in the last three digits.

TABLE 2. The 57 torsion-rotation parameters used in the global fit of transitions involving levels of the $\nu_t=0$ and 1 torsional states of C-13 methanol ($^{13}CH_3OH$)

Operator [a]	Parameter [a]	Value (cm^{-1}) [b]
$(1/2)(1-\cos 3\alpha)$	V_3	373.7767706(953)
P_α^2	F	27.64192026(873)
$P_\alpha P_a$	ρ	0.8101644791(385)
P_a^2	A	4.25385658(284)
P_b^2	B	0.803339535(463)
P_c^2	C	0.773770134(511)
$\{P_a,P_b\}$	D_{ab}	$-4.42289(530)\times10^{-3}$
P_α^4	k_4	$-8.99130(112)\times10^{-3}$
$(1/2)(1-\cos 6\alpha)$	V_6	$-1.578463(388)$
$P_\alpha^3 P_a$	k_3	$-3.507605(376)\times10^{-2}$
$P_\alpha^2 P^2$	G_v	$-1.1380203(566)\times10^{-4}$
$P_\alpha^2 P_a^2$	k_2	$-5.188959(473)\times10^{-2}$
$2P_\alpha^2(P_b^2-P_c^2)$	c_1	$-1.3957(265)\times10^{-4}$
$P_\alpha^2\{P_a,P_b\}$	Δ_{ab}	$-0.781(163)\times10^{-4}$
$\sin 3\alpha\{P_a,P_c\}$	D_{ac}	$1.1606(201)\times10^{-2}$
$\sin 3\alpha\{P_b,P_c\}$	D_{bc}	$-1.0154(330)\times10^{-3}$
$(1-\cos 3\alpha)P^2$	F_v	$-2.3306334(806)\times10^{-3}$
$(1-\cos 3\alpha)P_a^2$	k_5	$1.116040(139)\times10^{-2}$
$(1-\cos 3\alpha)(P_b^2-P_c^2)$	c_2	$-8.0858(519)\times10^{-5}$
$(1-\cos 3\alpha)\{P_a,P_b\}$	d_{ab}	$8.87902(473)\times10^{-3}$
$P_\alpha P_a P^2$	L_v	$-1.821960(123)\times10^{-4}$
$P_\alpha P_a^3$	k_1	$-3.456570(261)\times10^{-2}$
$P_\alpha\{P_a,(P_b^2-P_c^2)\}$	c_4	$-1.8577(273)\times10^{-4}$
$P_\alpha(P_a^2P_b+P_bP_a^2)$	δ_{ab}	$0.858(246)\times10^{-4}$
$-P^4$	Δ_J	$1.623755(111)\times10^{-6}$
$-P^2P_a^2$	Δ_{JK}	$8.17308(306)\times10^{-5}$
$-P_a^4$	Δ_K	$8.764954(538)\times10^{-3}$
$-2P^2(P_b^2-P_c^2)$	δ_J	$5.5702(171)\times10^{-8}$
$-\{P_a^2,(P_b^2-P_c^2)\}$	δ_K	$4.9475(252)\times10^{-5}$
$\{P_a^3,P_b\}$	D_{abK}	$1.5417(867)\times10^{-4}$
$(1/2)(1-\cos 9\alpha)$	V_9	1.036907 (fixed)
P_α^6	k_{4B}	$1.2729(195)\times10^{-5}$
$P_\alpha^5 P_a$	k_{3B}	$8.0601(962)\times10^{-5}$
$P_\alpha^4 P^2$	M_v	$8.124(140)\times10^{-8}$
$P_\alpha^4 P_a^2$	K_1	$2.0954(197)\times10^{-4}$
$P_\alpha^4\{P_a,P_b\}$	$\Delta\Delta_{ab}$	$7.054(703)\times10^{-9}$
$(1-\cos 6\alpha)P^2$	N_v	$-3.620(239)\times10^{-6}$
$(1-\cos 6\alpha)P_a^2$	K_2	$-2.3677(425)\times10^{-4}$
$(1-\cos 6\alpha)(P_b^2-P_c^2)$	c_{11}	$-4.372(508)\times10^{-6}$
$(1-\cos 6\alpha)\{P_a,P_b\}$	dd_{ab}	$2.181(100)\times10^{-4}$
$P_\alpha^3 P_a^3$	K_3	$2.8735(215)\times10^{-4}$
$P_\alpha^3 P_a P^2$	k_{3J}	$3.1199(453)\times10^{-7}$
$P_\alpha^3\{P_a,(P_b^2-P_c^2)\}$	c_{12}	$-3.228(286)\times10^{-9}$
$\{(1-\cos 3\alpha),P_a^3P_\alpha\}$	K_6	2.024131×10^{-4} (fixed)
$P_\alpha^2P^4$	g_v	$1.0338(254)\times10^{-9}$
$P_\alpha^2P_a^2P^2$	k_{2J}	$4.5502(555)\times10^{-7}$
$P_\alpha^2P_a^4$	k_{2K}	$2.1982(131)\times10^{-4}$
$(1-\cos 3\alpha)P^4$	f_v	$5.467(149)\times10^{-9}$
$(1\ \ \cos 3\alpha)P_a^2P^2$	k_{5J}	$-2.400(251)\times10^{-7}$
$(1-\cos 3\alpha)P_a^4$	f_k	$3.279719(297)\times10^{-4}$
$(1-\cos 3\alpha)(P_b^2-P_c^2)P^2$	c_{2J}	$3.450(807)\times10^{-9}$
$P_\alpha P_a^5$	l_k	$8.9110(425)\times10^{-5}$
$P_\alpha P_a^3P^2$	λ_v	$2.9933(313)\times10^{-7}$
$P_\alpha P_a P^4$	l_v	$1.1848(344)\times10^{-9}$
$P^4P_a^2$	H_{JK}	$4.094(155)\times10^{-10}$
$P_a^4P^2$	H_{KJ}	$0.76496(735)\times10^{-7}$
P_a^6	H_K	$1.49739(573)\times10^{-5}$

[a]Notation of Ref. 11. $\{A,B\}\equiv AB+BA$. The product of the parameter and operator from a given row yields the term actually used in the vibration-rotation-torsion Hamiltonian, except for F, ρ, and A, which occur in the Hamiltonian in the form $F(P_\alpha+\rho P_a)^2+AP_a^2$.

[b]All values are in cm^{-1}, except ρ, which is unitless. Uncertainties are shown as one standard deviation in the last three digits.

TABLE 3. Dipole moment values reported in the literature

Species	$\mu_a/10^{-30}$ C m	$\mu_b/10^{-30}$ C m	Reference
CH_3OH $\nu_t=0$	2.952 (0.885 D)[a]	4.803 (1.44 D)[a]	[IVA53]
CH_3OH $\nu_t=0$	2.989 (0.896 D)	4.710 (1.412 D)	[SAS81]
CH_3OH $\nu_t=0$	2.988(2) (0.8957(5)D)	4.67(7) (1.40(2) D)	[AMA81]
CH_3OH $\nu_t=1$	3.07 (0.920 D)	4.77 (1.43 D)	[SAS81]
CH_3OH $\nu_t=1$	3.073(3) (0.9213(8) D)	4.64(30) (1.39(9) D)	[AMA81]
$^{13}CH_3OH$ $\nu_t=0$	2.984(3) (0.8947(8) D)	4.761(2) (1.4274(6) D)	[SAS94]
$^{13}CH_3OH$ $\nu_t=1$	3.014(3) (0.9035(9) D)	4.784(3) (1.4343(8) D)	[SAS94]

[a]Values shown in parentheses are in Debye units (10^{-18} esu).

TABLE 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	3	1	2	−	1	3	1	3	+		577.542(0.009)	0.4669	235.712	
1	17	2	16	−	1	17	2	15	+		688.670(0.053)	0.4486	453.605	
0	17	3	14	−	0	17	3	15	+		709.316(0.012)	1.0086	281.347	
0	9	2	7	+	0	9	2	8	−		747.569(0.006)	0.6432	98.799	
0	1	1	0	−	0	1	1	1	+	834.267(0.050) [a]	834.285(0.001)	1.2129	11.705	RAD72
1	18	2	17	−	1	18	2	16	+		860.048(0.065)	0.4331	482.521	
1	4	1	3	−	1	4	1	4	+		962.328(0.015)	0.3574	242.143	
0	18	3	15	−	0	18	3	16	+		991.360(0.016)	0.9733	310.357	
1	19	2	18	−	1	19	2	17	+		1061.361(0.80)	0.4196	513.037	
0	10	2	8	+	0	10	2	9	−	1120.427(0.050)	1120.381(0.009)	0.5728	114.923	BRO81
1	20	2	19	−	1	20	2	18	+		1295.839(0.097)	0.4078	543.153	
0	19	3	16	−	0	19	3	17	+		1360.498(0.022)	0.9425	340.974	
1	5	1	4	−	1	5	1	5	+		1443.034(0.021)	0.2884	250.180	
1	21	2	20	−	1	21	2	19	+		1566.857(0.116)	0.3975	578.867	
0	11	2	9	+	0	11	2	10	−		1616.606(0.013)	0.5139	132.657	
0	22	6	17	−	0	21	7	14	−		1670.324(0.074)	5.4829	542.227	
0	22	6	16	+	0	21	7	15	+		1670.338(0.074)	5.4829	542.227	
0	20	3	17	−	0	20	3	18	+		1836.655(0.029)	0.9152	373.197	
1	22	2	21	−	1	22	2	20	+		1877.931(0.138)	0.3885	614.178	
1	6	1	5	−	1	6	1	6	+		2019.476(0.028)	0.2407	259.825	
1	23	2	22	−	1	23	2	21	+		2232.711(0.163)	0.3806	651.085	
0	12	2	10	+	0	12	2	11	−		2260.327(0.018)	0.4638	151.999	
0	21	3	18	−	0	21	3	19	+		2442.813(0.038)	0.8911	407.026	
0	2	1	1	−	0	2	1	2	+	2502.778(0.050)[a]	2502.784(0.003)	0.6725	14.904	HEU73
1	13	−6	8		1	12	−7	6			2582.571(0.250)	1.8005	489.196	
1	24	2	23	−	1	24	2	22	+		2634.979(0.191)	0.3736	689.587	
1	7	1	6	−	1	7	1	7	+		2691.426(0.035)	0.2055	271.076	
1	23	4	20		1	22	3	20			2704.087(0.921)	19.7534	695.953	
0	11	2	9		0	10	3	7			2925.964(0.021)	3.0646	121.899	
0	13	2	11	+	0	13	2	12	−		3077.483(0.024)	0.4205	172.948	
1	25	2	24	−	1	25	2	23	+		3088.639(0.223)	0.3674	729.682	
0	22	3	19	−	0	22	3	20	−		3205.217(0.049)	0.8694	442.459	
1	4	1	4		1	3	0	3			3279.993(0.013)	2.2316	218.568	
0	4	0	4		0	3	2	1			3387.316(0.014)	$0.3E-4$	25.141	
1	8	1	7	−	1	8	1	8	+		3458.618(0.042)	0.1784	283.933	
1	26	2	25	−	1	26	2	24	−		3597.711(0.259)	0.3620	771.370	
0	14	2	12	+	0	14	2	13	−		4095.733(0.032)	0.3825	195.504	
0	23	3	20	−	0	23	3	21	+		4153.560(0.062)	0.8499	479.496	
1	9	1	8	−	1	9	1	9	+		4320.740(0.048)	0.1569	298.396	
0	3	1	2		0	3	1	3	+	5005.321(0.050)[a]	5005.332(0.005)	0.4693	19.703	HEU73
1	10	1	9	−	1	10	1	10	+		5277.438(0.055)	0.1392	314.464	
0	24	3	21	−	0	24	3	22	+		5321.120(0.078)	0.8321	518.135	
0	15	2	13	+	0	15	2	14	−		5344.283(0.041)	0.3489	219.666	
1	17	2	15		1	18	−3	15			6181.589(0.153)	11.8457	499.172	
1	11	1	10	−	1	11	1	11	+		6328.308(0.063)	0.1245	332.137	
0	5	1	5	+	0	6	0	6	+	6668.522(0.050)	6668.472(0.014)	5.0768	33.876	BRO81
0	25	3	22	−	0	25	3	23	+		6744.843(0.098)	0.8157	558.375	
0	16	2	14	+	0	16	2	15	−		6853.687(0.052)	0.3189	245.432	
0	11	−3	9		0	10	−4	7			7283.449(0.017)	2.3930	149.812	
1	12	1	11	−	1	12	1	12	+		7472.900(0.073)	0.1120	351.414	
0	12	4	9	−	0	13	3	10	−		7682.301(0.018)	3.3477	181.400	
0	12	4	8	+	0	13	3	11	+		7830.903(0.017)	3.3467	181.395	
0	4	1	3	−	0	4	1	4	+	8341.640(0.050)	8341.638(0.008)	0.3606	26.101	LEE73
1	6	2	5		1	5	−1	4			8465.125(0.433)	0.0001	311.452	
0	26	3	23	−	0	26	3	24	+		8465.356(0.122)	0.8005	600.215	
0	17	2	15	+	0	17	2	16	−		8655.600(0.065)	0.2919	272.800	
1	13	1	12	−	1	13	1	13	+		8710.710(0.088)	0.1012	372.294	
0	6	2	4		0	7	−1	7			9400.829(0.013)	0.0015	49.035	
1	26	5	22	+	0	26	9	18	+		9761.952(2.302)	0.0398	855.757	
1	26	5	21	−	0	26	9	17	−		9761.998(2.302)	0.0398	855.757	
0	9	−1	9		0	8	−2	7		9936.200(0.050)	9936.203(0.014)	2.7769	76.102	RUD60

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	4	3	2	+	0	5	2	3	+	9978.669(0.050)	9978.703(0.015)	0.5684	50.413	BRO81
1	14	1	13	−	1	14	1	14	+		10041.182(0.111)	0.0919	394.776	
0	4	3	1	−	0	5	2	4	−	10058.316(0.050)	10058.281(0.015)	0.5682	50.411	BRO81
0	18	2	16	+	0	18	2	17	−		10782.506(0.079)	0.2674	301.771	
1	15	1	14	−	1	15	1	15	+		11463.701(0.143)	0.0837	418.861	
0	2	0	2		0	3	−1	3		12178.593(0.050)[a]	12178.561(0.015)	1.9848	13.556	LOV88
0	16	5	12		0	17	4	13		12229.400(0.050)	12229.335(0.030)	4.2860	313.437	LEE68
1	25	5	21	+	0	25	9	17	+		12309.705(1.588)	0.0194	813.968	
1	25	5	20	−	0	25	9	16	−		12309.737(1.588)	0.0194	813.968	
0	5	1	4	−	0	5	1	5	+	12511.000(0.050)*	12511.228(0.012)	0.2924	34.098	RUD60
1	16	1	15	−	1	16	1	16	+		12977.595(0.187)	0.0764	444.547	
0	19	2	17	+	0	19	2	18	−		13267.400(0.096)	0.2451	332.342	
0	16	−3	14		0	17	2	15			13775.553(0.041)	0.1926	262.456	
1	17	1	16	−	1	17	1	17	+		14582.130(0.245)	0.0700	471.833	
1	14	2	13		1	15	−2	13			14783.396(0.130)	0.9E−7	446.373	
0	14	3	11		0	15	0	15			14905.222(0.032)	0.0642	202.075	
1	24	5	20	+	0	24	9	16	+		14970.230(1.170)	0.0101	773.773	
1	24	5	19	−	0	24	9	15	−		14970.251(1.170)	0.0101	773.773	
0	25	4	22	−	0	24	5	19	−		15214.619(0.160)	7.8725	579.282	
1	20	−1	19		1	21	−2	19			15304.866(0.630)	2.7128	624.568	
0	7	−1	7		0	6	1	5			15617.294(0.016)	0.0002	48.514	
0	25	4	21	+	0	24	5	20	+		15642.781(0.163)	7.8703	579.282	
0	20	2	18	+	0	20	2	19	−		16143.438(0.116)	0.2247	364.512	
1	18	1	17	−	1	18	1	18	+		16276.508(0.317)	0.0642	500.717	
0	16	−2	15		0	15	−3	13		16395.740(0.050)	16395.861(0.026)	5.0753	237.125	SAS84
0	6	1	5	−	0	6	1	6	+	17513.341(0.050)[a]	17513.372(0.016)	0.2454	43.694	HEU73
1	23	5	19	+	0	23	9	15	+		17611.665(0.893)	0.0055	735.177	
1	23	5	18	−	0	23	9	14	−		17611.679(0.893)	0.0055	735.177	
0	21	3	18		0	20	4	16		17910.820(0.050)*	17910.982(0.070)	6.7517	405.277	SAS84
1	19	1	18	−	1	19	1	19	+		18059.863(0.406)	0.0590	531.201	
0	25	−8	17		0	26	−7	19			18163.304(0.226)	6.6271	746.092	
1	19	6	14	−	1	20	5	15	−		18224.097(0.437)	8.5027	629.824	
1	19	6	13	+	1	20	5	16	+		18224.111(0.437)	8.5027	629.824	
0	8	3	5		0	9	−2	8			18345.969(0.012)	0.0007	90.632	
0	21	2	19	+	0	21	2	20	−		19443.552(0.138)	0.2059	398.279	
1	20	1	19	−	1	20	1	20	+		19931.263(0.509)	0.0544	563.281	
0	2	1	1		0	3	0	3		19967.396(0.050)[a]	19967.427(0.007)	0.9244	18.803	MEH85
0	11	1	11	+	0	10	2	8	+	20171.089(0.050)[a]	20171.091(0.025)	3.5363	114.960	MEH85
1	22	5	18	+	0	22	9	14	+		20177.225(0.692)	0.0031	698.179	
1	22	5	17	−	0	22	9	13	−		20177.235(0.692)	0.0031	698.179	
0	17	6	12		0	18	5	14		20346.830(0.050)	20346.759(0.026)	4.3149	370.230	LEE68
0	16	−4	13		0	15	−5	10		20908.870(0.050)	20908.848(0.021)	4.0505	279.692	LEE68
1	10	1	10	+	1	11	2	9	+	20970.650(0.050)	20970.658(0.037)	6.5958	313.764	LEE68
1	8	2	7		1	7	3	5		21146.740(0.050)	21146.694(0.044)	0.2986	335.165	SAS84
1	12	2	11	−	1	11	1	10	−	21550.310(0.050)	21550.342(0.042)	7.0222	332.348	LEE68
1	21	1	20	−	1	21	1	21	+		21889.704(0.641)	0.0502	596.957	
1	21	5	17	+	0	21	9	13	+		22640.725(0.537)	0.0018	662.784	
1	21	5	16	−	0	21	9	12	−		22640.731(0.537)	0.0018	662.784	
1	10	0	10		1	9	−3	6			22894.980(0.088)	0.0001	296.638	
0	9	2	7	+	0	10	1	10	+	23121.024(0.050)[a]	23121.046(0.023)	3.1467	98.053	MEH85
0	22	2	20	+	0	22	2	21	−		23200.036(0.164)	0.1887	433.642	
1	23	−2	21		1	22	3	20			23345.873(0.665)	0.0003	695.953	
0	7	1	6	−	0	7	1	7	+	23346.956(0.050)[a]	23346.992(0.020)	0.2109	54.888	MEH85
0	10	3	7		0	11	1	10			23387.129(0.022)	0.0099	121.119	
0	6	0	6		0	5	−2	4			23443.202(0.015)	0.0002	42.206	
0	10	1	9	−	0	9	2	8	−	23444.778(0.050)[a]	23444.793(0.022)	3.5430	98.799	MEH85
1	22	1	21	−	1	22	1	22	+		23934.109(0.791)	0.0464	632.228	
1	23	7	16	−	1	22	8	15	−		24011.310(1.231)	0.7537	880.459	
1	23	7	17	+	1	22	8	14	+		24011.310(1.231)	0.7537	880.459	
0	4	−2	3		0	5	0	5			24592.026(0.015)	0.0001	33.316	
0	12	1	11		0	11	3	8			24912.303(0.023)	0.0128	139.647	
0	3	2	1		0	3	1	2		24928.700(0.050)	24928.715(0.014)	2.8073	24.310	HUG51

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	4	2	2		0	4	1	3		24933.470(0.050)[a]	24933.480(0.014)	3.9283	30.764	HUG51
0	2	2	0		0	2	1	1		24934.380(0.050)[a]	24934.398(0.015)	1.5948	19.469	HUG51
0	5	2	3		0	5	1	4		24959.079(0.050)[a]	24959.084(0.014)	5.0264	38.833	MEH85
1	20	5	16	+	0	20	9	12	+		24989.697(0.416)	0.0010	628.990	
1	20	5	15	−	0	20	9	11	−		24989.701(0.416)	0.0010	628.990	
0	6	2	4		0	6	1	5		25018.123(0.050)[a]	25018.122(0.015)	6.1287	48.514	MEH85
0	7	2	5		0	7	1	6		25124.872(0.050)[a]	25124.864(0.016)	7.2483	59.809	MEH85
0	8	2	6		0	8	1	7		25294.417(0.050)[a]	25294.401(0.019)	8.3910	72.717	MEH85
1	8	−3	5		1	9	0	9			25318.127(0.090)	$0.3E-4$	281.316	
1	9	9	0	−	1	9	8	1	+	25322.980(0.050)*	25322.793(0.095)	1.7407	546.768	SAS84
1	9	9	1	+	1	9	8	2	−	25322.980(0.050)*	25322.793(0.095)	1.7407	546.768	SAS84
1	21	8	13	+	1	22	7	16	+		25456.308(0.957)	0.6958	844.339	
1	21	8	14	−	1	22	7	15	−		25456.308(0.957)	0.6958	844.339	
0	9	2	7		0	9	1	8		25541.398(0.050)[a]	25541.375(0.021)	9.5570	87.239	MEH85
0	26	2	24		0	26	1	25			25786.647(0.254)	10.3619	580.449	
0	10	2	8		0	10	1	9		25878.266(0.050)[a]	25878.239(0.024)	10.7398	103.373	MEH85
1	23	1	22	−	1	23	1	23	+		26063.330(0.965)	0.0429	669.093	
1	10	1	9	−	1	11	2	10	−	26120.500(0.050)	26120.526(0.036)	6.5318	313.769	LEE68
0	11	2	9		0	11	1	10		26313.124(0.050)[a]	26313.093(0.025)	11.9257	121.119	MEH85
1	10	9	1	−	1	10	8	2	+	26550.263(0.050)	26550.192(0.066)	2.9776	562.819	LEE94
1	10	9	2	+	1	10	8	3	−	26550.263(0.050)	26550.192(0.066)	2.9776	562.819	LEE94
0	12	2	10		0	12	1	11		26847.237(0.050)	26847.205(0.027)	13.0919	140.478	LEE94
1	21	3	19		1	22	−2	20			27142.462(0.571)	0.0002	659.853	
1	19	5	15	+	0	19	9	11	+		27218.375(0.324)	0.0006	596.800	
1	19	5	14	−	0	19	9	10	−		27218.378(0.324)	0.0006	596.800	
1	6	3	4		1	7	2	6		27227.113(0.050)	27227.088(0.039)	0.2292	322.998	LEE94
0	14	−5	9		0	15	−4	12		27283.140(0.050)	27283.149(0.021)	3.6070	254.603	LEE94
0	23	2	21	+	0	23	2	22	−		27444.112(0.193)	0.1728	470.600	
0	25	2	23		0	25	1	24			27470.607(0.207)	11.5777	538.598	
0	13	2	11		0	13	1	12		27472.534(0.050)	27472.501(0.027)	14.2057	161.449	LEE94
1	12	2	10	+	1	11	1	11	+	27700.180(0.050)	27700.151(0.041)	7.1044	332.137	LEE94
1	11	9	2	−	1	11	8	3	+	27817.439(0.050)	27817.442(0.046)	3.8452	580.476	LEE94
1	11	9	3	+	1	11	8	4	−	27817.439(0.050)	27817.442(0.046)	3.8452	580.476	LEE94
0	19	5	15		0	18	6	13		27820.841(0.050)	27820.942(0.031)	4.7721	399.904	LEE94
0	16	0	16		0	15	3	12			28069.258(0.036)	0.0816	226.775	
0	14	2	12		0	14	1	13		28169.470(0.050)	28169.437(0.028)	15.2244	184.032	LEE94
1	24	1	23	−	1	24	1	24	+		28276.142(1.166)	0.0398	707.550	
0	4	0	4		0	3	1	2		28316.067(0.050)	28316.031(0.008)	1.4029	24.310	LEE94
0	24	2	22		0	24	1	23			28874.127(0.169)	12.7943	498.344	
0	15	2	13		0	15	1	14		28905.812(0.050)	28905.787(0.029)	16.0977	208.226	LEE94
0	8	2	7	−	0	9	1	8	−	28969.959(0.050)	28969.954(0.020)	3.0236	83.319	LEE94
1	12	9	3	−	1	12	8	4	+	29113.793(0.050)	29113.832(0.037)	4.4408	599.737	LEE94
1	12	9	4	+	1	12	8	5	−	29113.793(0.050)	29113.832(0.037)	4.4408	599.737	LEE94
1	18	5	14	+	0	18	9	10	+		29324.488(0.257)	0.0003	566.214	
1	18	5	13	−	0	18	9	9	−		29324.489(0.257)	0.0003	566.214	
0	16	2	14		0	16	1	15		29636.942(0.050)	29636.920(0.031)	16.7716	234.031	LEE94
0	23	2	21		0	23	1	22			29972.843(0.136)	13.9704	459.690	
0	8	1	7	−	0	8	1	8	+		30010.550(0.024)	0.1846	67.679	
0	17	2	15		0	17	1	16		30308.033(0.050)	30308.015(0.035)	17.1961	261.445	LEE94
0	10	−2	9		0	9	3	6			30400.888(0.013)	0.0018	105.765	
1	13	9	4	−	1	13	8	5	+	30429.883(0.050)	30429.934(0.038)	4.8357	620.602	LEE94
1	13	9	5	+	1	13	8	6	−	30429.883(0.050)	30429.934(0.038)	4.8357	620.602	LEE94
1	25	1	24	−	1	25	1	25	+		30571.248(1.396)	0.0369	747.599	
1	22	−2	20		1	21	−1	20			30677.480(0.699)	2.7929	658.830	
0	22	2	20		0	22	1	21			30752.084(0.109)	15.0541	422.636	
0	18	2	16		0	18	1	17		30858.301(0.050)	30858.278(0.042)	17.3339	290.469	LEE94
0	21	2	19		0	21	1	20			31209.684(0.086)	15.9865	387.186	
0	19	2	17		0	19	1	18		31226.750(0.050)	31226.709(0.053)	17.1684	321.101	LEE94
1	17	5	13	+	0	17	9	9	+		31307.669(0.212)	0.0002	537.233	
1	17	5	12	−	0	17	9	8	−		31307.670(0.212)	0.0002	537.233	
0	20	2	18		0	20	1	19		31358.415(0.050)	31358.349(0.068)	16.7083	353.341	LEE94
1	14	9	5	−	1	14	8	6	+	31757.390(0.050)	31757.420(0.041)	5.0826	643.070	LEE94

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	14	9	6	+	1	14	8	7	−	31757.390(0.050)	31757.420(0.041)	5.0826	643.070	LEE94
0	19	4	15		0	20	3	17		31977.791(0.050)	31977.680(0.053)	6.3266	371.990	LEE94
0	24	2	22	+	0	24	2	23	−		32205.472(0.226)	0.1581	509.150	
1	21	5	17	+	1	20	6	14	+		32373.759(0.562)	9.5254	662.459	
1	21	5	16	−	1	20	6	15	−		32373.782(0.562)	9.5254	662.459	
0	5	1	4		0	6	−1	6			32478.611(0.016)	0.0001	37.749	
1	16	−2	14		1	15	2	14			32559.957(0.146)	0.1E−6	470.990	
1	26	1	25	−	1	26	1	26	+		32947.277(1.656)	0.0344	789.237	
1	15	9	6	−	1	15	8	7	+	33088.919(0.050)	33088.906(0.041)	5.2206	667.141	LEE94
1	15	9	7	+	1	15	8	8	−	33088.919(0.050)	33088.906(0.041)	5.2206	667.141	LEE94
1	16	5	11	−	0	16	9	7	−		33168.617(0.188)	0.0001	509.859	
1	16	5	12	+	0	16	9	8	+		33168.617(0.188)	0.0001	509.859	
0	23	5	19	+	0	24	4	20	+		33691.409(0.130)	7.4438	539.523	
1	13	11	2	−	1	12	12	1	−		33891.149(6.331)	0.0327	851.737	
1	13	11	3	+	1	12	12	0	+		33891.149(6.331)	0.0327	851.737	
0	23	5	18	−	0	24	4	21	−		34003.136(0.127)	7.4454	539.513	
0	14	−3	12		0	15	−2	14		34236.946(0.050)	34236.844(0.023)	4.7002	211.800	LEE94
1	16	9	7	−	1	16	8	8	+	34417.849(0.050)	34417.796(0.039)	5.2791	692.814	LEE94
1	16	9	8	+	1	16	8	9	−	34417.849(0.050)	34417.796(0.039)	5.2791	692.814	LEE94
1	15	5	10	−	0	15	9	6	−		34908.622(0.180)	5.5E−5	484.090	
1	15	5	11	+	0	15	9	7	+		34908.622(0.180)	5.5E−5	484.090	
0	18	2	16		0	17	−3	15		35478.550(0.050)	35478.656(0.049)	0.2927	290.315	HUG51
1	17	9	8	−	1	17	8	9	+	35738.210(0.050)	35738.164(0.038)	5.2800	720.089	LEE94
1	17	9	9	+	1	17	8	10	−	35738.210(0.050)	35738.164(0.038)	5.2800	720.089	LEE94
0	4	−1	4		0	3	0	3		36169.262(0.050)	36169.290(0.014)	2.5184	18.803	LEE94
0	18	4	14		0	17	5	13		36248.148(0.050)	36248.111(0.035)	4.7359	341.235	LEE94
1	14	5	9	−	0	14	9	5	−		36529.288(0.183)	2.8E−5	459.930	
1	14	5	10	+	0	14	9	6	+		36529.288(0.183)	2.8E−5	459.930	
1	18	9	9	−	1	18	8	10	+	37044.666(0.050)	37044.638(0.046)	5.2400	748.965	LEE94
1	18	9	10	+	1	18	8	11	−	37044.666(0.050)	37044.638(0.046)	5.2400	748.965	LEE94
0	24	0	24		0	23	-3	21			37234.634(0.288)	0.4630	488.444	
0	9	1	8	−	0	9	1	9	+		37501.927(0.029)	0.1636	82.068	
0	25	2	23	+	0	25	2	24	−		37511.825(0.265)	0.1445	549.290	
0	21	−3	19		0	22	0	22			37588.587(0.168)	0.3589	414.727	
0	7	−2	6		0	8	−1	8		37703.708(0.050)	37703.696(0.013)	2.4051	61.930	LEE94
1	26	−4	22		0	26	−9	17			37785.754(1.766)	0.1E−4	844.987	
1	25	−4	21		0	25	−9	16			37908.818(1.461)	0.7E−5	803.193	
1	13	5	8	−	0	13	9	4	−		38032.366(0.194)	1.3E−5	437.377	
1	13	5	9	+	0	13	9	5	+		38032.366(0.194)	1.3E−5	437.377	
1	24	−4	20		0	24	−9	15			38173.489(1.198)	0.5E−5	762.997	
0	6	2	5	−	0	5	3	2	−	38293.288(0.050)	38293.292(0.014)	0.9488	58.813	LEE94
1	19	9	10	−	1	19	8	11	+	38332.265(0.050)	38332.318(0.069)	5.1716	779.440	LEE94
1	19	9	11	+	1	19	8	12	−	38332.265(0.050)	38332.318(0.069)	5.1716	779.440	LEE94
0	6	2	4	+	0	5	3	3	+	38452.680(0.050)	38452.653(0.014)	0.9495	58.813	LEE94
0	8	−1	8		0	7	2	5			38464.768(0.015)	0.0034	60.647	
1	23	−4	19		0	23	−9	14			38564.892(0.973)	0.3E−5	724.401	
1	22	−4	18		0	22	−9	13			39068.175(0.784)	0.2E−5	687.406	
1	12	5	7	−	0	12	9	3	−		39419.646(0.209)	5.4E−6	416.432	
1	12	5	8	+	0	12	9	4	+		39419.646(0.209)	5.4E−6	416.432	
1	20	9	11	−	1	20	8	12	+		39596.700(0.108)	5.0845	811.515	
1	20	9	12	+	1	20	8	13	−		39596.700(0.108)	5.0845	811.515	
1	21	−4	17		0	21	−9	12			39668.606(0.627)	0.1E−5	652.013	
1	4	−1	3		1	5	2	4			39740.285(0.435)	0.3E−4	302.080	
0	24	−3	22		0	25	−1	25			40027.317(0.295)	0.0005	525.745	
1	20	−4	16		0	20	−9	11			40351.659(0.500)	0.8E−6	618.222	
0	14	3	12	+	0	13	4	9	+	40405.370(0.050)	40405.226(0.018)	3.7779	202.621	SAS84
0	14	3	11	−	0	13	4	10	−	40635.060(0.050)	40635.111(0.018)	3.7796	202.621	SAS84
1	11	5	6	−	0	11	9	2	−		40692.890(0.228)	1.9E−6	397.097	
1	11	5	7	+	0	11	9	3	+		40692.890(0.228)	1.9E−6	397.097	
1	21	9	12	−	1	21	8	13	+		40833.619(0.162)	4.9860	845.188	
1	21	9	13	+	1	21	8	14	−		40833.619(0.162)	4.9860	845.188	
1	19	−4	15		0	19	−9	10			41103.087(0.401)	0.5E−6	586.035	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	9	−4	6		0	10	−3	8		41110.040(0.050)	41110.034(0.017)	1.9687	132.314	SAS84
1	10	5	5	−	0	10	9	1	−		41853.790(0.250)	5.5E−7	379.371	
1	10	5	6	+	0	10	9	2	+		41853.790(0.250)	5.5E−7	379.371	
1	18	−4	14		0	18	−9	9			41909.000(0.326)	0.3E−6	555.453	
1	22	9	13	−	1	22	8	14	+		42039.201(0.232)	4.8818	880.459	
1	22	9	14	+	1	22	8	15	−		42039.201(0.232)	4.8818	880.459	
1	19	−3	16		1	18	−2	16			42284.325(0.188)	12.5087	528.280	
1	17	−4	13		0	17	−9	8			42755.933(0.272)	0.2E−6	526.475	
1	9	5	5	+	0	9	9	1	+		42903.935(0.272)	0.9E−7	363.255	
1	9	5	5	+	0	9	9	1	+		42903.935(0.272)	0.9E−7	363.255	
1	23	9	14	−	1	23	8	15	+		43209.831(0.320)	4.7762	917.326	
1	23	9	15	+	1	23	8	16	−		43209.831(0.320)	4.7762	917.326	
0	26	2	24	+	0	26	2	25	−		43388.441(0.308)	0.1319	591.020	
1	16	−4	12		0	16	−9	7			43630.898(0.237)	0.8E−7	499.104	
0	3	1	2		0	2	−2	1			44029.400(0.020)	0.0001	22.841	
0	7	0	7	+	0	6	1	6	+	44069.490(0.050)	44069.476(0.015)	6.1380	43.694	SAS84
1	24	9	15	−	1	24	8	16	+		44342.123(0.431)	4.6728	955.788	
1	24	9	16	+	1	24	8	17	−		44342.123(0.431)	4.6728	955.788	
1	15	−4	11		0	15	−9	6			44521.444(0.216)	0.4E−7	473.339	
0	2	2	0		0	3	0	3			44901.825(0.014)	0.8E−5	18.803	
1	2	0	2		1	3	1	3		44955.810(0.050)	44955.778(0.012)	1.7823	212.241	SAS81
1	14	−4	10		0	14	−9	5			45415.698(0.206)	0.2E−7	449.181	
1	25	9	16	−	1	25	8	17	+		45432.906(0.568)	4.5742	995.845	
1	25	9	17	+	1	25	8	18	−		45432.906(0.568)	4.5742	995.845	
1	11	−7	5		1	12	−6	7			45738.293(0.260)	1.3652	468.388	
0	10	1	9	−	0	10	1	10	+	45818.260(0.050)	45818.271(0.033)	0.1467	98.053	SAS84
0	9	3	6		0	10	2	8		45843.360(0.050)*	45843.574(0.020)	2.6546	104.236	LEE73
1	13	−4	9		0	13	−9	4			46302.407(0.204)	0.8E−8	426.631	
1	26	9	17	−	1	26	8	18	+		46479.204(0.736)	4.4826	1037.490	
1	26	9	18	+	1	26	8	19	−		46479.204(0.736)	4.4826	1037.490	
0	20	7	14	+	0	21	6	15	+		46558.077(0.058)	5.0141	506.873	
0	20	7	13	−	0	21	6	16	−		46558.085(0.058)	5.0141	506.873	
1	12	−4	8		0	12	−9	3			47170.971(0.207)	0.3E−8	405.689	
1	11	−4	7		0	11	−9	2			48011.473(0.214)	0.1E−8	386.357	
1	1	0	1		1	0	0	0		48247.568(0.050)	48247.572(0.002)	0.8089	208.912	LEE94
1	1	0	1	+	1	0	0	0	+	48257.322(0.050)	48257.302(0.004)	0.8081	294.451	LEE94
0	1	0	1	+	0	0	0	0	+	48372.456(0.050)[a]	48372.463(0.001)	0.8086	0.000	HEU73
0	1	0	1		0	0	0	0		48376.889(0.050)	48376.889(0.001)	0.8084	9.122	SAS81
0	25	5	21	+	0	24	6	18	+		48406.486(0.208)	7.1099	617.905	
0	25	5	20	−	0	24	6	19	−		48410.447(0.208)	7.1099	617.905	
1	21	3	19		1	22	4	19			48712.983(0.777)	18.6892	659.134	
1	21	3	19		1	22	4	19			48712.983(0.777)	18.6892	659.134	
0	22	6	17	−	0	23	5	18	−		49029.046(0.129)	6.1963	540.647	
0	22	6	16	+	0	23	5	19	+		49030.782(0.129)	6.1963	540.647	
0	23	6	18	−	0	22	7	15	−		49867.418(0.093)	5.9583	577.630	
0	23	6	17	+	0	22	7	16	+		49867.441(0.093)	5.9583	577.630	
1	14	−6	9		1	13	−7	7			50950.318(0.250)	2.2767	510.082	
1	5	1	5		1	4	0	4		51509.280(0.050)	51509.327(0.014)	2.6837	225.005	SAS84
0	5	0	5		0	4	2	2			51576.149(0.013)	0.0001	31.596	
0	12	2	10		0	11	3	8		51759.850(0.050)*	51759.508(0.022)	3.4619	139.647	SAS84
1	24	4	21		1	23	3	21			54481.137(1.082)	20.8400	732.730	
1	16	−2	14		1	17	−3	14			54593.196(0.126)	11.2065	470.255	
1	26	9	17		0	26	12	15			54941.834(3.786)	0.0006	1071.630	
0	11	1	10	−	0	11	1	11	+	54955.840(0.050)	54955.840(0.036)	0.1326	115.633	SAS84
0	12	−3	10		0	11	−4	8		55673.890(0.050)	55673.929(0.018)	2.8287	167.550	SAS84
0	11	4	8	−	0	12	3	9	−	56012.370(0.050)	56012.455(0.017)	2.9154	160.434	SAS84
0	11	4	7	+	0	12	3	10	+	56105.250(0.050)	56105.245(0.017)	2.9149	160.431	SAS84
1	25	9	16		0	25	12	14			56480.343(3.018)	0.0005	1029.880	
1	7	2	6		1	6	−1	5			56660.735(0.431)	0.0002	321.108	
0	4	1	4	+	0	5	0	5	+	57032.920(0.050)	57032.906(0.013)	4.0347	24.199	SAS84
0	10	−1	10		0	9	−2	8		57292.960(0.050)	57292.944(0.015)	3.1155	90.632	SAS84
0	5	2	3		0	6	−1	6			57437.695(0.012)	0.0006	37.749	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	24	9	15		0	24	12	13			58035.982(2.388)	0.0004	989.713	
0	3	3	1	+	0	4	2	2	+	58394.940(0.050)	58394.948(0.016)	0.2363	42.345	SAS84
0	3	3	0	−	0	4	2	3	−	58429.010(0.050)	58429.025(0.016)	0.2363	42.344	SAS84
0	13	3	10		0	14	0	14			58725.398(0.029)	0.0486	178.025	
1	23	9	14		0	23	12	12			59599.528(1.877)	0.0003	951.148	
1	9	8	1		1	9	6	3			60205.420(0.336)	0.0005	484.061	
1	8	8	0		1	8	6	2			60220.568(0.357)	0.0002	469.587	
1	10	8	2		1	10	6	4			60319.854(0.330)	0.0008	500.139	
0	1	0	1		0	2	−1	2		60531.420(0.050)	60531.455(0.015)	1.4742	8.717	SAS84
1	11	8	3		1	11	6	5			*60604.140(0.344)*	*0.0010*	517.821	
0	15	5	11		0	16	4	12		60690.880(0.050)	60690.860(0.027)	3.8427	286.039	SAS84
1	12	8	4		1	12	6	6			61100.541(0.378)	0.0009	537.106	
1	22	9	13		0	22	12	11			61162.183(1.469)	0.0003	914.182	
1	19	−1	18		1	20	−2	18			61558.157(0.578)	2.6284	590.876	
1	13	8	5		1	13	6	7			61851.937(0.432)	0.0006	557.991	
1	13	2	12		1	14	−2	12			62279.746(0.119)	$0.6E-7$	422.271	
1	21	9	12		0	21	12	10			62715.571(1.152)	0.0002	878.816	
1	14	8	6		1	14	6	8			62900.182(0.501)	0.0002	580.476	
0	12	1	12	+	0	11	2	9	+	62906.990(0.050)	62906.977(0.027)	3.9124	132.710	SAS84
0	15	−3	13		0	16	2	14			63120.429(0.036)	0.1206	235.019	
0	8	−1	8		0	7	1	6			63589.632(0.016)	0.0003	59.809	
1	20	9	11		0	20	12	9			64251.726(0.915)	0.0002	845.050	
0	26	4	23	−	0	25	5	20	−		64538.579(0.198)	8.2961	619.520	
0	12	1	11	−	0	12	1	12	+	64907.750(0.050)*	64909.823(0.041)	0.1207	134.809	SAS84
0	26	4	22	+	0	25	5	21	+		65118.923(0.203)	8.2930	619.520	
1	19	9	10		0	19	12	8			65763.083(0.750)	0.0001	812.886	
1	16	8	8		1	16	6	10			66039.102(0.679)	0.0003	630.241	
0	24	−8	16		0	25	−7	18			66527.097(0.189)	6.1455	704.285	
0	8	2	6	+	0	9	1	9	+	66948.010(0.050)	66947.939(0.021)	2.7458	82.068	SAS84
0	7	3	4		0	8	−2	7			66994.218(0.012)	0.0002	76.102	
1	18	9	9		0	18	12	7			67242.470(0.647)	*0.0001*	782.325	
0	17	−2	16		0	16	-3	14		67542.230(0.050)*	67542.982(0.031)	5.4225	262.916	SAS84
0	22	3	19		0	21	4	17			68032.467(0.091)	7.1718	439.102	
1	17	8	9		1	17	6	11			68193.276(0.787)	0.0015	657.519	
0	1	1	0		0	2	0	2		68305.630(0.050)	68305.680(0.007)	0.4573	13.963	SAS84
1	18	6	13	−	1	19	5	14	−		68502.235(0.332)	7.5221	597.708	
1	18	6	12	+	1	19	5	15	+		68502.242(0.332)	7.5221	597.708	
0	16	6	11		0	17	5	13		68554.700(0.050)	68554.790(0.024)	3.8634	341.235	SAS84
1	17	9	8		0	17	12	6			68683.104(0.596)	0.0001	753.368	
0	3	2	1		0	2	−2	1			68958.116(0.015)	$0.1E-6$	22.841	
0	17	−4	14		0	16	−5	11		69055.010(0.050)	69055.064(0.023)	4.4966	305.480	SAS84
1	13	2	12	−	1	12	1	11	−	69175.520(0.050)	69175.527(0.050)	7.5226	351.663	SAS84
1	9	2	8		1	8	3	6		69600.200(0.050)*	69599.604(0.053)	0.3684	348.029	SAS84
1	9	1	9	+	1	10	2	8	+	69607.150(0.050)*	69606.856(0.033)	6.0998	296.074	SAS84
1	16	9	7		0	16	12	5			70078.582(0.581)	$0.3E-4$	726.014	
0	17	0	17		0	16	3	13			70139.416(0.041)	0.1002	252.591	
1	18	8	10		1	18	6	12			70769.102(0.907)	0.0044	686.392	
1	11	0	11		1	10	−3	7			71092.551(0.086)	0.0001	312.721	
0	7	0	7		0	6	−2	5			71260.406(0.015)	0.0003	51.889	
1	15	9	6		0	15	12	4			71422.875(0.592)	$0.2E-4$	700.266	
0	9	3	6		0	10	1	9			71721.813(0.022)	0.0073	103.373	
1	14	9	5		0	14	12	3			72710.327(0.619)	$0.8E-5$	676.124	
0	3	−2	2		0	4	0	4			72780.961(0.016)	$0.4E-4$	25.254	
0	13	1	12		0	12	3	9			73166.369(0.024)	0.0159	159.009	
0	25	0	25		0	24	−3	22			73381.354(0.366)	0.5158	527.080	
1	24	7	17	−	1	23	8	16	−		73536.586(1.563)	0.8122	917.326	
1	24	7	18	+	1	23	8	15	+		*73536.586(1.563)*	*0.8122*	917.326	
1	7	−3	4		1	8	0	8			73544.119(0.093)	$0.2E-4$	266.838	
1	19	8	11		1	19	6	13			73781.902(1.042)	0.0093	716.859	
1	9	1	8	−	1	10	2	9	−	73841.700(0.050)*	73839.235(0.031)	6.0511	296.077	LEE94
1	13	9	4		0	13	12	2			73935.647(0.658)	$0.3E-5$	653.588	
1	24	−2	22		1	23	3	21			74057.937(0.767)	0.0006	732.730	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	20	8	12	+	1	21	7	15	+		74870.506(0.736)	0.6383	809.018	
1	20	8	13	−	1	21	7	14	−		74870.506(0.736)	0.6383	809.018	
1	12	9	3		0	12	12	1			75093.911(0.704)	0.8E−6	632.659	
0	13	−5	8		0	14	−4	11		75515.350(0.050)	75515.344(0.021)	3.1673	230.426	SAS84
1	5	3	3		1	6	2	5		75543.290(0.050)	75543.247(0.041)	0.1614	311.735	SAS84
0	13	1	12	−	0	13	1	13	+		75674.147(0.046)	0.1105	155.578	
0	20	5	16		0	19	6	14		75943.580(0.050)*	75943.716(0.041)	5.2342	430.505	SAS84
0	6	−2	5		0	6	2	4			76167.245(0.014)	0.0001	49.349	
0	5	−2	4		0	5	2	3			76167.690(0.014)	0.4E−4	39.665	
0	2	−2	1		0	2	2	0			76168.074(0.015)	0.7E−7	20.300	
0	4	−2	3		0	4	2	2			76168.175(0.014)	0.8E−5	31.596	
0	3	−2	2		0	3	2	1			76168.276(0.014)	0.1E−5	25.141	
0	7	−2	6		0	7	2	5			76168.464(0.014)	0.0004	60.647	
0	8	−2	7		0	8	2	6			76175.318(0.015)	0.0009	73.561	
1	25	−2	23		1	26	0	26			76194.655(0.694)	0.0005	772.717	
0	9	−2	8		0	9	2	7			76195.836(0.015)	0.0020	88.091	
0	10	−2	9		0	10	2	8			76244.462(0.016)	0.0041	104.236	
0	11	1	10	−	0	10	2	9	−	76247.270(0.050)	76247.312(0.023)	4.0815	114.923	SAS84
0	20	−3	18		0	21	0	21			76270.658(0.125)	0.3089	379.611	
0	11	−2	10		0	11	2	9			76345.003(0.017)	0.0077	121.997	
1	23	−2	21		1	22	−1	21			76366.766(0.788)	2.8683	694.184	
1	13	2	11	+	1	12	1	12	+	76405.140(0.050)	76405.166(0.048)	7.6261	351.414	SAS84
0	5	0	5		0	4	1	3		76509.670(0.050)	76509.628(0.008)	1.8942	30.764	SAS84
0	12	−2	11		0	12	2	10			76534.004(0.019)	0.0137	141.374	
0	13	−2	12		0	13	2	11			76864.136(0.020)	0.0230	162.366	
1	20	8	12		1	20	6	14			77240.397(1.193)	0.0170	748.919	
1	20	3	18		1	21	−2	19			77403.407(0.485)	0.0001	624.568	
0	14	−2	13		0	14	2	12			77406.948(0.023)	0.0368	184.972	
0	15	−2	14		0	15	2	13			78254.129(0.026)	0.0560	209.190	
0	11	−2	10		0	10	3	7			79270.967(0.013)	0.0043	121.899	
0	16	−2	15		0	16	2	14			79516.290(0.032)	0.0816	235.019	
1	17	−2	15		1	16	2	15			79731.350(0.171)	0.2E−6	496.719	
0	23	−3	21		0	24	−1	24			80402.081(0.230)	0.0005	485.762	
0	4	1	3		0	5	−1	5			80669.334(0.017)	0.0001	28.073	
0	7	2	6	−	0	8	1	7	−	80993.160(0.050)	80993.257(0.019)	2.5221	68.680	SAS84
1	21	8	13		1	21	6	15			81147.462(1.361)	0.0279	782.571	
0	17	−2	16		0	17	2	15			81318.535(0.040)	0.1139	262.456	
0	18	4	14		0	19	3	16		81653.080(0.050)	81652.931(0.040)	5.8973	339.720	SAS84
1	14	11	3	−	1	13	12	2	−		82418.816(6.498)	0.0918	872.603	
1	14	11	4	+	1	13	12	1	+		82418.816(6.498)	0.0918	872.603	
0	22	5	18	+	0	23	4	19	+		82897.082(0.101)	7.0142	500.850	
0	22	5	17	−	0	23	4	20	−		83120.815(0.099)	7.0153	500.842	
1	22	5	18	+	1	21	6	15	+		83312.524(0.706)	10.5801	696.074	
1	22	5	17	−	1	21	6	16	−		83312.564(0.706)	10.5801	696.074	
0	18	−2	17		0	18	2	16			83792.654(0.051)	0.1528	291.498	
1	11	10	1		1	11	11	0			84158.571(3.824)	1.4593	738.186	
0	13	−3	11		0	14	−2	13		84423.810(0.050)	84423.706(0.021)	4.3033	187.554	SAS84
0	5	−1	5		0	4	0	4		84521.210(0.050)	84521.206(0.014)	3.0830	25.254	ZUC72
1	12	10	2		1	12	11	1			84540.414(3.970)	2.7860	757.455	
0	19	2	17		0	18	−3	16			84574.024(0.060)	0.4243	319.322	
0	19	4	15		0	18	5	14		84744.170(0.050)*	84743.896(0.043)	5.1920	370.230	SAS84
1	13	10	3		1	13	11	2			84940.420(4.133)	4.0053	778.327	
1	14	10	4		1	14	11	3			85355.421(4.315)	5.1350	800.802	
1	22	8	14		1	22	6	16			85501.157(1.547)	0.0425	817.815	
0	6	−2	5		0	7	−1	7		85567.970(0.050)	85568.074(0.013)	2.0068	49.035	SAS84
1	15	10	5		1	15	11	4			85782.043(4.518)	6.1883	824.879	
0	9	−1	9		0	8	2	6			86111.520(0.017)	0.0073	73.561	
1	16	10	6		1	16	11	5			86216.706(4.746)	7.1751	850.558	
0	7	2	6	−	0	6	3	3	−	86615.760(0.050)*	86615.602(0.014)	1.3578	68.493	SAS84
1	17	10	7		1	17	11	6			86655.627(5.001)	8.1025	877.837	
0	7	2	5	+	0	6	3	4	+	86903.060(0.050)	86902.947(0.014)	1.3596	68.493	SAS84
0	19	−2	18		0	19	2	17			87066.819(0.067)	0.1974	322.143	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	18	10	8		1	18	11	7			87094.825(5.290)	8.9763	906.717	
0	14	1	13	−	0	14	1	14	+		87241.266(0.053)	0.1018	177.941	
1	19	10	9		1	19	11	8			87530.120(5.619)	9.8007	937.196	
1	3	−1	2		1	4	2	3			87954.998(0.436)	0.9E−5	294.034	
1	20	10	10		1	20	11	9			87957.136(5.995)	10.5792	969.274	
1	21	10	11		1	21	11	10			88371.302(6.427)	11.3144	1002.950	
0	15	3	13	+	0	14	4	10	+	88594.960(0.050)	88594.809(0.019)	4.2066	225.197	SAS84
1	22	10	12		1	22	11	11			88767.849(6.925)	12.0083	1038.220	
0	15	3	12	−	0	14	4	11	−	88940.090(0.050)	88939.993(0.020)	4.2095	225.197	SAS84
1	23	10	13		1	23	11	12			89141.812(7.498)	12.6625	1075.090	
1	24	10	14		1	24	11	13			89488.029(8.157)	13.2782	1113.550	
0	8	−4	5		0	9	−3	7		89505.740(0.050)	89505.778(0.017)	1.5582	116.184	SAS84
1	25	10	15		1	25	11	14			89801.138(8.913)	13.8564	1153.610	
1	23	8	15		1	23	6	17			90295.864(1.754)	0.0612	854.650	
1	20	−3	17		1	19	−2	17			90812.387(0.232)	13.1965	558.780	
0	20	−2	19		0	20	2	18			91254.721(0.087)	0.2463	354.387	
0	4	1	3		0	3	−2	2			92409.579(0.019)	0.0005	27.682	
1	1	0	1		1	2	1	2		93196.620(0.050)	93196.657(0.012)	1.3353	207.413	LOV82
1	10	−7	4		1	11	−6	6			94021.258(0.278)	0.9735	449.099	
0	8	3	5		0	9	2	7		94541.787(0.050)	94541.806(0.019)	2.2362	88.091	AND90
0	19	7	13	+	0	20	6	14	+	94815.040(0.050)	94815.075(0.047)	4.5524	473.067	SAS84
0	19	7	12	−	0	20	6	15	−	94815.040(0.050)	94815.080(0.047)	4.5524	473.067	SAS84
0	8	0	8	+	0	7	1	7	+	95169.440(0.050)	95169.516(0.016)	7.2211	54.888	LEE68
1	24	8	16		1	24	6	18			95523.388(1.982)	0.0841	893.074	
0	25	−6	19		0	26	−5	21			95745.985(0.188)	7.7024	651.743	
0	2	1	2	+	0	1	1	1	+	95914.290(0.050)	95914.310(0.003)	1.2141	11.705	LEE68
1	2	1	2	+	1	1	1	1	+	96396.010(0.050)	96396.055(0.004)	1.2147	227.674	LEE68
0	21	−2	20		0	21	2	19			96446.603(0.112)	0.2983	388.227	
1	2	1	2		1	1	1	1		96492.200(0.050)	96492.164(0.004)	1.2116	204.194	AND90
1	2	0	2		1	1	0	1		96493.590(0.050)	96493.553(0.004)	1.6179	210.522	AND90
1	2	−1	1		1	1	−1	0		96501.660(0.050)	96501.698(0.006)	1.2110	288.921	LOV82
1	2	0	2	+	1	1	0	1	+	96513.660(0.050)	96513.671(0.008)	1.6162	296.060	HER84
1	2	1	1	−	1	1	1	0	−	96588.600(0.050)	96588.593(0.005)	1.2147	227.677	LEE68
0	2	−1	2		0	1	−1	1		96739.390(0.050)	96739.363(0.003)	1.2133	5.490	LEE68
0	2	0	2	+	0	1	0	1	+	96741.420(0.050)	96741.377(0.003)	1.6171	1.614	LEE68
0	2	0	2		0	1	0	1		96744.580(0.050)	96744.549(0.003)	1.6167	10.736	LEE68
0	2	1	1		0	1	1	0		96755.510(0.050)	96755.507(0.003)	1.2443	16.241	LEE68
0	26	5	22	+	0	25	6	19	+		97204.624(0.260)	7.5812	658.116	
0	26	5	21	−	0	25	6	20	−		97210.460(0.260)	7.5812	658.116	
0	2	1	1	−	0	1	1	0	−	97582.830(0.050)	97582.808(0.003)	1.2141	11.733	LEE68
0	21	6	16	−	0	22	5	17	−		97678.261(0.100)	5.7462	503.615	
0	21	6	15	+	0	22	5	18	+		97679.378(0.100)	5.7462	503.615	
0	24	6	19	−	0	23	7	16	−		98030.396(0.118)	6.4398	614.635	
0	24	6	18	+	0	23	7	17	+		98030.435(0.118)	6.4398	614.635	
1	15	−6	10		1	14	−7	8			99374.624(0.264)	2.7920	532.569	
0	15	1	14	−	0	15	1	15	+		99601.946(0.064)	0.0941	201.897	
0	6	0	6		0	5	2	3			99610.891(0.013)	0.0002	39.665	
1	6	1	6		1	5	0	5		99730.920(0.050)	99730.959(0.014)	3.1397	233.051	LOV82
1	20	3	18		1	21	4	18			99776.775(0.649)	17.6514	623.822	
0	13	2	11		0	12	3	9		100638.900(0.050)	100638.870(0.024)	3.8425	159.009	SAS84
0	3	−2	2		0	3	1	2			101096.992(0.019)	0.0008	24.310	
0	4	−2	3		0	4	1	3			101101.654(0.018)	0.0030	30.764	
0	2	−2	1		0	2	1	1			101102.472(0.020)	0.0001	19.469	
0	5	−2	4		0	5	1	4		101126.800(0.050)	101126.774(0.017)	0.0088	38.833	SAS84
1	25	8	17		1	25	6	19			101173.914(2.232)	0.1115	933.087	
0	6	−2	5		0	6	1	5		101185.320(0.050)	101185.367(0.017)	0.0214	48.514	SAS84
0	7	−2	6		0	7	1	6		101293.340(0.050)	101293.328(0.016)	0.0463	59.809	SAS84
0	8	−2	7		0	8	1	7		101469.700(0.050)	101469.719(0.016)	0.0912	72.717	SAS84
0	9	−2	8		0	9	1	8		101737.080(0.050)	101737.211(0.017)	0.1677	87.239	SAS84
0	10	−2	9		0	10	1	9		102122.590(0.050)	102122.701(0.018)	0.2916	103.373	SAS84
0	11	−2	10		0	11	1	10		102658.040(0.050)	102658.096(0.018)	0.4846	121.119	SAS84
0	22	−2	21		0	22	2	20			102704.202(0.142)	0.3525	423.662	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	15	−2	13		1	16	−3	13			102957.986(0.106)	10.5900	442.939	
0	12	3	9		0	13	0	13			103325.255(0.027)	0.0353	155.562	
0	12	−2	11		0	12	1	11		103381.110(0.050)	103381.209(0.019)	0.7747	140.478	SAS84
0	13	−3	11		0	12	−4	9		104060.760(0.050)	104060.717(0.019)	3.2738	186.899	LEE68
0	11	−1	11		0	10	−2	9		104300.460(0.050)	104300.396(0.016)	3.4141	106.779	LEE68
0	13	−2	12		0	13	1	12		104336.540(0.050)	104336.637(0.020)	1.1966	161.449	SAS84
0	10	4	7	−	0	11	3	8	−	104354.850(0.050)	104354.861(0.017)	2.4848	141.080	LEE68
0	10	4	6	+	0	11	3	9	+	104410.480(0.050)	104410.489(0.017)	2.4845	141.079	LEE68
1	8	2	7		1	7	−1	6			104846.115(0.428)	0.0003	332.373	
0	13	1	13	+	0	12	2	10	+	105063.700(0.050)	105063.761(0.030)	4.2727	152.074	LEE68
0	14	−2	13		0	14	1	13		105576.350(0.050)	105576.385(0.021)	1.7917	184.032	LEE68
0	4	2	2		0	5	−1	5			105602.813(0.011)	0.0002	28.073	
1	25	4	22		1	24	3	22			106620.989(1.258)	21.9448	771.090	
0	3	1	3	+	0	4	0	4	+	107013.850(0.050)	107013.770(0.013)	3.0088	16.134	LEE68
0	15	−2	14		0	15	1	14		107159.790(0.050)	107159.915(0.023)	2.6051	208.226	SAS84
1	26	8	18		1	26	6	20			107236.786(2.505)	0.1436	974.688	
1	18	−1	17		1	19	−2	17			108060.757(0.541)	2.5400	558.780	
0	26	0	26		0	25	−3	23			108690.257(0.458)	0.5681	567.318	
0	0	0	0		0	1	−1	1		108893.940(0.050)	108893.929(0.015)	0.9784	5.490	LEE68
0	26	0	26		0	26	−1	26			109137.566(0.171)	3.0776	567.303	
0	14	5	10		0	15	4	11		109138.710(0.050)	109138.688(0.025)	3.4067	260.249	LEE68
0	16	−2	15		0	16	1	15		109153.190(0.050)	109153.210(0.028)	3.6815	234.031	SAS84
1	12	2	11		1	13	−2	11			109911.105(0.112)	$0.3E-7$	399.772	
0	23	−2	22		0	23	2	21			110060.301(0.179)	0.4086	460.689	
0	18	0	18		0	17	3	14			111254.384(0.051)	0.1192	280.020	
0	7	2	5	+	0	8	1	8	+	111289.620(0.050)	111289.601(0.019)	2.3361	67.679	LEE68
0	9	−1	9		0	8	1	7			111405.922(0.017)	0.0005	72.717	
0	17	−2	16		0	17	1	16		111626.530(0.050)	111626.550(0.035)	5.0585	261.445	SAS84
0	14	−3	12		0	15	2	13			112490.973(0.032)	0.0716	209.190	
0	16	1	15	−	0	16	1	16	+		112745.031(0.081)	0.0874	227.443	
0	25	0	25		0	25	−1	25			113408.671(0.146)	3.4103	525.745	
0	18	−2	17		0	18	1	17		114650.990(0.050)	114650.932(0.046)	6.7581	290.469	SAS84
0	23	−8	15		0	24	−7	17			114899.746(0.158)	5.6712	664.077	
0	6	3	3		0	7	−2	6			115564.530(0.012)	0.0001	63.188	
0	19	−3	17		0	20	0	20			115799.747(0.091)	0.2614	346.073	
1	14	2	13	−	1	13	1	12	−	116757.550(0.050)	116757.498(0.061)	8.0335	372.584	LEE68
0	15	6	10		0	16	5	12		116798.890(0.050)	116798.728(0.024)	3.4185	313.845	LEE68
0	18	−4	15		0	17	−5	12		117149.700(0.050)	117149.656(0.028)	4.9442	332.876	LEE68
0	4	2	2		0	3	−2	2			117343.058(0.015)	$0.2E-5$	27.682	
0	24	0	24		0	24	−1	24			117636.715(0.123)	3.7672	485.762	
1	10	2	9		1	9	3	7		118156.500(0.050)*	118156.112(0.066)	0.4379	362.498	SAS84
1	8	1	8	+	1	9	2	7	+	118207.930(0.050)	118207.936(0.030)	5.6156	279.990	LEE68
0	19	−2	18		0	19	1	18			118293.528(0.061)	8.7795	321.101	
0	23	3	20		0	22	4	18			118406.053(0.117)	7.5863	474.532	
1	17	6	12	−	1	18	5	13	−		118482.536(0.246)	6.5899	567.192	
1	17	6	11	+	1	18	5	14	+		118482.540(0.246)	6.5899	567.192	
0	24	−2	23		0	24	2	22			118522.133(0.221)	0.4676	499.307	
0	8	0	8		0	7	−2	6			118785.162(0.016)	0.0005	63.188	
0	18	−2	17		0	17	−3	15			119271.311(0.040)	5.7366	290.315	
1	12	0	12		1	11	−3	8			119271.820(0.085)	0.0002	330.411	
0	8	3	5		0	9	1	8			120083.180(0.021)	0.0051	87.239	
0	3	1	2		0	2	2	0		120197.520(0.050)	120197.475(0.015)	0.3160	20.300	LEE68
0	2	−2	1		0	3	0	3			121069.899(0.016)	$0.1E-4$	18.803	
0	14	1	13		0	13	3	10			121363.090(0.024)	0.0192	179.984	
0	22	−3	20		0	23	−1	23			121542.614(0.177)	0.0004	447.356	
1	8	1	7	−	1	9	2	8	−	121607.750(0.050)	121607.620(0.028)	5.5796	279.992	LEE68
0	2	2	0		0	1	1	0		121689.850(0.050)	121689.905(0.016)	2.8297	16.241	LEE68
1	24	−2	22		1	23	−1	22			121740.543(0.899)	2.9387	731.140	
1	6	−3	3		1	7	0	7			121780.458(0.095)	$0.8E-5$	253.968	
0	23	0	23		0	23	−1	23			121788.457(0.102)	4.1467	447.356	
0	20	−2	19		0	20	1	19			122613.071(0.079)	11.0953	353.341	
0	9	3	6		0	8	−3	6			122876.929(0.019)	$0.1E-8$	101.666	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	25	7	18	−	1	24	8	17	−		123124.098(1.960)	0.8714	955.788	
1	25	7	19	+	1	24	8	16	+		123124.098(1.960)	0.8714	955.788	
0	12	−5	7		0	13	−4	10		123782.420(0.050)	123782.425(0.021)	2.7329	207.858	LEE68
1	4	3	2		1	5	2	4			123820.202(0.046)	0.0974	302.080	
0	21	5	17		0	20	6	15		124016.660(0.050)*	124016.793(0.054)	5.7006	462.711	LEE68
1	19	8	11	+	1	20	7	14	+		124235.156(0.564)	0.5813	775.296	
1	19	8	12	−	1	20	7	13	−		124235.156(0.564)	0.5813	775.296	
0	6	0	6		0	5	1	4		124569.970(0.050)	124569.976(0.010)	2.3990	38.833	LEE68
1	25	−2	23		1	24	3	22			124986.173(0.877)	0.0012	771.090	
1	24	−2	22		1	25	0	25			125078.774(0.584)	0.0004	731.028	
1	14	2	12	+	1	13	1	13	+		125144.076(0.058)	8.1619	372.294	
0	22	0	22		0	22	−1	22			125828.561(0.084)	4.5458	410.529	
0	17	1	16	−	0	17	1	17	+		126657.199(0.103)	0.0815	254.580	
1	18	−2	16		1	17	2	16			126710.900(0.205)	$0.3E-6$	524.054	
1	19	3	17		1	20	−2	18			127437.218(0.409)	0.0001	590.876	
0	21	2	20		0	21	1	20			127656.287(0.102)	13.6534	387.186	
0	25	−2	24		0	25	2	23			128076.995(0.272)	0.5319	539.515	
0	12	−2	11		0	11	3	8			128293.513(0.013)	0.0095	139.647	
0	3	1	2		0	4	−1	4			128930.010(0.018)	$0.3E-4$	20.009	
0	12	1	11	−	0	11	2	10	−	129433.410(0.050)	129433.406(0.025)	4.6409	132.657	LEE68
0	21	0	21		0	21	−1	21			129720.502(0.068)	4.9598	375.284	
1	15	11	4	−	1	14	12	3	−		130965.719(6.706)	0.1730	895.072	
1	15	11	5	+	1	14	12	2	+		130965.719(6.706)	0.1730	895.072	
0	17	4	13		0	18	3	15		131133.916(0.050)*	131134.052(0.032)	5.4647	309.063	BAS92
0	21	5	17	+	0	22	4	18	+		131986.775(0.078)	6.5818	463.785	
0	21	5	16	−	0	22	4	19	−		132144.888(0.077)	6.5826	463.779	
0	6	2	5	−	0	7	1	6	−	132621.940(0.050)	132621.859(0.018)	2.0376	55.667	LEE68
0	6	−1	6		0	5	0	5		132890.790(0.050)	132890.800(0.014)	3.6871	33.316	LEE68
0	20	4	16		0	19	5	15		133260.820(0.050)	133260.621(0.054)	5.6539	400.832	LEE68
0	20	0	20		0	20	−1	20		133427.560(0.050)*	133427.766(0.055)	5.3823	341.622	LEE68
0	20	2	18		0	19	−3	17			133444.993(0.073)	0.5884	349.935	
0	22	−2	21		0	22	1	21			133456.286(0.130)	16.3836	422.636	
0	10	−1	10		0	9	2	7			133488.780(0.019)	0.0145	88.091	
0	5	−2	4		0	6	−1	6		133605.500(0.050)	133605.385(0.013)	1.5894	37.749	LEE68
0	12	−3	10		0	13	−2	12		134231.120(0.050)	134231.013(0.020)	3.8904	164.930	SAS84
1	23	5	19	+	1	22	6	16	+		134613.883(0.871)	11.6485	731.274	
1	23	5	18	−	1	22	6	17	−		134613.949(0.871)	11.6485	731.274	
0	8	2	7	−	0	7	3	4	−	134896.960(0.050)	134896.917(0.014)	1.7851	79.785	LEE68
0	8	2	6	+	0	7	3	5	+	135376.760(0.050)	135376.852(0.014)	1.7889	79.785	LEE68
1	2	−1	1		1	3	2	2			136178.446(0.438)	$0.2E-5$	287.597	
0	16	3	14	+	0	15	4	11	+	136728.440(0.050)	136728.394(0.022)	4.6316	249.385	LEE68
0	19	0	19		0	19	−1	19		136915.140(0.050)	136915.304(0.045)	5.8048	309.545	LEE68
0	16	3	13	−	0	15	4	12	−	137233.440(0.050)	137233.429(0.022)	4.6362	249.385	LEE68
0	7	−4	4		0	8	−3	6		137903.060(0.050)	137902.997(0.018)	1.1656	101.666	LEE68
0	26	−2	25		0	26	2	24			138698.363(0.331)	0.6050	581.310	
1	21	−3	18		1	20	−2	18			139410.747(0.286)	13.9096	590.876	
0	23	−2	22		0	23	1	22			140033.144(0.163)	19.2077	459.690	
0	18	0	18		0	18	−1	18		140151.080(0.050)	140151.188(0.037)	6.2168	279.056	LEE68
0	5	1	4		0	4	−2	3			140777.384(0.018)	0.0018	34.137	
1	9	7	2		1	8	8	0			140845.093(0.319)	0.0754	471.596	
0	18	1	17	−	0	18	1	18	+		141322.726(0.132)	0.0762	283.306	
1	0	0	0		1	1	1	1		141441.280(0.050)	141441.249(0.012)	0.8898	204.194	LEE68
1	9	−7	3		1	10	−6	5			142274.565(0.300)	0.6306	431.415	
0	18	7	12	+	0	19	6	13	+	143097.970(0.050)	143098.000(0.039)	4.0982	440.864	SAS84
0	18	7	11	−	0	19	6	14	−	143097.970(0.050)	143098.002(0.039)	4.0982	440.864	SAS84
0	17	0	17		0	17	−1	17		143108.270(0.050)	143108.339(0.031)	6.6057	250.157	LEE68
0	7	3	4		0	8	2	6		143169.500(0.050)	143169.536(0.018)	1.8138	73.561	LEE68
0	3	1	3	+	0	2	1	2	+	143865.790(0.050)	143865.795(0.004)	2.1584	14.904	LEE68
0	24	−6	18		0	25	−5	20			144194.758(0.153)	7.2686	609.895	
1	3	1	3	+	1	2	1	2	+	144589.820(0.050)	144589.856(0.006)	2.1595	230.889	LEE68
1	3	2	1	+	1	2	2	0	+	144728.700(0.200)*	144728.356(0.006)	1.3437	212.418	LEE68
1	3	−2	1		1	2	−2	0		144728.700(0.200)*	144728.775(0.006)	1.3511	258.246	LEE68

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	3	2	2	−	1	2	2	1	−	144728.700(0.200)*	144729.071(0.006)	1.3437	212.418	LEE68
1	3	2	2		1	2	2	1		144733.320(0.050)*	144733.243(0.007)	1.3504	282.769	LEE68
1	3	1	3		1	2	1	2		144734.520(0.050)	144734.432(0.006)	2.1540	207.413	LEE68
1	3	0	3		1	2	0	2		144736.300(0.050)	144736.351(0.006)	2.4268	213.740	LEE68
1	3	−1	2		1	2	−1	1		144750.200(0.050)	144750.242(0.009)	2.1530	292.140	LEE68
1	3	0	3	+	1	2	0	2	+	144768.200(0.050)	144768.170(0.012)	2.4243	299.280	LEE68
1	3	1	2	−	1	2	1	1	−	144878.580(0.050)	144878.572(0.007)	2.1595	230.899	LEE68
0	3	0	3		0	2	0	2		145093.750(0.050)	145093.760(0.004)	2.4249	13.963	LEE68
0	3	−1	3		0	2	−1	2		145097.470(0.050)	145097.443(0.004)	2.1569	8.717	LEE68
0	3	0	3	+	0	2	0	2	+	145103.230(0.050)	145103.194(0.004)	2.4257	4.840	LEE68
0	3	2	2	−	0	2	2	1	−	145124.410(0.050)	145124.334(0.004)	1.3551	31.049	LEE68
0	3	2	1		0	2	2	0		145126.370(0.100)*	145126.190(0.004)	1.3312	20.300	LEE68
0	3	−2	2		0	2	−2	1		145126.370(0.100)*	145126.392(0.004)	1.3487	22.841	LEE68
0	3	1	2		0	2	1	1		145131.880(0.050)	145131.872(0.004)	2.2119	19.469	LEE68
0	3	2	1	+	0	2	2	0	+	145133.460(0.050)	145133.418(0.004)	1.3551	31.049	LEE68
0	16	0	16		0	16	−1	16		145766.140(0.050)	145766.163(0.027)	6.9571	222.849	LEE68
0	25	6	20	−	0	24	7	17	−		146156.383(0.148)	6.9271	653.241	
0	25	6	19	+	0	24	7	18	+		146156.447(0.148)	6.9271	653.241	
0	20	6	15	−	0	21	5	16	−		146286.581(0.077)	5.3009	468.187	
0	20	6	14	+	0	21	5	17	+		146287.285(0.077)	5.3009	468.187	
0	3	1	2	−	0	2	1	1	−	146368.300(0.050)	146368.342(0.004)	2.1585	14.988	LEE68
0	14	1	14	+	0	13	2	11	+	146617.270(0.050)	146617.419(0.033)	4.6151	173.051	LEE68
0	9	0	9	+	0	8	1	8	+	146618.820(0.050)	146618.838(0.018)	8.3288	67.679	LEE68
0	24	−2	23		0	24	1	23			147396.260(0.203)	22.0485	498.344	
0	7	0	7		0	6	2	4			147427.651(0.013)	0.0003	49.349	
1	16	−6	11		1	15	−7	9			147865.787(0.293)	3.3455	556.656	
1	7	1	7		1	6	0	6		147943.630(0.050)	147943.693(0.015)	3.6001	242.705	LEE68
0	15	0	15		0	15	−1	15		148111.880(0.050)	148111.919(0.024)	7.2557	197.135	LEE68
0	11	3	8		0	12	0	12			148632.406(0.025)	0.0245	134.689	
0	14	2	12		0	13	3	10		149532.590(0.050)	149532.527(0.026)	4.2016	179.984	SAS84
0	14	0	14		0	14	−1	14		150141.680(0.050)	150141.593(0.022)	7.4860	173.017	LEE68
1	19	3	17		1	20	4	17			150497.826(0.537)	16.6439	590.107	
0	12	−1	12		0	11	−2	10		150884.580(0.050)	150884.597(0.017)	3.6662	124.544	LEE68
1	14	−2	12		1	15	−3	12			151283.054(0.092)	9.9952	417.225	
0	19	0	19		0	18	3	15			151370.837(0.066)	0.1377	309.063	
0	13	0	13		0	13	−1	13		151860.320(0.050)	151860.170(0.020)	7.6334	150.497	LEE68
0	14	−3	12		0	13	−4	10		152443.140(0.050)	152443.177(0.020)	3.7274	207.858	LEE68
0	9	4	6	−	0	10	3	7	−	152708.510(0.050)	152708.486(0.017)	2.0583	123.338	LEE68
0	9	4	5	+	0	10	3	8	+	152740.310(0.050)	152740.249(0.017)	2.0582	123.337	LEE68
1	9	2	8		1	8	−1	7			153020.899(0.426)	0.0006	345.246	
0	12	0	12		0	12	−1	12		153281.240(0.050)	153281.207(0.019)	7.6849	129.577	LEE68
0	3	2	1		0	4	−1	4			153858.726(0.010)	$0.5E-4$	20.009	
0	11	0	11		0	11	−1	11		154425.780(0.050)	154425.765(0.017)	7.6304	110.258	LEE68
1	17	−1	16		1	18	−2	16			154791.612(0.515)	2.4478	528.280	
0	10	0	10		0	10	−1	10		155320.920(0.050)	155320.834(0.015)	7.4633	92.543	LEE68
0	25	−2	24		0	25	1	24			155547.602(0.250)	24.8365	538.598	
0	9	0	9		0	9	−1	9		155997.520(0.050)	155997.472(0.014)	7.1805	76.433	LEE68
0	6	2	4	+	0	7	1	7	+	156127.700(0.050)	156127.695(0.018)	1.9204	54.888	LEE68
0	18	−3	16		0	19	0	19			156171.410(0.066)	0.2171	314.112	
0	8	0	8		0	8	−1	8		156488.950(0.050)	156488.858(0.013)	6.7830	61.930	LEE68
0	2	1	2	+	0	3	0	3	+	156602.420(0.050)	156602.346(0.013)	1.9963	9.681	LEE68
0	19	1	18	−	0	19	1	19	+		156723.228(0.169)	0.0715	313.620	
0	7	0	7		0	7	−1	7		156828.520(0.050)	156828.480(0.013)	6.2749	49.035	LEE68
0	6	0	6		0	6	−1	6		157048.620(0.050)	157048.586(0.013)	5.6636	37.749	LEE68
0	5	0	5		0	5	−1	5		157178.970(0.050)	157178.962(0.013)	4.9589	28.073	LEE68
0	4	0	4		0	4	−1	4		157246.100(0.050)	157246.041(0.014)	4.1725	20.009	LEE68
0	1	0	1		0	1	−1	1		157270.700(0.050)	157270.818(0.015)	1.4611	5.490	LEE68
0	3	0	3		0	3	−1	3		157272.470(0.050)	157272.320(0.014)	3.3178	13.556	LEE68
0	2	0	2		0	2	−1	2		157276.040(0.050)	157276.004(0.015)	2.4090	8.717	LEE68
0	13	5	9		0	14	4	10		157574.960(0.050)	157574.849(0.024)	2.9788	236.068	LEE68
1	11	2	10		1	12	−2	10			157660.496(0.108)	$0.2E-7$	378.876	
0	10	−1	10		0	9	1	8			159030.154(0.018)	0.0007	87.239	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	26	4	23		1	25	3	23			159122.519(1.450)	23.0628	811.031	
0	13	−3	11		0	14	2	12			161830.654(0.029)	0.0402	184.972	
0	22	−8	14		0	23	−7	16			163280.666(0.132)	5.2045	625.468	
0	21	−3	19		0	22	−1	22			163417.149(0.134)	0.0004	410.529	
1	25	5	20		1	26	4	23			163924.002(1.915)	1.5969	816.339	
0	5	3	2		0	6	−2	5			164074.257(0.012)	0.1E−4	51.889	
1	15	2	14	−	1	14	1	13	−	164299.540(1.000)	164299.041(0.077)	8.5557	395.111	LEE94
0	26	−2	25		0	26	1	25			164485.011(0.305)	27.5128	580.449	
0	1	1	0		0	1	0	1		165050.190(0.050)	165050.229(0.007)	1.3466	10.736	LEE68
0	2	1	1		0	2	0	2		165061.140(0.050)	165061.187(0.007)	2.2373	13.963	LEE68
0	14	6	9		0	15	5	11			165074.327(0.025)	2.9815	288.063	
0	3	1	2		0	3	0	3		165099.310(0.050)	165099.300(0.007)	3.1170	18.803	LEE68
0	19	−4	16		0	18	−5	13		165186.460(0.050)	165186.534(0.035)	5.3925	361.881	LEE68
0	4	1	3		0	4	0	4		165190.530(0.050)	165190.539(0.007)	3.9808	25.254	LEE68
0	5	1	4		0	5	0	5		165369.440(0.050)	165369.410(0.007)	4.8228	33.316	LEE68
0	6	1	5		0	6	0	6		165678.770(0.050)	165678.724(0.008)	5.6368	42.988	LEE68
0	5	2	3		0	4	−2	3			165736.468(0.015)	0.8E−5	34.137	
0	9	0	9		0	8	−2	7			165933.675(0.017)	0.0007	76.102	
0	7	1	6		0	7	0	7		166169.210(0.050)	166169.179(0.010)	6.4158	54.266	LEE68
1	7	1	7	+	1	8	2	6	+	166773.278(0.050)	166773.290(0.027)	5.1430	265.513	HER84
1	25	−2	23		1	24	−1	23			166776.220(1.034)	3.0039	769.696	
1	11	2	10		1	10	3	8			166843.471(0.082)	0.5062	378.570	
0	8	1	7		0	8	0	8		166898.650(0.050)	166898.653(0.012)	7.1527	67.150	SAS84
1	13	0	13		1	12	−3	9			167429.909(0.084)	0.0003	349.707	
0	9	1	8		0	9	0	9		167931.130(0.050)	167931.149(0.014)	7.8402	81.637	SAS84
1	16	6	11	−	1	17	5	12	−		168188.041(0.182)	5.7105	538.278	
1	16	6	10	+	1	17	5	13	+		168188.043(0.182)	5.7105	538.278	
0	7	3	4		0	8	1	7			168463.937(0.021)	0.0033	72.717	
0	4	1	3		0	3	2	1		168577.860(0.050)	168577.855(0.014)	0.7073	25.141	SAS84
0	24	3	21		0	23	4	19			169050.566(0.148)	7.9945	511.566	
0	10	1	9		0	10	0	10		169335.340(0.050)	169335.315(0.017)	8.4715	97.724	LEE68
1	7	1	6	−	1	8	2	7	−	169427.231(0.050)	169427.197(0.026)	5.1172	265.514	HER84
0	15	1	14		0	14	3	11			169488.264(0.026)	0.0226	202.572	
1	5	−3	2		1	6	0	6			170024.724(0.098)	0.3E−5	242.705	
0	3	2	1		0	2	1	1		170060.630(0.050)	170060.588(0.016)	3.1205	19.469	LEE68
0	11	1	10		0	11	0	11		171182.580(0.050)	171182.546(0.019)	9.0413	115.409	LEE68
0	10	3	7		0	9	−3	7			171339.297(0.019)	0.3E−8	116.184	
0	19	−2	18		0	18	−3	16			171640.843(0.052)	6.0140	319.322	
0	22	5	18		0	21	6	16		172035.020(0.050)*	172035.236(0.073)	6.1707	496.522	LEE68
1	3	3	1		1	4	2	3			172073.212(0.054)	0.0408	294.034	
0	11	−5	6		0	12	−4	9		172079.370(0.050)	172079.353(0.021)	2.3059	186.899	LEE68
0	7	0	7		0	6	1	5		172445.950(0.050)	172445.773(0.011)	2.9171	48.514	LEE68
1	26	7	20	+	1	25	8	17	+		172778.729(2.428)	0.9315	995.845	
1	26	7	19	−	1	25	8	18	−		172778.730(2.428)	0.9315	995.845	
0	20	1	19	−	0	20	1	20	+		172837.428(0.215)	0.0674	345.521	
1	19	−2	17		1	18	2	17			173477.858(0.252)	0.5E−6	552.994	
0	12	1	11		0	12	0	12		173544.710(0.050)	173544.710(0.022)	9.5455	134.689	LEE68
1	18	8	10	+	1	19	7	13	+		173553.729(0.434)	0.5245	743.175	
1	18	8	11	−	1	19	7	12	−		173553.729(0.434)	0.5245	743.175	
1	23	−2	21		1	24	0	24			173881.125(0.488)	0.0004	690.931	
1	15	2	13	+	1	14	1	14	+	173916.650(0.050)	173916.662(0.074)	8.7125	394.776	LEE68
1	26	−2	24		1	25	3	23			176119.151(0.995)	0.0023	811.031	
0	13	1	12		0	13	0	13		176491.580(0.050)	176491.624(0.025)	9.9826	155.562	LEE68
0	2	1	1		0	3	−1	3			177239.748(0.018)	0.1E−4	13.556	
1	18	3	16		1	19	−2	17			177247.987(0.342)	0.3E−4	558.780	
0	13	−2	12		0	12	3	9			177503.006(0.014)	0.0192	159.009	
1	16	11	6	+	1	15	12	3	+		179530.969(6.958)	0.2729	919.143	
1	16	11	5	−	1	15	12	4	−		179530.970(6.958)	0.2729	919.143	
0	14	1	13		0	14	0	14		180088.550(0.050)	180088.487(0.029)	10.3534	178.025	LEE68
0	16	4	12		0	17	3	14		180440.020(0.050)	180439.968(0.027)	5.0294	280.020	SAS84
0	11	−1	11		0	10	2	8			180544.857(0.022)	0.0270	104.236	
0	20	5	16	+	0	21	4	17	+		180972.188(0.060)	6.1473	428.328	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	20	5	15	−	0	21	4	18	−		181082.061(0.059)	6.1477	428.324	
0	7	−1	7		0	6	0	6		181296.030(0.050)	181296.018(0.014)	4.3391	42.988	LEE68
0	4	−2	3		0	5	−1	5		181771.050(0.050)	181770.988(0.013)	1.1613	28.073	LEE68
0	21	4	17		0	20	5	16		181801.560(0.050)*	181801.070(0.070)	6.1216	433.038	LEE68
0	21	2	19		0	20	−3	18			182033.627(0.091)	0.7830	382.155	
0	13	1	12	−	0	12	2	11	−	182997.890(0.050)*	182998.235(0.026)	5.2232	151.999	LEE68
0	9	2	8	−	0	8	3	5	−	183123.840(0.050)	183123.821(0.014)	2.2248	92.691	LEE68
0	11	−3	9		0	12	−2	11		183720.120(0.050)	183720.072(0.020)	3.4670	143.927	SAS84
0	5	2	4	−	0	6	1	5	−	183853.000(0.050)*	183852.824(0.017)	1.5702	44.278	LEE68
0	9	2	7	+	0	8	3	6	+	183879.960(0.050)	183879.914(0.015)	2.2321	92.690	LEE68
0	15	1	14		0	15	0	15		184393.540(0.050)	184393.486(0.033)	10.6613	202.075	LEE68
1	1	−1	0		1	2	2	1			184409.991(0.439)	$0.2E-6$	282.769	
0	17	3	15	+	0	16	4	12	+	184795.300(0.050)	184795.314(0.026)	5.0515	275.183	LEE68
0	17	3	14	−	0	16	4	13	−	185517.510(0.050)	185517.563(0.026)	5.0587	275.183	LEE68
0	6	−4	3		0	7	−3	5		186300.950(0.050)	186300.853(0.019)	0.7973	88.761	LEE68
1	24	5	20	+	1	23	6	17	+		186303.382(1.063)	12.6939	768.058	
1	24	5	19	−	1	23	6	18	−		186303.487(1.063)	12.6939	768.058	
0	15	1	15	+	0	14	2	12	+		187542.959(0.039)	4.9378	195.641	
1	22	−3	19		1	21	−2	19			188087.802(0.351)	14.6496	624.568	
1	26	0	26		1	26	1	26			188640.867(0.177)	19.0708	766.425	
1	10	7	3		1	9	8	1			188801.079(0.325)	0.1940	486.069	
1	25	0	25		1	25	1	25		188804.820(0.050)*	188805.005(0.148)	18.6556	724.730	LEE68
1	24	0	24		1	24	1	24		188950.090(0.050)*	188950.286(0.123)	18.2080	684.629	LEE68
1	23	0	23		1	23	1	23		189077.940(0.050)*	189078.049(0.101)	17.7285	646.121	LEE68
0	6	1	5		0	5	−2	4			189121.926(0.018)	0.0047	42.206	
1	22	0	22		1	22	1	22		189189.510(0.050)*	189189.608(0.083)	17.2181	609.209	LEE68
1	21	0	21		1	21	1	21		189286.220(0.050)*	189286.255(0.067)	16.6776	573.893	LEE68
1	20	0	20		1	20	1	20		189369.250(0.050)	189369.251(0.054)	16.1079	540.175	LEE68
1	19	0	19		1	19	1	19		189439.860(0.050)	189439.821(0.044)	15.5100	508.056	LEE68
0	16	1	15		0	16	0	16		189455.880(0.050)	189455.816(0.039)	10.9122	227.711	LEE68
1	18	0	18		1	18	1	18		189499.200(0.050)	189499.152(0.035)	14.8850	477.536	LEE68
1	17	0	17		1	17	1	17		189548.370(0.050)	189548.385(0.028)	14.2340	448.617	LEE68
1	16	0	16		1	16	1	16		189588.590(0.050)	189588.617(0.023)	13.5581	421.300	LEE68
1	15	0	15		1	15	1	15		189620.900(0.050)	189620.894(0.019)	12.8585	395.585	LEE68
0	21	1	20	−	0	21	1	21	+		189640.919(0.270)	0.0636	379.008	
1	14	0	14		1	14	1	14		189646.260(0.050)	189646.212(0.016)	12.1365	371.473	LEE68
1	13	0	13		1	13	1	13		189665.510(0.050)	189665.510(0.014)	11.3935	348.966	LEE68
1	12	0	12		1	12	1	12		189679.650(0.050)	189679.671(0.013)	10.6305	328.063	LEE68
1	1	0	1		1	1	1	1		189688.769(0.050)	189688.821(0.011)	1.3340	204.194	AND90
1	11	0	11		1	11	1	11		189689.570(0.050)	189689.522(0.012)	9.8492	308.765	LEE68
1	2	0	2		1	2	1	2		189690.252(0.050)	189690.210(0.011)	2.2207	207.413	AND90
1	3	0	3		1	3	1	3		189692.114(0.050)	189692.129(0.011)	3.1037	212.241	AND90
1	4	0	4		1	4	1	4		189694.375(0.050)	189694.384(0.010)	3.9813	218.678	AND90
1	10	0	10		1	10	1	10		189695.814(0.050)	189695.829(0.011)	9.0507	291.074	AND90
1	5	0	5		1	5	1	5		189696.718(0.050)	189696.713(0.010)	4.8521	226.723	AND90
1	6	0	6		1	6	1	6		189698.782(0.050)	189698.791(0.010)	5.7145	236.378	AND90
1	9	0	9		1	9	1	9		189699.323(0.050)	189699.296(0.010)	8.2366	274.989	AND90
1	7	0	7		1	7	1	7		189699.040(0.050)*	189700.228(0.009)	6.5670	247.640	LEE68
1	8	0	8		1	8	1	8		189700.490(0.050)	189700.569(0.010)	7.4082	260.511	LEE68
0	2	2	0		0	2	0	2			189995.585(0.014)	$0.2E-4$	13.963	
0	3	2	1		0	3	0	3			190028.015(0.014)	0.0001	18.803	
0	4	2	2		0	4	0	4			190124.019(0.013)	0.0001	25.254	
0	5	2	3		0	5	0	5			190328.495(0.012)	0.0003	33.316	
0	20	0	20		0	19	3	16			190452.323(0.088)	0.1550	339.720	
1	8	−7	2		1	9	−6	4			190505.665(0.325)	0.3441	415.337	
0	6	2	4		0	6	0	6			190696.847(0.012)	0.0004	42.988	
0	7	2	5		0	7	0	7			191294.043(0.012)	0.0006	54.266	
0	17	7	11	+	0	18	6	12	+	191404.230(0.050)	191404.263(0.035)	3.6524	410.266	SAS84
0	17	7	10	−	0	18	6	13	−	191404.230(0.050)	191404.264(0.035)	3.6524	410.266	SAS84
0	6	3	3		0	7	2	5		191733.050(0.050)	191732.994(0.017)	1.3932	60.647	LEE68
0	4	1	4	+	0	3	1	3	+	191810.490(0.050)	191810.503(0.005)	3.0352	19.703	LEE68
0	8	2	6		0	8	0	8			192193.055(0.013)	0.0009	67.150	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	23	−6	17		0	24	−5	19			192626.272(0.123)	6.8330	569.650	
1	4	1	4	+	1	3	1	3	+	192778.520(0.050)	192778.586(0.008)	3.0368	235.712	LEE68
1	4	−3	1		1	3	−3	0		192952.700(0.050)	192952.715(0.008)	1.4069	233.896	LEE68
1	4	3	2		1	3	3	1		192957.680(0.050)	192957.723(0.009)	1.4148	299.774	LEE68
1	4	−2	2		1	3	−2	1		192962.100(0.050)	192962.176(0.008)	2.4318	263.074	LEE68
1	4	3	2	+	1	3	3	1	+	192963.445(0.050)	192963.405(0.009)	1.4138	284.968	AND90
1	4	3	1	−	1	3	3	0	−	192963.445(0.050)	192963.407(0.009)	1.4138	284.968	AND90
1	4	2	2	+	1	3	2	1	+	192963.792(0.050)	192963.764(0.008)	2.4186	217.245	AND90
1	4	2	3	−	1	3	2	2	−	192965.530(0.050)	192965.553(0.008)	2.4186	217.245	LEE68
1	4	1	4		1	3	1	3		192972.080(0.050)	192972.122(0.008)	3.0291	212.241	LEE68
1	4	2	3		1	3	2	2		192973.687(0.050)	192973.690(0.009)	2.4308	287.597	AND90
1	4	0	4		1	3	0	3		192974.360(0.050)	192974.377(0.008)	3.2357	218.568	LEE68
1	4	−1	3		1	3	−1	2		192996.030(0.050)	192996.020(0.012)	3.0276	296.968	LEE68
1	4	0	4	+	1	3	0	3	+	193019.870(0.050)	193019.866(0.016)	3.2324	304.109	LEE68
1	4	1	3	−	1	3	1	2	−	193163.330(0.050)	193163.372(0.008)	3.0368	235.732	LEE68
0	4	0	4		0	3	0	3		193415.370(0.050)	193415.331(0.005)	3.2327	18.803	LEE68
0	4	−1	4		0	3	−1	3		193441.620(0.050)	193441.610(0.005)	3.0330	13.556	LEE68
0	4	0	4	+	0	3	0	3	+	193454.390(0.050)	193454.370(0.005)	3.2342	9.681	LEE68
0	4	3	2	+	0	3	3	1	+	193471.520(0.050)	193471.432(0.004)	1.4096	44.293	LEE68
0	4	3	1	−	0	3	3	0	−	193471.520(0.050)	193471.543(0.004)	1.4096	44.293	LEE68
0	9	2	7		0	9	0	9			193472.524(0.015)	0.0011	81.637	
0	4	3	1		0	3	3	0		193474.330(0.050)	193474.418(0.004)	1.4148	42.842	LEE68
0	4	2	3	−	0	3	2	2	−	193488.030(0.050)	193488.050(0.005)	2.4391	35.890	LEE68
0	4	−3	2		0	3	−3	1		193488.990(0.050)	193488.964(0.005)	1.4204	53.266	LEE68
0	4	1	3		0	3	1	2		193506.600(0.050)	193506.570(0.005)	3.1099	24.310	LEE68
0	4	2	2	+	0	3	2	1	+	193511.210(0.050)*	193510.754(0.005)	2.4391	35.890	LEE68
0	4	−2	3		0	3	−2	2		193511.210(0.050)*	193511.233(0.005)	2.4276	27.682	LEE68
0	4	2	2		0	3	2	1		193511.210(0.050)*	193511.335(0.005)	2.3964	25.141	LEE68
0	26	6	21	−	0	25	7	18	−		194242.429(0.184)	7.4201	693.447	
0	26	6	20	+	0	25	7	19	+		194242.530(0.184)	7.4201	693.447	
0	10	3	7		0	11	0	11			194569.674(0.023)	0.0161	115.409	
0	19	6	14	−	0	20	5	15	−	194858.420(0.200)	194858.319(0.061)	4.8606	434.364	LEE68
0	19	6	13	+	0	20	5	16	+	194858.420(0.200)	194858.753(0.061)	4.8606	434.364	LEE68
0	8	0	8		0	7	2	5			194953.626(0.014)	0.0005	60.647	
0	4	1	3	−	0	3	1	2	−	195146.760(0.050)	195146.809(0.005)	3.0353	19.870	LEE68
0	10	2	8		0	10	0	10			195213.554(0.018)	0.0014	97.724	
0	17	1	16		0	17	0	17		195314.350(0.050)	195314.270(0.049)	11.1133	254.930	LEE68
1	8	1	8		1	7	0	7		196146.210(0.050)*	196146.397(0.015)	4.0657	253.968	LEE68
1	17	−6	12		1	16	−7	10			196434.651(0.337)	3.9368	582.344	
0	13	−1	13		0	12	−2	11		196963.020(0.050)*	196963.377(0.019)	3.8653	143.927	SAS84
0	17	−3	15		0	18	0	18			197376.092(0.049)	0.1764	283.731	
0	11	2	9		0	11	0	11			197495.639(0.022)	0.0015	115.409	
0	2	−2	1		0	1	1	0			197857.979(0.020)	$0.2E-4$	16.241	
0	15	2	13		0	14	3	11			198394.051(0.029)	4.5340	202.572	
0	10	0	10	+	0	9	1	9	+	198403.220(0.050)	198403.221(0.020)	9.4638	82.068	LEE68
1	13	−2	11		1	14	−3	11			199575.065(0.082)	9.4214	393.115	
0	12	2	10		0	12	0	12			200391.914(0.026)	0.0016	134.689	
0	15	−3	13		0	14	−4	11			200820.730(0.022)	4.1884	230.426	
1	18	3	16		1	19	4	16			200890.361(0.443)	15.6703	557.991	
0	8	4	5	−	0	9	3	6	−		201071.887(0.018)	1.6397	107.208	
0	8	4	4	+	0	9	3	7	+		201088.979(0.018)	1.6396	107.208	
1	10	2	9		1	9	−1	8			201184.790(0.424)	0.0009	359.728	
0	5	2	3	+	0	6	1	6	+	201445.590(0.050)	201445.644(0.017)	1.5022	43.694	SAS84
1	16	−1	15		1	17	−2	15			201730.338(0.498)	2.3520	499.379	
0	18	1	17		0	18	0	18			201996.470(0.063)	11.2734	283.731	
0	2	2	0		0	3	−1	3			202174.146(0.010)	$0.7E-5$	13.556	
0	13	2	11		0	13	0	13			203964.125(0.030)	0.0016	155.562	
1	10	2	9		1	11	−2	9			205511.994(0.105)	$0.1E-7$	359.584	
1	24	5	19		1	25	4	22			205675.920(1.686)	1.7036	774.646	
0	1	1	1	+	0	2	0	2	+	205791.270(0.050)	205791.231(0.013)	0.9943	4.840	SAS84
0	20	−3	18		0	21	−1	21			205991.160(0.101)	0.0004	375.284	
0	12	5	8		0	13	4	9			206001.172(0.024)	2.5600	213.496	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	11	−1	11		0	10	1	9			206423.096(0.020)	0.0010	103.373	
0	22	1	21	−	0	22	1	22	+		207105.951(0.335)	0.0603	414.080	
0	14	2	12		0	14	0	14			208257.925(0.034)	0.0014	178.025	
0	19	1	18		0	19	0	19			209518.725(0.083)	11.4012	314.112	
0	12	−3	10		0	13	2	11			211095.149(0.027)	0.0213	162.366	
1	26	−2	24		1	25	−1	24			211451.412(1.194)	3.0632	809.852	
0	21	−8	13		0	22	−7	15			211669.260(0.111)	4.7458	588.460	
1	16	2	15	−	1	15	1	14	−		211803.245(0.098)	9.0899	419.243	
0	4	3	1		0	5	−2	4			212537.943(0.012)	0.2E−5	42.206	
0	10	0	10		0	9	−2	8			212613.778(0.018)	0.0010	90.632	
0	20	−4	17		0	19	−5	14		213159.210(0.050)*	213159.369(0.047)	5.8407	392.494	SAS84
0	15	2	13		0	15	0	15			213299.273(0.039)	0.0012	202.075	
0	13	6	8		0	14	5	10			213377.521(0.027)	2.5539	263.889	
0	1	1	0		0	0	0	0			213427.118(0.007)	0.8935	9.122	
0	6	2	4		0	5	−2	4			214140.049(0.015)	0.3E−4	42.206	
1	6	1	6	+	1	7	2	5	+	215302.201(0.050)	215302.205(0.025)	4.6819	252.643	HER84
1	14	0	14		1	13	−3	10			215563.828(0.086)	0.0004	370.609	
1	12	2	11		1	11	3	9			215691.463(0.100)	0.5727	396.244	
0	6	3	3		0	7	1	6			216857.858(0.022)	0.0020	59.809	
0	5	1	4		0	4	2	2		216945.600(0.050)	216945.559(0.014)	1.1236	31.596	SAS84
1	6	1	5	−	1	7	2	6	−	217299.202(0.050)	217299.162(0.024)	4.6642	252.644	HER84
0	16	1	15		0	15	3	12			217525.074(0.030)	0.0260	226.775	
1	15	6	10	−	1	16	5	11	−		217642.859(0.144)	4.8863	510.965	
1	15	6	9	+	1	16	5	12	+		217642.860(0.144)	4.8863	510.965	
0	20	1	19		0	20	0	20			217886.390(0.111)	11.5054	346.073	
1	4	−3	1		1	5	0	5			218274.612(0.100)	0.9E−6	233.051	
0	4	2	2		0	3	1	2		218440.050(0.050)	218440.050(0.015)	3.4766	24.310	SAS84
1	26	6	20		1	26	7	19			219010.813(4.436)	0.0005	967.383	
0	16	2	14		0	16	0	16			219092.737(0.045)	0.0009	227.711	
0	11	3	8		0	10	−3	8			219852.375(0.019)	0.1E−7	132.314	
0	25	3	22		0	24	4	20			219983.995(0.184)	8.3957	550.204	
0	23	5	19		0	22	6	17			219993.939(0.095)	6.6442	531.938	
1	20	−2	18		1	19	2	18			220010.675(0.314)	0.7E−6	583.538	
0	8	0	8		0	7	1	6			220078.490(0.013)	3.4472	59.809	
0	10	−5	5		0	11	−4	8			220401.374(0.021)	1.8890	167.550	
1	25	6	19		1	25	7	18			220989.475(4.009)	0.0073	925.716	
0	3	−2	2		0	2	2	0			221294.466(0.015)	0.1E−6	20.300	
1	22	−2	20		1	23	0	23			222607.714(0.405)	0.0003	652.428	
1	16	2	14	+	1	15	1	15	+		222722.796(0.097)	9.2790	418.861	
1	17	8	9	+	1	18	7	12	+		222829.255(0.341)	0.4680	712.656	
1	17	8	10	−	1	18	7	11	−		222829.255(0.341)	0.4680	712.656	
1	24	6	18		1	24	7	17			222842.667(3.615)	0.0389	885.641	
1	23	6	17		1	23	7	16			224560.320(3.250)	0.0979	847.159	
0	20	−2	19		0	19	−3	17		224699.400(0.050)*	224699.714(0.068)	6.2540	349.935	BAS92
0	25	7	19		0	26	6	21			224842.880(0.238)	7.1052	689.622	
0	23	1	22	−	0	23	1	23	+		225201.249(0.411)	0.0573	450.735	
0	25	−7	18		0	26	−6	20			225314.686(0.317)	6.8019	696.769	
0	1	1	0		0	2	−1	2			225581.684(0.019)	0.3E−5	8.717	
0	17	2	15		0	17	0	17			225622.284(0.053)	0.0007	254.930	
1	22	6	16		1	22	7	15			226132.997(2.912)	0.1861	810.272	
1	17	3	15		1	18	−2	16			226843.433(0.284)	0.2E−4	528.280	
0	14	−2	13		0	13	3	10			226939.475(0.015)	0.0363	179.984	
0	21	1	20		0	21	0	21			227094.601(0.147)	11.5939	379.611	
0	12	−1	12		0	11	2	9			227229.600(0.024)	0.0478	121.997	
1	21	6	15		1	21	7	14			227552.263(2.600)	0.3042	774.981	
0	16	1	16	+	0	15	2	13	+		227814.651(0.047)	5.2388	219.844	
1	17	11	6	−	1	16	12	5	−		228113.679(7.256)	0.3890	944.815	
1	17	11	7	+	1	16	12	4	+		228113.679(7.256)	0.3890	944.815	
0	21	0	21		0	20	3	17			228468.304(0.119)	0.1703	371.990	
1	20	6	14		1	20	7	13			228811.170(2.310)	0.4508	741.287	
0	15	4	11		0	16	3	13			229589.073(0.024)	4.5924	252.591	
0	8	−1	8		0	7	0	7		229758.760(0.050)	229758.811(0.015)	5.0473	54.266	SAS84

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	19	5	15	+	0	20	4	16	+	229864.190(0.050)	229864.221(0.046)	5.7111	394.480	SAS84
1	19	6	13		1	19	7	12			229904.792(2.042)	0.6226	709.190	
0	19	5	14	−	0	20	4	17	−	229939.180(0.050)	229939.180(0.046)	5.7114	394.477	SAS84
0	3	−2	2		0	4	−1	4		230027.060(0.050)	230027.002(0.013)	0.7343	20.009	SAS84
0	22	2	20		0	21	−3	19			230292.725(0.113)	1.0036	415.980	
0	22	4	18		0	21	5	17			230368.199(0.089)	6.5946	466.848	
1	18	6	12		1	18	7	11			230830.800(1.792)	0.8130	678.692	
0	10	2	9	−	0	9	3	6	−	231281.100(0.050)	231281.150(0.015)	2.6731	107.208	SAS84
1	17	6	11		1	17	7	10			231589.972(1.561)	1.0129	649.794	
1	16	6	10		1	16	7	9			232186.569(1.347)	1.2104	622.497	
0	10	2	8	+	0	9	3	7	+	232418.590(0.050)	232418.571(0.016)	2.6864	107.208	SAS84
1	7	6	1		1	7	7	0			232419.500(0.484)	0.5722	448.967	
1	15	6	9		1	15	7	8			232628.490(1.149)	1.3913	596.800	
1	8	6	2		1	8	7	1			232641.954(0.453)	1.0060	461.827	
0	18	3	16	+	0	17	4	13	+	232783.500(0.050)	232783.591(0.033)	5.4653	302.592	SAS84
1	9	6	3		1	9	7	2			232844.221(0.449)	1.3222	476.294	
0	18	2	16		0	18	0	18			232854.748(0.066)	0.0005	283.731	
1	14	6	8		1	14	7	7			232927.130(0.969)	1.5405	572.707	
0	10	−3	8		0	11	−2	10			232945.835(0.019)	3.0375	124.544	
1	10	6	4		1	10	7	3			233009.411(0.484)	1.5340	492.367	
1	13	6	7		1	13	7	6			233096.965(0.808)	1.6428	550.216	
1	11	6	5		1	11	7	4			233119.305(0.560)	1.6513	510.045	
1	12	6	6		1	12	7	5			233154.873(0.670)	1.6840	529.328	
0	18	3	15	−	0	17	4	14	−	233795.750(0.050)	233795.799(0.032)	5.4762	302.592	SAS84
0	4	2	3	−	0	5	1	4	−	234683.390(0.050)	234683.451(0.017)	1.1212	34.516	SAS84
0	5	−4	2		0	6	−3	4		234698.450(0.050)	234698.467(0.021)	0.4640	77.468	SAS84
1	11	7	4		1	10	8	2			236649.844(0.355)	0.3345	502.151	
1	23	−3	20		1	22	−2	20			236852.155(0.429)	15.4168	659.853	
0	14	1	13	−	0	13	2	12	−	236936.130(0.050)	236936.168(0.029)	5.8306	172.948	SAS84
0	22	1	21		0	22	0	22			237129.229(0.193)	11.6735	414.727	
0	7	1	6		0	6	−2	5			237429.585(0.018)	0.0104	51.889	
1	25	5	21	+	1	24	6	18	+		238418.769(1.297)	13.6281	806.426	
1	25	5	20	−	1	24	6	19	−		238418.933(1.297)	13.6281	806.426	
1	7	−7	1		1	8	−6	3			238721.186(0.350)	0.1269	400.865	
0	16	−3	14		0	17	0	17			239397.838(0.038)	0.1401	254.930	
0	16	7	9	−	0	17	6	12	−		239731.344(0.033)	3.2159	381.273	
0	16	7	10	+	0	17	6	11	+		239731.344(0.033)	3.2159	381.273	
0	5	1	5	+	0	4	1	4	+	239746.253(0.050)	239746.220(0.006)	3.8849	26.101	PIC81
0	5	3	2		0	6	2	4		240241.502(0.050)	240241.502(0.017)	0.9820	49.349	PIC81
0	26	3	23	−	0	26	2	24	+		240740.621(0.210)	26.8001	592.467	
0	19	2	17		0	19	0	19			240745.434(0.086)	0.0003	314.112	
1	5	1	5	+	1	4	1	4	+	240960.560(0.050)	240960.559(0.009)	3.8871	242.143	SAS84
0	22	−6	16		0	23	−5	18			241042.683(0.099)	6.3963	531.008	
0	9	3	6		0	10	0	10			241057.128(0.022)	0.0100	97.724	
1	5	4	2		1	4	4	1		241159.174(0.050)	241159.144(0.010)	1.4409	268.657	AND90
1	5	3	3		1	4	3	2		241166.530(0.050)	241166.564(0.011)	2.5867	306.210	SAS84
1	5	4	1	+	1	4	4	0	+	241178.411(0.050)	241178.426(0.014)	1.4556	350.455	AND90
1	5	4	2	−	1	4	4	1	−	241178.411(0.050)	241178.426(0.014)	1.4556	350.455	AND90
1	5	−3	2		1	4	−3	1		241179.900(0.050)	241179.862(0.009)	2.5727	240.332	SAS84
1	5	−4	1		1	4	−4	0		241184.163(0.050)	241184.167(0.011)	1.4538	297.860	AND90
1	5	−2	3		1	4	−2	2		241187.400(0.050)	241187.417(0.009)	3.4045	269.510	SAS84
1	5	2	3	+	1	4	2	2	+	241192.810(0.050)	241192.851(0.009)	3.3860	223.682	SAS84
1	5	2	4	−	1	4	2	3	−	241196.350(0.050)	241196.427(0.010)	3.3860	223.682	SAS84
1	5	3	3	+	1	4	3	2	+	241198.290(0.050)	241198.262(0.010)	2.5852	291.405	SAS84
1	5	3	2	−	1	4	3	1	−	241198.290(0.050)	241198.269(0.010)	2.5852	291.405	SAS84
1	5	1	5		1	4	1	4		241203.690(0.050)	241203.710(0.010)	3.8772	218.678	SAS84
1	5	0	5		1	4	0	4		241205.990(0.050)	241206.039(0.009)	4.0446	225.005	SAS84
1	5	2	4		1	4	2	3		241210.734(0.050)	241210.733(0.011)	3.4031	294.034	AND90
1	5	−1	4		1	4	−1	3		241238.160(0.050)	241238.108(0.014)	3.8753	303.406	SAS84
1	5	0	5	+	1	4	0	4	+	241267.880(0.050)	241267.822(0.020)	4.0405	310.547	SAS84
1	5	1	4	−	1	4	1	3	−	241441.240(0.050)	241441.265(0.010)	3.8871	242.175	SAS84
0	25	3	22	−	0	25	2	23	+		241590.115(0.176)	25.4732	550.542	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	5	0	5		0	4	0	4		241700.219(0.050)	241700.168(0.006)	4.0403	25.254	PIC81
0	5	−1	5		0	4	−1	4		241767.224(0.050)	241767.247(0.006)	3.8822	20.009	PIC81
0	5	0	5	+	0	4	0	4	+	241791.431(0.050)	241791.367(0.006)	4.0427	16.134	PIC81
0	5	4	1	+	0	4	4	0	+	241806.508(0.050)	241806.521(0.005)	1.4529	71.975	PIC81
0	5	4	2	−	0	4	4	1	−	241806.508(0.050)	241806.521(0.005)	1.4529	71.975	PIC81
0	5	−4	2		0	4	−4	1		241813.257(0.050)	241813.248(0.005)	1.4495	77.230	PIC81
0	5	4	1		0	4	4	0		241829.646(0.050)	241829.629(0.006)	1.4590	82.856	PIC81
0	5	3	3	+	0	4	3	2	+	241832.910(0.200)	241832.716(0.005)	2.5775	50.746	SAS84
0	5	3	2	−	0	4	3	1	−	241832.910(0.200)	241833.104(0.005)	2.5775	50.746	SAS84
0	5	2	4	−	0	4	2	3	−	241842.324(0.050)	241842.287(0.006)	3.4147	42.344	PIC81
0	5	3	2		0	4	3	1		241843.646(0.050)	241843.608(0.005)	2.5870	49.295	PIC81
0	5	−3	3		0	4	−3	2		241852.352(0.050)	241852.299(0.005)	2.5973	59.720	PIC81
0	5	1	4		0	4	1	3		241879.073(0.050)	241879.038(0.006)	3.9797	30.764	PIC81
0	5	2	3	+	0	4	2	2	+	241887.704(0.050)	241887.678(0.006)	3.4147	42.345	PIC81
0	5	−2	4		0	4	−2	3		241904.152(0.050)	241904.158(0.005)	3.3986	34.137	AND90
0	5	2	3		0	4	2	2		241904.645(0.050)	241904.643(0.006)	3.3555	31.596	AND90
0	9	0	9		0	8	2	6			242108.993(0.016)	0.0008	73.561	
0	14	−1	14		0	13	−2	12		242446.210(0.050)	242446.125(0.020)	4.0053	164.930	SAS84
0	24	3	21	−	0	24	2	22	+		242491.312(0.146)	24.1969	510.224	
0	18	6	13	−	0	19	5	14	−	243397.530(0.100)	243397.555(0.050)	4.4257	402.147	SAS84
0	18	6	12	+	0	19	5	15	+	243397.530(0.100)	243397.816(0.050)	4.4257	402.147	SAS84
0	23	3	20	−	0	23	2	21	+		243413.431(0.120)	22.9674	471.515	
0	24	1	23	−	0	24	1	24	+		243891.865(0.498)	0.0546	488.972	
0	5	1	4	−	0	4	1	3	−	243915.826(0.050)	243915.811(0.006)	3.8851	26.380	PIC81
0	22	3	19	−	0	22	2	20	+		244330.987(0.098)	21.7804	434.416	
1	9	1	9		1	8	0	8		244338.020(0.050)	244338.004(0.015)	4.5374	266.838	SAS84
1	18	−6	13		1	17	−7	11			245092.513(0.397)	4.5658	609.629	
0	21	3	18	−	0	21	2	19	+		245223.465(0.080)	20.6312	398.928	
0	20	3	17	−	0	20	2	18	+	246074.650(0.050)*	246074.914(0.065)	19.5155	365.051	SAS84
0	3	−2	2		0	2	1	1			246228.864(0.020)	0.0002	19.469	
0	19	3	16	−	0	19	2	17	+	246873.340(0.050)	246873.503(0.053)	18.4288	332.785	SAS84
0	16	2	14		0	15	3	12			247161.994(0.033)	4.8340	226.775	
0	4	2	2	+	0	5	1	5	+	247228.693(0.050)	247228.737(0.017)	1.0865	34.098	PIC81
0	18	3	15	−	0	18	2	16	+	247610.960(0.050)	247611.037(0.043)	17.3667	302.131	SAS84
1	12	−2	10		1	13	−3	10			247840.224(0.075)	8.8674	370.609	
0	23	1	22		0	23	0	23			247967.929(0.249)	11.7497	451.418	
1	23	5	18		1	24	4	21			248002.794(1.474)	1.8044	734.547	
0	17	3	14	−	0	17	2	15	+	248282.460(0.050)	248282.480(0.036)	16.3253	273.089	SAS84
1	15	−1	14		1	16	−2	14			248857.299(0.487)	2.2531	472.076	
0	16	3	13	−	0	16	2	14	+	248885.480(0.050)	248885.479(0.030)	15.3008	245.660	SAS84
0	16	−3	14		0	15	−4	12		249192.800(0.050)	249192.864(0.024)	4.6563	254.603	SAS84
0	19	−3	17		0	20	−1	20			249227.513(0.075)	0.0003	341.622	
0	20	2	18		0	20	0	20			249244.740(0.114)	0.0002	346.073	
1	11	2	10		1	10	−1	9			249337.551(0.422)	0.0015	375.818	
0	15	3	12	−	0	15	2	13	+	249419.920(0.050)	249419.904(0.026)	14.2895	219.844	SAS84
0	7	4	4	−	0	8	3	5	−	249443.402(0.050)	249443.344(0.019)	1.2338	92.691	PIC81
0	7	4	3	+	0	8	3	6	+	249451.911(0.050)	249451.885(0.019)	1.2338	92.690	PIC81
0	14	3	11	−	0	14	2	12	+	249887.470(0.050)	249887.427(0.023)	13.2880	195.641	SAS84
0	13	3	10	−	0	13	2	11	+	250291.180(0.050)	250291.130(0.020)	12.2933	173.051	SAS84
0	11	0	11	+	0	10	1	10	+	250506.980(0.050)	250507.016(0.022)	10.6288	98.053	SAS84
0	12	3	9	−	0	12	2	10	+	250635.207(0.050)	250635.144(0.018)	11.3022	152.074	PIC81
0	11	3	8	−	0	11	2	9	+	250924.423(0.050)	250924.342(0.016)	10.3116	132.710	PIC81
1	17	3	15		1	18	4	15			250972.016(0.364)	14.7341	527.476	
0	10	3	7	−	0	10	2	8	+	251164.090(0.050)	251164.056(0.014)	9.3183	114.960	AND90
0	9	3	6	−	0	9	2	7	+	251359.880(0.050)	251359.841(0.013)	8.3185	98.824	AND90
0	8	3	5	−	0	8	2	6	+	251517.262(0.050)	251517.269(0.013)	7.3077	84.301	PIC81
0	7	3	4	−	0	7	2	5	+	251641.667(0.050)	251641.754(0.013)	6.2794	71.391	PIC81
0	6	3	3	−	0	6	2	4	+	251738.520(0.050)	251738.411(0.013)	5.2241	60.096	PIC81
0	5	3	2	−	0	5	2	3	+	251811.882(0.050)	251811.936(0.014)	4.1257	50.413	PIC81
0	4	3	1	−	0	4	2	2	+	251866.579(0.050)	251866.510(0.015)	2.9538	42.345	PIC81
0	5	3	3	+	0	5	2	4	−	251890.901(0.050)	251890.868(0.014)	4.1243	50.411	PIC81
0	6	3	4	+	0	6	2	5	−	251895.728(0.050)	251895.703(0.013)	5.2205	60.090	PIC81

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v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	4	3	2	+	0	4	2	3	−	251900.495(0.050)	251900.439(0.015)	2.9534	42.344	PIC81
0	3	3	0	−	0	3	2	1	+	251905.812(0.050)	251905.720(0.016)	1.6411	35.890	PIC81
0	3	3	1	+	0	3	2	2	−	251917.042(0.050)	251917.057(0.016)	1.6410	35.890	PIC81
0	7	3	5	+	0	7	2	6	−	251923.631(0.050)	251923.671(0.012)	6.2715	71.382	PIC81
0	8	3	6	+	0	8	2	7	−	251984.702(0.050)	251984.802(0.012)	7.2925	84.285	PIC81
0	9	3	7	+	0	9	2	8	−	252090.380(0.050)	252090.369(0.013)	8.2915	98.799	AND90
0	10	3	8	+	0	10	2	9	−	252252.850(0.050)	252252.807(0.014)	9.2731	114.923	AND90
0	11	3	9	+	0	11	2	10	−	252485.649(0.050)	252485.631(0.015)	10.2397	132.657	PIC81
0	12	3	10	+	0	12	2	11	−	252803.377(0.050)	252803.346(0.017)	11.1923	151.999	PIC81
0	13	3	11	+	0	13	2	12	−	253221.390(0.050)	253221.340(0.019)	12.1314	172.948	SAS84
1	9	2	8		1	10	−2	8			253450.755(0.105)	$0.5E-8$	341.896	
0	12	−1	12		0	11	1	10			253542.693(0.022)	0.0015	121.119	
0	14	3	12	+	0	14	2	13	−	253755.850(0.050)	253755.783(0.022)	13.0563	195.504	SAS84
0	2	0	2		0	1	−1	1		254015.340(0.050)	254015.367(0.015)	0.4985	5.490	SAS84
0	11	5	7		0	12	4	8		254423.580(0.050)*	254419.282(0.024)	2.1519	192.535	SAS84
0	15	3	13	+	0	15	2	14	−	254423.580(0.050)	254423.511(0.025)	13.9662	219.666	SAS84
0	16	3	14	+	0	16	2	15	−	255241.970(0.050)	255241.905(0.029)	14.8598	245.432	SAS84
0	17	3	15	+	0	17	2	16	−	256228.800(0.050)	256228.765(0.035)	15.7357	272.800	SAS84
0	18	3	16	+	0	18	2	17	−	257402.190(0.050)	257402.182(0.043)	16.5919	301.771	SAS84
0	21	2	19		0	21	0	21			258304.285(0.151)	0.0002	379.611	
0	11	0	11		0	10	−2	9			258726.160(0.020)	0.0013	106.779	
0	19	3	17	+	0	19	2	18	−	258780.380(0.050)	258780.405(0.052)	17.4267	332.342	SAS84
1	17	2	16	−	1	16	1	15	−		259273.508(0.125)	9.6365	444.980	
0	24	1	23		0	24	0	24			259581.205(0.318)	11.8269	489.686	
0	20	−8	12		0	21	−7	14			260064.925(0.094)	4.2956	553.054	
0	11	−3	9		0	12	2	10			260254.077(0.026)	0.0105	141.374	
0	20	3	18	+	0	20	2	19	−	260381.560(0.050)	260381.697(0.065)	18.2381	364.512	SAS84
0	3	3	0		0	4	−2	3			260967.683(0.012)	$0.2E-6$	34.137	
0	21	−4	18		0	20	−5	15		261061.360(0.050)*	261061.615(0.062)	6.2883	424.713	SAS84
0	12	6	7		0	13	5	9		261704.440(0.050)	261704.420(0.028)	2.1378	241.324	SAS84
0	2	1	1		0	1	0	1		261805.710(0.050)	261805.736(0.008)	1.3339	10.736	SAS84
0	21	3	19	+	0	21	2	20	−		262224.203(0.080)	19.0238	398.279	
0	7	2	5		0	6	−2	5			262554.450(0.016)	0.0001	51.889	
0	25	1	24	−	0	25	1	25	+		263139.093(0.598)	0.0523	528.790	
1	15	0	15		1	14	−3	11			263670.479(0.091)	0.0005	393.115	
1	5	1	5	+	1	6	2	4	+	263793.856(0.050)	263793.865(0.024)	4.2332	241.381	HER84
0	22	3	20	+	0	22	2	21	−		264325.806(0.098)	19.7820	433.642	
1	13	2	12		1	12	3	10			264732.062(0.124)	0.6370	415.518	
1	25	−2	23		1	26	1	26			264835.522(0.828)	0.0002	766.425	
1	5	1	4	−	1	6	2	5	−	265224.400(0.050)	265224.385(0.024)	4.2218	241.381	HER84
0	5	3	2		0	6	1	5			265259.625(0.022)	0.0010	48.514	
0	6	1	5		0	5	2	3		265289.650(0.050)	265289.616(0.015)	1.5463	39.665	SAS84
0	22	0	22		0	21	3	18			265393.092(0.159)	0.1829	405.874	
0	17	1	16		0	16	3	13			265453.686(0.037)	0.0294	252.591	
0	2	−2	1		0	2	0	2			266163.659(0.016)	$0.3E-4$	13.963	
0	3	−2	2		0	3	0	3			266196.291(0.016)	0.0001	18.803	
1	21	−2	19		1	20	2	19			266287.073(0.390)	$0.9E-6$	615.686	
0	4	−2	3		0	4	0	4			266292.194(0.015)	0.0002	25.254	
0	5	−2	4		0	5	0	5			266496.184(0.015)	0.0004	33.316	
1	3	−3	0		1	4	0	4			266527.936(0.101)	$0.2E-6$	225.005	
0	23	3	21	+	0	23	2	22	−		266703.983(0.120)	20.5105	470.600	
0	5	2	3		0	4	1	3		266838.130(0.050)	266838.123(0.015)	3.8478	30.764	SAS84
0	6	−2	5		0	6	0	6			266864.092(0.014)	0.0007	42.988	
1	14	6	9	−	1	15	5	10	−		266871.879(0.133)	4.1190	485.255	
1	14	6	8	+	1	15	5	11	+		266871.880(0.133)	4.1190	485.255	
0	9	0	9		0	8	1	7		267403.440(0.050)	267403.394(0.015)	3.9867	72.717	SAS84
0	17	1	17	+	0	16	2	14	+	267405.950(0.050)*	267406.286(0.060)	5.5164	245.660	BAS92
0	7	−2	6		0	7	0	7			267462.507(0.014)	0.0011	54.266	
0	22	2	20		0	22	0	22			267881.313(0.197)	0.0003	414.727	
0	24	5	20		0	23	6	18			267887.637(0.123)	7.1206	568.957	
0	8	−2	7		0	8	0	8			268368.373(0.015)	0.0016	67.150	
0	12	3	9		0	11	−3	9			268428.731(0.019)	$0.3E-7$	150.055	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	9	−5	4		0	10	−4	7		268744.050(0.050)	268744.019(0.022)	1.4859	149.812	SAS84
0	24	3	22	+	0	24	2	23	−		269375.665(0.146)	21.2075	509.150	
0	9	−2	8		0	9	0	9			269668.360(0.016)	0.0021	81.637	
0	4	−2	3		0	3	2	1			269679.509(0.015)	0.1E−5	25.141	
0	26	3	23		0	25	4	21			271223.050(0.226)	8.7894	590.443	
1	21	−2	19		1	22	0	22			271264.657(0.334)	0.0003	615.519	
0	10	−2	9		0	10	0	10			271458.016(0.017)	0.0028	97.724	
1	17	2	15	+	1	16	1	16	+		271562.432(0.128)	9.8623	444.547	
0	25	1	24		0	25	0	25			271933.428(0.400)	11.9081	529.528	
1	16	8	8	+	1	17	7	11	+		272064.285(0.279)	0.4118	683.739	
1	16	8	9	−	1	17	7	10	−		272064.285(0.279)	0.4118	683.739	
0	25	3	23	+	0	25	2	24	−		272357.098(0.177)	21.8712	549.290	
0	24	7	18		0	25	6	20			272813.825(0.198)	6.6643	647.800	
0	13	−1	13		0	12	2	10		273497.348(0.050)	273497.381(0.027)	0.0807	141.374	BAS92
0	11	−2	10		0	11	0	11			273840.642(0.020)	0.0035	115.409	
0	24	−7	17		0	25	−6	19			274023.069(0.256)	6.3593	654.936	
0	26	3	24	+	0	26	2	25	−		275663.705(0.213)	22.4999	591.020	
1	16	3	14		1	17	−2	15			276234.541(0.235)	0.1E−4	499.379	
0	15	−2	14		0	14	3	11			276648.180(0.017)	0.0649	202.572	
1	18	11	7	−	1	17	12	6	−		276712.953(7.604)	0.5196	972.088	
1	18	11	8	+	1	17	12	5	+		276712.953(7.604)	0.5196	972.088	
0	12	−2	11		0	12	0	12			276925.919(0.022)	0.0043	134.689	
0	25	9	17		0	26	8	19			277171.928(0.421)	5.8026	798.079	
0	23	2	21		0	23	0	23			277940.773(0.253)	0.0004	451.418	
0	23	2	21		0	22	−3	20			278186.616(0.139)	1.2439	451.410	
0	9	−1	9		0	8	0	8		278304.510(0.050)	278304.575(0.015)	5.8200	67.150	SAS84
0	2	−2	1		0	3	−1	3		278342.257(0.050)	278342.220(0.014)	0.3292	13.556	BAS92
0	21	−2	20		0	20	−3	18		278479.935(0.050)*	278480.230(0.090)	6.4587	382.155	BAS92
0	14	4	10		0	15	3	12		278599.055(0.050)	278599.079(0.024)	4.1547	226.775	BAS92
0	18	5	14	+	0	19	4	15	+	278672.920(0.050)	278673.026(0.037)	5.2738	362.241	SAS84
0	18	5	13	−	0	19	4	16	−	278723.250(0.050)	278723.142(0.036)	5.2740	362.239	SAS84
0	23	4	19		0	22	5	18			278965.129(0.114)	7.0731	502.261	
0	11	2	10	−	0	10	3	7	−	279351.910(0.050)	279351.928(0.016)	3.1275	123.338	SAS84
0	19	3	17	+	0	18	4	14	+	280679.680(0.050)	280679.837(0.043)	5.8717	331.612	SAS84
0	13	−2	12		0	13	0	13			280828.261(0.025)	0.0050	155.562	
1	2	−1	1		1	2	2	1			280911.689(0.437)	0.1E−5	282.769	
1	3	−1	2		1	3	2	2			280928.688(0.436)	0.7E−5	287.597	
1	4	−1	3		1	4	2	3			280951.018(0.434)	0.3E−4	294.034	
1	5	−1	4		1	5	2	4			280978.394(0.432)	0.0001	302.080	
0	11	2	9	+	0	10	3	8	+	281000.200(0.050)	281000.164(0.018)	3.1500	123.337	SAS84
1	6	−1	5		1	6	2	5			281010.458(0.429)	0.0002	311.735	
1	7	−1	6		1	7	2	6			281046.784(0.427)	0.0004	322.998	
1	8	−1	7		1	8	2	7			281086.877(0.424)	0.0007	335.870	
1	9	−1	8		1	9	2	8			281130.170(0.421)	0.0013	350.351	
1	10	−1	9		1	10	2	9			281176.033(0.418)	0.0021	366.439	
1	11	−1	10		1	11	2	10			281223.769(0.415)	0.0034	384.135	
1	12	−1	11		1	12	2	11			281272.614(0.413)	0.0051	403.438	
1	13	−1	12		1	13	2	12			281321.744(0.411)	0.0075	424.349	
1	14	−1	13		1	14	2	13			281370.273(0.410)	0.0107	446.866	
1	15	−1	14		1	15	2	14			281417.255(0.410)	0.0149	470.990	
1	16	−1	15		1	16	2	15			281461.688(0.411)	0.0203	496.719	
1	17	−1	16		1	17	2	16			281502.512(0.415)	0.0271	524.054	
1	18	−1	17		1	18	2	17			281538.616(0.421)	0.0355	552.994	
1	25	−1	24		1	25	2	24			281551.741(0.642)	0.1523	800.461	
1	19	−1	18		1	19	2	18			281568.832(0.431)	0.0458	583.538	
1	24	−1	23		1	24	2	23			281586.056(0.582)	0.1304	760.303	
1	20	−1	19		1	20	2	19			281591.938(0.446)	0.0581	615.686	
1	23	−1	22		1	23	2	22			281605.298(0.534)	0.1092	721.746	
1	21	−1	20		1	21	2	20			281606.649(0.467)	0.0728	649.437	
1	22	−1	21		1	22	2	21			281611.597(0.496)	0.0898	684.790	
0	9	−3	7		0	10	−2	9		281956.536(0.050)	281956.537(0.019)	2.6058	106.779	BAS92
0	19	3	16	−	0	18	4	15	−	282072.897(0.050)	282073.014(0.041)	5.8879	331.611	BAS92

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	15	−3	13		0	16	0	16			282213.165(0.033)	0.1083	227.711	
0	26	1	25	−	0	26	1	26	+		282900.451(0.711)	0.0502	570.188	
0	4	−4	1		0	5	−3	3		283094.900(0.050)	283094.915(0.022)	0.1852	67.787	SAS84
1	12	7	5		1	11	8	3			284367.876(0.409)	0.4818	519.843	
0	26	1	25		0	26	0	26			284983.797(0.496)	11.9952	570.943	
0	3	2	2	−	0	4	1	3	−	285111.150(0.050)	285111.211(0.017)	0.6958	26.380	SAS84
0	14	−2	13		0	14	0	14			285664.873(0.028)	0.0057	178.025	
0	8	1	7		0	7	−2	6			285683.815(0.018)	0.0201	63.188	
1	24	−3	21		1	23	−2	21			285712.529(0.520)	16.2120	696.731	
1	2	0	2		1	1	1	1			286182.374(0.012)	0.4457	204.194	
0	2	2	0		0	1	0	1			286740.134(0.015)	$0.1E-4$	10.736	
0	15	−1	15		0	14	−2	13		287234.000(0.050)	287233.926(0.022)	4.0811	187.554	SAS84
0	6	1	6	+	0	5	1	5	+	287670.835(0.050)	287670.770(0.007)	4.7211	34.098	PIC81
0	8	3	5		0	9	0	9			288014.329(0.021)	0.0057	81.637	
0	15	7	8	−	0	16	6	11	−	288076.768(0.050)	288076.791(0.033)	2.7899	353.887	BAS92
0	15	7	9	+	0	16	6	10	+	288076.768(0.050)	288076.791(0.033)	2.7899	353.887	BAS92
0	24	2	22		0	24	0	24			288455.332(0.320)	0.0008	489.686	
0	4	3	1		0	5	2	3		288705.567(0.050)	288705.632(0.018)	0.5926	39.665	PIC81
0	10	0	10		0	9	2	7			288809.614(0.018)	0.0013	88.091	
1	6	1	6	+	1	5	1	5	+	289134.050(0.050)	289134.086(0.010)	4.7239	250.180	SAS84
1	6	5	1	−	1	5	5	0	−	289343.185(0.050)	289343.151(0.017)	1.4566	316.435	AND90
1	6	5	2	+	1	5	5	1	+	289343.185(0.050)	289343.151(0.017)	1.4566	316.435	AND90
1	6	3	4		1	5	3	3		289355.020(0.050)	289355.035(0.012)	3.6367	314.255	SAS84
1	6	4	3		1	5	4	2		289374.834(0.050)	289374.787(0.012)	2.6684	276.702	AND90
1	6	−3	3		1	5	−3	2		289399.590(0.050)	289399.655(0.010)	3.6179	248.377	SAS84
1	6	−2	4		1	5	−2	3		289402.490(0.050)	289402.460(0.010)	4.3231	277.556	SAS84
1	6	2	4	+	1	5	2	3	+	289414.030(0.050)	289414.037(0.011)	4.2997	231.727	SAS84
1	6	−5	2		1	5	−5	1		289415.043(0.050)	289414.944(0.021)	1.4738	403.723	AND90
1	6	−4	2		1	5	−4	1		289416.391(0.050)	289416.363(0.012)	2.6923	305.905	AND90
1	6	2	5	−	1	5	2	4	−	289420.240(0.050)	289420.293(0.011)	4.2997	231.727	SAS84
1	6	5	1		1	5	5	0		289423.499(0.050)	289423.509(0.014)	1.4825	322.395	AND90
1	6	1	6		1	5	1	5		289427.600(0.050)	289427.672(0.011)	4.7119	226.723	SAS84
1	6	4	2	+	1	5	4	1	+	289428.212(0.050)	289428.206(0.016)	2.6955	358.500	AND90
1	6	4	3	−	1	5	4	2	−	289428.212(0.050)	289428.206(0.016)	2.6955	358.500	AND90
1	6	3	4	+	1	5	3	3	+	289429.140(0.050)	289429.120(0.012)	3.6355	299.450	AND90
1	6	3	3	−	1	5	3	2	−	289429.140(0.050)	289429.136(0.012)	3.6355	299.450	AND90
1	6	0	6		1	5	0	5		289429.756(0.050)	289429.750(0.011)	4.8535	233.051	AND90
1	6	2	5		1	5	2	4		289443.541(0.050)	289443.519(0.013)	4.3215	302.080	AND90
0	21	−6	15		0	22	−5	17			289445.999(0.081)	5.9589	493.971	
1	6	−1	5		1	5	−1	4		289475.610(0.050)	289475.583(0.016)	4.7096	311.452	SAS84
1	6	0	6	+	1	5	0	5	+	289511.110(0.050)	289511.103(0.023)	4.8487	318.595	SAS84
1	6	1	5	−	1	5	1	4	−	289710.460(0.050)	289710.527(0.011)	4.7238	250.228	SAS84
0	26	−3	24		0	26	3	23			289810.305(0.241)	0.0004	599.490	
0	6	0	6		0	5	0	5		289939.477(0.050)	289939.386(0.007)	4.8474	33.316	PIC81
0	6	−1	6		0	5	−1	5		290069.824(0.050)	290069.762(0.007)	4.7178	28.073	PIC81
0	6	0	6	+	0	5	0	5	+	290110.666(0.050)	290110.655(0.007)	4.8511	24.199	PIC81
0	6	−5	1		0	5	−5	0		290117.815(0.050)	290117.773(0.007)	1.4763	110.394	PIC81
0	6	5	2		0	5	5	1		290138.890(0.050)	290138.881(0.007)	1.4758	118.775	SAS84
0	6	5	1	−	0	5	5	0	−	290145.090(0.050)	290145.086(0.007)	1.4837	120.043	SAS84
0	6	5	2	+	0	5	5	1	+	290145.090(0.050)	290145.086(0.007)	1.4837	120.043	SAS84
0	6	4	3	−	0	5	4	2	−	290161.593(0.050)*	290161.344(0.006)	2.6905	80.041	PIC81
0	6	4	2	+	0	5	4	1	+	290161.593(0.050)*	290161.348(0.006)	2.6905	80.041	PIC81
0	6	−4	3		0	5	−4	2		290162.430(0.050)	290162.348(0.006)	2.6843	85.296	SAS84
0	6	4	2		0	5	4	1		290183.210(0.050)	290183.289(0.006)	2.7019	90.923	SAS84
0	6	2	5	−	0	5	2	4	−	290184.690(0.050)	290184.677(0.006)	4.3361	50.411	SAS84
0	6	3	4	+	0	5	3	3	+	290189.510(0.050)	290189.513(0.006)	3.6248	58.813	SAS84
0	6	3	3	−	0	5	3	2	−	290190.540(0.050)	290190.547(0.006)	3.6248	58.813	SAS84
0	6	−3	4		0	5	−3	3		290209.700(0.050)	290209.695(0.006)	3.6525	67.787	SAS84
0	6	3	3		0	5	3	2		290213.238(0.050)	290213.186(0.006)	3.6380	57.362	PIC81
0	6	1	5		0	5	1	4		290248.762(0.050)	290248.700(0.007)	4.8346	38.833	PIC81
0	6	2	4	+	0	5	2	3	+	290264.150(0.050)	290264.072(0.006)	4.3361	50.413	PIC81
0	6	−2	5		0	5	−2	4		290307.376(0.050)	290307.294(0.006)	4.3157	42.206	AND90

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	6	2	4		0	5	2	3		290307.643(0.050)	290307.738(0.007)	4.2618	39.665	AND90
1	22	5	17		1	23	4	20			290891.899(1.278)	1.8962	696.043	
1	26	5	22	+	1	25	6	19	+		291032.259(1.627)	14.2094	846.375	
1	26	5	21	−	1	25	6	20	−		291032.510(1.627)	14.2094	846.375	
0	15	1	14	−	0	14	2	13	−	291240.650(0.050)	291240.638(0.032)	6.4657	195.504	SAS84
0	15	−2	14		0	15	0	15			291553.402(0.031)	0.0063	202.075	
0	17	6	12	−	0	18	5	13	−	291908.170(0.100)	291908.135(0.043)	3.9967	371.536	SAS84
0	17	6	11	+	0	18	5	14	+	291908.170(0.100)	291908.287(0.043)	3.9967	371.536	SAS84
1	10	1	10		1	9	0	9		292517.440(0.050)	292517.514(0.015)	5.0159	281.316	SAS84
0	6	1	5	−	0	5	1	4	−	292672.890(0.050)	292672.914(0.007)	4.7215	34.516	SAS84
0	18	−3	16		0	19	−1	19			293086.714(0.057)	0.0003	309.545	
0	25	−3	23		0	25	3	22			293093.690(0.199)	0.0002	557.541	
0	3	2	1	+	0	4	1	4	+	293463.990(0.050)*	293464.203(0.017)	0.6814	26.101	SAS84
1	19	−6	14		1	18	−7	12			293851.018(0.472)	5.2328	638.512	
0	4	−2	3		0	3	1	2			294608.225(0.019)	0.0009	24.310	
0	17	2	15		0	16	3	13			295761.700(0.040)	5.0958	252.591	
0	24	−3	22		0	24	3	21			296034.540(0.162)	0.0002	517.205	
1	11	−2	9		1	12	−3	9			296084.255(0.070)	8.3327	349.707	
1	14	−1	13		1	15	−2	13			296153.669(0.481)	2.1512	446.373	
1	12	2	11		1	11	−1	10			297479.009(0.420)	0.0023	393.516	
0	17	−3	15		0	16	−4	13		297559.120(0.050)	297559.138(0.028)	5.1307	280.389	BAS92
0	6	4	3	−	0	7	3	4	−	297821.004(0.050)	297820.961(0.020)	0.8485	79.785	BAS92
0	6	4	2	+	0	7	3	5	+	297824.860(0.050)	297824.842(0.020)	0.8485	79.785	BAS92
0	16	−2	15		0	16	0	16			298609.026(0.034)	0.0068	227.711	
0	23	−3	21		0	23	3	20			298649.995(0.130)	0.0001	478.482	
0	25	2	23		0	25	0	25			299404.035(0.398)	0.0016	529.528	
0	13	−1	13		0	12	1	11			300344.586(0.024)	0.0021	140.478	
1	16	3	14		1	17	4	14			300763.428(0.302)	13.8380	498.560	
0	22	−3	20		0	22	3	19			300958.989(0.103)	0.0001	441.371	
0	23	0	23		0	22	3	19			301204.832(0.210)	0.1926	441.371	
1	8	2	7		1	9	−2	7			301463.037(0.106)	$0.3E-8$	325.815	
0	3	0	3		0	2	−1	2		302369.900(0.050)	302369.763(0.015)	1.0139	8.717	SAS84
0	10	5	6		0	11	4	7		302830.498(0.050)	302830.601(0.026)	1.7567	173.184	BAS92
0	12	0	12	+	0	11	1	11	+	302912.629(0.050)*	302913.146(0.023)	11.8262	115.633	BAS92
0	21	−3	19		0	21	3	18			302981.679(0.080)	$0.4E-4$	405.874	
0	1	1	0	−	0	1	0	1	+	303366.890(0.050)	303366.893(0.014)	2.9659	1.614	SAS84
0	12	0	12		0	11	−2	10			304165.804(0.022)	0.0016	124.544	
0	2	1	1	−	0	2	0	2	+	304208.350(0.050)	304208.324(0.013)	4.9336	4.840	SAS84
0	20	−3	18		0	20	3	17			304738.962(0.062)	$0.2E-4$	371.990	
0	3	1	2	−	0	3	0	3	+	305473.520(0.050)	305473.472(0.013)	6.8868	9.681	SAS84
0	19	−3	17		0	19	3	16			306252.070(0.047)	$0.1E-4$	339.720	
0	18	1	18	+	0	17	2	15	+		306291.462(0.078)	5.7689	273.089	
1	18	2	17	−	1	17	1	16	−		306713.518(0.160)	10.1965	472.319	
0	17	−2	16		0	17	0	17			306940.820(0.039)	0.0071	254.930	
0	4	1	3	−	0	4	0	4	+	307165.940(0.050)	307165.911(0.013)	8.8200	16.134	SAS84
0	18	−3	16		0	18	3	15			307542.248(0.036)	$0.7E-5$	309.063	
0	19	−8	11		0	20	−7	13			308467.026(0.080)	3.8545	519.251	
0	17	−3	15		0	17	3	14			308630.476(0.029)	$0.4E-5$	280.020	
0	22	−4	19		0	21	−5	16			308886.523(0.082)	6.7346	458.539	
0	5	1	4	−	0	5	0	5	+	309290.400(0.050)	309290.354(0.014)	10.7273	24.199	SAS84
0	10	−3	8		0	11	2	9			309290.838(0.024)	0.0048	121.997	
0	16	−3	14		0	16	3	13			309537.254(0.024)	$0.2E-5$	252.591	
1	26	3	24		1	26	2	25			309802.576(1.907)	4.1716	842.218	
0	11	6	6		0	12	5	8		310051.364(0.050)	310051.318(0.030)	1.7358	220.368	BAS92
0	3	1	2		0	2	0	2		310193.000(0.050)	310193.059(0.008)	1.7728	13.963	SAS84
0	15	−3	13		0	15	3	12			310282.423(0.021)	$0.9E-6$	226.775	
0	26	2	24		0	26	0	26			310770.445(0.488)	0.0031	570.943	
0	14	−3	12		0	14	3	11			310885.024(0.020)	$0.4E-6$	202.572	
0	8	2	6		0	7	−2	6			310978.217(0.016)	0.0003	63.188	
0	13	−3	11		0	13	3	10			311363.181(0.019)	$0.2E-6$	179.984	
0	12	−3	10		0	12	3	9			311734.018(0.019)	$0.8E-7$	159.009	
1	16	0	16		1	15	−3	12			311746.655(0.100)	0.0008	417.225	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	6	1	5	−	0	6	0	6	+	311852.640(0.050)	311852.614(0.015)	12.6030	33.876	PIC81
0	11	−3	9		0	11	3	8			312013.585(0.018)	0.3E−7	139.647	
0	10	−3	8		0	10	3	7			312216.802(0.018)	0.1E−7	121.899	
1	4	1	4	+	1	5	2	3	+	312247.354(0.050)	312247.343(0.024)	3.7991	231.727	HER84
1	22	−2	20		1	21	2	20			312284.128(0.484)	0.1E−5	649.437	
0	9	−3	7		0	9	3	6			312357.425(0.018)	0.4E−8	105.765	
0	8	−3	6		0	8	3	5			312448.007(0.018)	0.1E−8	91.244	
1	4	1	3	−	1	5	2	4	−	313203.428(0.050)	313203.412(0.024)	3.7922	231.727	HER84
0	18	1	17		0	17	3	14			313250.854(0.047)	0.0328	280.020	
0	7	1	6		0	6	2	4		313596.840(0.050)	313596.830(0.017)	1.9666	49.349	SAS84
0	4	3	1		0	5	1	4			313664.717(0.023)	0.0004	38.833	
1	24	−2	22		1	25	1	25			313883.779(0.694)	0.0002	724.730	
1	14	2	13		1	13	3	11			313999.009(0.154)	0.6984	436.392	
0	10	0	10		0	9	1	8			314350.989(0.017)	4.5314	87.239	
0	7	1	6	−	0	7	0	7	+	314859.550(0.050)	314859.537(0.016)	14.4414	45.164	SAS84
0	6	2	4		0	5	1	4		315266.830(0.050)	315266.823(0.016)	4.2159	38.833	SAS84
0	25	5	21		0	24	6	19			315710.904(0.157)	7.5996	607.577	
1	13	6	7	+	1	14	5	10	+		315900.366(0.144)	3.4095	461.148	
1	13	6	8	−	1	14	5	9	−		315900.366(0.144)	3.4095	461.148	
0	18	−2	17		0	18	0	18			316647.402(0.050)	0.0072	283.731	
1	25	3	23		1	25	2	24			316884.002(1.653)	4.0454	800.461	
0	13	3	10		0	12	−3	10			317082.102(0.020)	0.6E−7	169.407	
0	8	−5	3		0	9	−4	6			317103.110(0.024)	1.1017	133.685	
0	5	−2	4		0	4	2	2			318072.333(0.015)	0.8E−5	31.596	
0	8	1	7	−	0	8	0	8	+	318318.793(0.050)*	318318.934(0.018)	16.2368	58.062	PIC81
0	14	−1	14		0	13	2	11			319310.261(0.030)	0.1302	162.366	
1	20	−2	18		1	21	0	21			319858.098(0.274)	0.0003	580.207	
1	18	2	16	+	1	17	1	17	+		320435.601(0.168)	10.4634	471.833	
0	23	7	17		0	24	6	19			320825.137(0.165)	6.2236	607.577	
1	15	8	7	+	1	16	7	10	+		321260.841(0.240)	0.3560	656.425	
1	15	8	8	−	1	16	7	9	−		321260.841(0.240)	0.3560	656.425	
0	9	1	8	−	0	9	0	9	+	322239.450(0.050)	322239.480(0.020)	17.9835	72.570	SAS84
0	1	1	0		0	1	−1	1			322321.047(0.020)	0.3E−5	5.490	
0	2	1	1		0	2	−1	2			322337.191(0.019)	0.1E−4	8.717	
0	3	1	2		0	3	−1	3			322371.620(0.018)	0.4E−4	13.556	
0	4	1	3		0	4	−1	4			322436.581(0.017)	0.0001	20.009	
0	5	1	4		0	5	−1	5			322548.372(0.016)	0.0002	28.073	
0	23	−7	16		0	24	−6	18			322682.603(0.205)	5.9203	614.704	
0	6	1	5		0	6	−1	6			322727.311(0.015)	0.0003	37.749	
0	7	1	6		0	7	−1	7			322997.659(0.015)	0.0005	49.035	
1	24	3	22		1	24	2	23			323376.104(1.422)	3.9202	760.303	
0	8	1	7		0	8	−1	8			323387.511(0.015)	0.0007	61.930	
0	9	1	8		0	9	−1	9			323928.621(0.016)	0.0010	76.433	
0	10	1	9		0	10	−1	10			324656.149(0.018)	0.0014	92.543	
1	19	11	8	−	1	18	12	7	−		325327.886(8.003)	0.6632	1000.960	
1	19	11	9	+	1	18	12	6	+		325327.886(8.003)	0.6632	1000.960	
1	15	3	13		1	16	−2	14			325435.089(0.196)	0.5E−5	472.076	
0	11	1	10		0	11	−1	11			325608.310(0.020)	0.0018	110.258	
0	24	2	22		0	23	−3	21			325689.966(0.169)	1.4966	488.444	
0	24	9	16		0	25	8	18			325713.377(0.355)	5.3455	756.276	
0	14	−3	12		0	15	0	15			325790.246(0.031)	0.0814	202.075	
0	10	1	9	−	0	10	0	10	+	326630.610(0.050)	326630.601(0.022)	19.6762	88.686	SAS84
0	16	−2	15		0	15	3	12			326678.284(0.019)	0.1098	226.775	
0	12	1	11		0	12	−1	12			326825.917(0.022)	0.0022	129.577	
0	10	−1	10		0	9	0	9			326961.304(0.016)	6.6652	81.637	
0	12	2	11	−	0	11	3	8	−	327317.275(0.050)	327317.292(0.018)	3.5860	141.080	BAS92
0	17	5	13	+	0	18	4	14	+	327407.955(0.050)	327408.045(0.031)	4.8361	331.612	BAS92
0	17	5	12	−	0	18	4	15	−	327440.686(0.050)	327440.809(0.031)	4.8362	331.611	BAS92
0	13	4	9		0	14	3	11		327486.882(0.050)	327486.901(0.024)	3.7172	202.572	BAS92
0	24	4	20		0	23	5	19			327595.136(0.144)	7.5569	539.276	
0	19	−2	18		0	19	0	19			327812.254(0.067)	0.0072	314.112	
0	13	1	12		0	13	−1	13			328351.795(0.024)	0.0025	150.497	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	20	3	18	+	0	19	4	15	+		328469.161(0.056)	6.2699	362.241	
1	23	3	21		1	23	2	22			329287.904(1.212)	3.7922	721.746	
0	12	2	10	+	0	11	3	9	+		329632.936(0.020)	3.6221	141.079	
0	14	1	13		0	14	−1	14			330230.080(0.027)	0.0028	173.017	
0	20	3	17	−	0	19	4	16	−		330355.780(0.052)	6.2933	362.239	
0	8	−3	6		0	9	−2	8		330793.909(0.050)	330793.977(0.019)	2.1755	90.632	AND90
0	16	−1	16		0	15	−2	14			331220.395(0.024)	4.0889	211.800	
0	11	1	10	−	0	11	0	11	+	331502.370(0.050)	331502.333(0.024)	21.3092	106.409	SAS84
1	13	7	6		1	12	8	4			331930.478(0.483)	0.6253	539.144	
0	15	1	14		0	15	−1	15			332505.405(0.029)	0.0030	197.135	
0	22	−2	21		0	21	−3	19			332996.927(0.116)	6.6329	415.980	
0	9	1	8		0	8	−2	7			333864.824(0.018)	0.0353	76.102	
1	21	5	16		1	22	4	19			334327.276(1.099)	1.9755	659.134	
1	3	0	3		1	2	1	2		334426.590(0.050)	334426.561(0.013)	0.8930	207.413	HER84
1	22	3	20		1	22	2	21			334632.489(1.023)	3.6594	684.790	
1	25	−3	22		1	24	−2	22			334677.709(0.625)	17.0359	735.200	
0	11	0	11		0	10	2	8			334970.622(0.021)	0.0018	104.236	
0	3	2	1		0	2	0	2			335121.775(0.015)	$0.3E-4$	13.963	
0	2	2	1	−	0	3	1	2	−	335133.513(0.050)*	335133.686(0.017)	0.3073	19.870	PIC81
0	16	1	15		0	16	−1	16			335221.980(0.033)	0.0029	222.849	
0	7	3	4		0	8	0	8			335362.591(0.021)	0.0030	67.150	
0	7	1	7	+	0	6	1	6	+	335582.005(0.050)	335582.022(0.007)	5.5495	43.694	PIC81
0	25	8	18	−	0	26	7	19	−		335701.502(0.328)	6.5301	735.252	
0	25	8	17	+	0	26	7	20	+		335701.504(0.328)	6.5301	735.252	
0	24	0	24		0	23	3	20			335884.628(0.273)	0.1992	478.482	
0	14	7	7	−	0	15	6	10	−		336438.219(0.036)	2.3759	328.108	
0	14	7	8	+	0	15	6	9	+		336438.219(0.036)	2.3759	328.108	
0	12	1	11	−	0	12	0	12	+	336865.110(0.050)	336865.153(0.026)	22.8775	125.737	SAS84
0	3	3	0		0	4	2	2		337135.873(0.050)	337135.858(0.018)	0.2481	31.596	HER84
1	7	1	7	+	1	6	1	6	+	337297.439(0.050)	337297.483(0.011)	5.5529	259.825	AND90
1	7	6	1	+	1	6	6	0	+	337463.671(0.050)	337463.624(0.017)	1.5068	359.210	AND90
1	7	6	2	−	1	6	6	1	−	337463.671(0.050)	337463.624(0.017)	1.5068	359.210	AND90
1	7	−6	2		1	6	−6	1		337490.523(0.050)	337490.378(0.029)	1.4534	376.743	AND90
1	7	3	5		1	6	3	4		337519.067(0.050)	337519.117(0.013)	4.6169	323.907	AND90
0	17	−3	15		0	18	−1	18			337527.280(0.045)	0.0002	279.056	
1	7	5	2	−	1	6	5	1	−	337546.048(0.050)	337545.987(0.018)	2.7242	326.086	AND90
1	7	5	3	+	1	6	5	2	+	337546.048(0.050)	337545.987(0.018)	2.7242	326.086	AND90
1	7	4	4		1	6	4	3		337581.663(0.050)	337581.604(0.013)	3.7740	286.354	AND90
1	7	−2	5		1	6	−2	4		337605.255(0.050)	337605.272(0.011)	5.2107	287.209	AND90
1	7	6	1		1	6	6	0			337610.580(0.046)	1.4379	445.458	
1	7	−3	4		1	6	−3	3		337610.624(0.050)	337610.627(0.011)	4.5942	258.030	AND90
1	7	2	5	+	1	6	2	4	+	337625.679(0.050)	337625.745(0.011)	5.1827	241.381	AND90
1	7	2	6	−	1	6	2	5	−	337635.655(0.050)	337635.750(0.011)	5.1827	241.381	AND90
1	7	1	7		1	6	1	6		337642.365(0.050)	337642.484(0.012)	5.5389	236.378	AND90
1	7	0	7		1	6	0	6		337643.864(0.050)	337643.921(0.011)	5.6624	242.705	AND90
1	7	−4	3		1	6	−4	2		337645.992(0.050)	337646.021(0.013)	3.8077	315.559	AND90
1	7	−5	3		1	6	−5	2		337648.167(0.050)	337648.188(0.024)	2.7562	413.377	AND90
1	7	3	5	+	1	6	3	4	+	337655.204(0.050)	337655.174(0.013)	4.6165	309.104	AND90
1	7	3	4	−	1	6	3	3	−	337655.204(0.050)	337655.211(0.013)	4.6165	309.104	AND90
1	7	2	6		1	6	2	5		337671.194(0.050)	337671.194(0.014)	5.2089	311.735	AND90
1	7	5	2		1	6	5	1		337685.490(0.100)**	337685.218(0.016)	2.7728	332.049	AND92
1	7	4	3	+	1	6	4	2	+	337685.490(0.100)**	337685.594(0.018)	3.8122	368.154	AND92
1	7	4	4	−	1	6	4	3	−	337685.490(0.100)**	337685.594(0.018)	3.8122	368.154	AND92
1	7	−1	6		1	6	−1	5		337707.547(0.050)	337707.520(0.018)	5.5362	321.108	AND90
1	7	0	7	+	1	6	0	6	+	337748.783(0.050)	337748.771(0.026)	5.6568	328.252	AND90
0	20	−6	14		0	21	−5	16			337838.089(0.067)	5.5212	458.539	
1	7	1	6	−	1	6	1	5	−	337969.414(0.050)	337969.434(0.012)	5.5528	259.892	AND90
0	7	0	7		0	6	0	6		338124.502(0.050)	338124.498(0.007)	5.6540	42.988	PIC81
0	7	−1	7		0	6	−1	6		338344.628(0.050)	338344.605(0.007)	5.5456	37.749	PIC81
0	7	6	2		0	6	6	1		338404.580(0.050)	338404.593(0.009)	1.4907	158.155	AND90
0	7	0	7	+	0	6	0	6	+	338408.681(0.050)	338408.718(0.007)	5.6595	33.876	PIC81
0	17	1	16		0	17	−1	17			338422.608(0.040)	0.0027	250.157	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	7	−6	1		0	6	−6	0		338430.933(0.050)	338430.981(0.010)	1.5001	165.213	AND90
0	7	6	1	+	0	6	6	0	+	338442.344(0.050)	338442.367(0.011)	1.4946	168.514	AND90
0	7	6	2	−	0	6	6	1	−	338442.344(0.050)	338442.367(0.011)	1.4946	168.514	AND90
0	7	−5	2		0	6	−5	1		338456.499(0.050)	338456.521(0.007)	2.7608	120.071	PIC81
0	7	5	3		0	6	5	2		338475.290(0.050)	338475.217(0.008)	2.7599	128.453	PIC81
0	7	5	2	−	0	6	5	1	−	338486.337(0.050)	338486.322(0.008)	2.7748	129.721	AND90
0	7	5	3	+	0	6	5	2	+	338486.337(0.050)	338486.322(0.008)	2.7748	129.721	AND90
0	7	−4	4		0	6	−4	3		338504.099(0.050)	338504.056(0.007)	3.7964	94.975	PIC81
0	7	4	4	−	0	6	4	3	−	338512.762(0.050)*	338512.627(0.007)	3.8051	89.720	PIC81
0	7	4	3	+	0	6	4	2	+	338512.762(0.050)*	338512.639(0.007)	3.8051	89.720	PIC81
0	7	2	6	−	0	6	2	5	−	338512.762(0.050)*	338512.856(0.007)	5.2264	60.090	PIC81
0	7	4	3		0	6	4	2		338530.249(0.050)	338530.256(0.007)	3.8213	100.602	PIC81
0	7	3	5	+	0	6	3	4	+	338540.795(0.050)	338540.824(0.007)	4.6031	68.493	PIC81
0	7	3	4	−	0	6	3	3	−	338543.204(0.050)	338543.149(0.007)	4.6031	68.493	PIC81
0	7	−3	5		0	6	−3	4		338559.928(0.050)	338559.963(0.007)	4.6380	77.468	PIC81
0	7	3	4		0	6	3	3		338583.195(0.050)	338583.223(0.007)	4.6197	67.043	PIC81
0	7	1	6		0	6	1	5		338614.999(0.050)	338614.953(0.007)	5.6802	48.514	PIC81
0	7	2	5	+	0	6	2	4	+	338639.939(0.050)	338639.807(0.007)	5.2264	60.096	PIC81
0	7	2	5		0	6	2	4		338721.630(0.050)	338721.694(0.007)	5.1380	49.349	SAS84
0	7	−2	6		0	6	−2	5		338722.940(0.050)	338722.914(0.007)	5.2018	51.889	SAS84
1	21	3	19		1	21	2	20			339426.590(0.854)	3.5210	649.437	
0	2	2	0	+	0	3	1	3	+	340141.223(0.050)	340141.288(0.017)	0.3035	19.703	AND90
0	16	6	11	−	0	17	5	12	−	340393.672(0.050)	340393.660(0.040)	3.5742	342.533	BAS92
0	16	6	10	+	0	17	5	13	+	340393.672(0.050)	340393.746(0.040)	3.5742	342.533	BAS92
0	20	−2	19		0	20	0	20			340499.461(0.094)	0.0070	346.073	
1	11	1	11		1	10	0	10			340683.989(0.016)	5.5020	297.401	
0	7	1	6	−	0	6	1	5	−	341415.639(0.050)	341415.641(0.007)	5.5500	44.278	AND90
0	18	1	17		0	18	−1	18			342147.658(0.049)	0.0024	279.056	
1	20	−6	15		1	19	−7	13			342722.042(0.565)	5.9380	668.991	
0	13	1	12	−	0	13	0	13	+	342729.830(0.050)	342729.781(0.028)	24.3758	146.670	SAS84
0	5	−2	4		0	4	1	3			343005.812(0.019)	0.0026	30.764	
1	13	−1	12		1	14	−2	12			343601.491(0.477)	2.0466	422.271	
1	20	3	18		1	20	2	19			343690.480(0.706)	3.3766	615.686	
0	18	2	16		0	17	3	14			344109.132(0.050)	5.3139	280.020	
1	10	−2	8		1	11	−3	8			344312.374(0.067)	7.8166	330.411	
0	19	1	19	+	0	18	2	16	+		344443.897(0.103)	5.9951	302.131	
1	13	2	12		1	12	−1	11			345609.050(0.419)	0.0034	412.821	
0	16	1	15	−	0	15	2	14	−		345903.965(0.037)	7.1313	219.666	
0	18	−3	16		0	17	−4	14			345919.191(0.034)	5.6113	307.783	
0	5	4	2	−	0	6	3	3	−	346202.776(0.050)	346202.766(0.021)	0.4962	68.493	AND90
0	5	4	1	+	0	6	3	4	+	346204.369(0.050)	346204.318(0.021)	0.4962	68.493	AND90
0	19	1	18		0	19	−1	19			346434.029(0.063)	0.0018	309.545	
0	14	−1	14		0	13	1	12			346782.761(0.026)	0.0030	161.449	
0	2	2	0		0	2	−1	2			347271.589(0.010)	$0.8E-5$	8.717	
0	3	2	1		0	3	−1	3			347300.336(0.010)	0.0001	13.556	
0	4	2	2		0	4	−1	4			347370.060(0.010)	0.0002	20.009	
1	19	3	17		1	19	2	18			347447.893(0.577)	3.2262	583.538	
0	5	2	3		0	5	−1	5			347507.457(0.011)	0.0004	28.073	
0	6	2	4		0	6	−1	6			347745.433(0.012)	0.0007	37.749	
0	7	2	5		0	7	−1	7			348122.523(0.013)	0.0010	49.035	
0	8	2	6		0	8	−1	8			348681.913(0.015)	0.0011	61.930	
0	13	0	13		0	12	−2	11			348823.547(0.025)	0.0019	143.927	
0	14	1	13	−	0	14	0	14	+	349107.020(0.050)	349106.954(0.031)	25.7993	169.206	SAS84
0	9	2	7		0	9	−1	9			349469.996(0.017)	0.0007	76.433	
1	7	2	6		1	8	−2	6			349536.229(0.109)	$0.1E-8$	311.339	
1	15	3	13		1	16	4	13			350287.710(0.256)	12.9844	471.247	
0	10	2	8		0	10	−1	10			350534.388(0.020)	0.0001	92.543	
0	4	0	4		0	3	−1	3		350687.730(0.050)	350687.651(0.015)	1.5544	13.556	SAS84
1	18	3	16		1	18	2	17			350725.846(0.466)	3.0699	552.994	
0	1	1	1	+	0	0	0	0	+	350905.119(0.050)	350905.070(0.014)	1.9773	0.000	PIC81
0	9	5	5		0	10	4	6			351236.343(0.028)	1.3772	155.444	
0	20	1	19		0	20	−1	20			351314.156(0.083)	0.0012	341.622	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	11	2	9		0	11	−1	11			351921.403(0.023)	0.0003	110.258	
1	17	3	15		1	17	2	16			353554.333(0.373)	2.9082	524.054	
0	12	2	10		0	12	−1	12			353673.122(0.026)	0.0042	129.577	
1	19	2	18	−	1	18	1	17	−		354127.258(0.202)	10.7705	501.260	
0	21	−2	20		0	21	0	21			354750.888(0.133)	0.0066	379.611	
0	13	0	13	+	0	12	1	12	+		355603.110(0.026)	13.0586	134.809	
0	13	2	11		0	13	−1	13			355824.295(0.029)	0.0179	150.497	
1	16	3	14		1	16	2	15			355965.891(0.295)	2.7416	496.719	
0	15	1	14	−	0	15	0	15	+		356007.152(0.037)	27.1437	193.344	
0	23	−4	20		0	22	−5	17			356627.165(0.106)	7.1792	493.971	
0	21	1	20		0	21	−1	21			356815.103(0.110)	0.0006	375.284	
0	18	−8	10		0	19	−7	12			356874.914(0.069)	3.4232	487.051	
1	23	−2	21		1	22	2	21			357978.363(0.597)	$0.2E-5$	684.790	
1	15	3	13		1	15	2	14		357994.100(0.100)**	357995.046(0.233)	2.5710	470.990	AND92
0	9	−3	7		0	10	2	8			358200.999(0.024)	0.0020	104.236	
0	14	2	12		0	14	−1	14			358399.517(0.032)	0.0521	173.017	
0	10	6	5		0	11	5	7			358414.688(0.032)	1.3516	201.021	
0	4	1	3		0	3	0	3		358605.800(0.050)	358605.870(0.009)	2.2120	18.803	SAS84
0	9	2	7		0	8	−2	7			359406.199(0.017)	0.0006	76.102	
1	14	3	12		1	14	2	13		359676.945(0.100)**	359677.681(0.183)	2.3968	446.866	AND92
1	17	0	17		1	16	−3	13			359789.042(0.113)	0.0010	442.939	
1	3	1	3	+	1	4	2	2	+	360661.433(0.050)*	360661.608(0.025)	3.3849	223.682	HER84
0	11	0	11		0	10	1	9			360848.861(0.020)	5.0757	103.373	
0	19	1	18		0	18	3	15			360889.563(0.062)	0.0362	309.063	
1	13	3	11		1	13	2	12		361049.793(0.100)**	361050.351(0.145)	2.2198	424.349	AND92
1	3	1	2	−	1	4	2	3	−	361236.476(0.050)	361236.467(0.025)	3.3812	223.682	HER84
0	15	2	13		0	15	−1	15			361411.192(0.035)	0.1229	197.135	
0	8	1	7		0	7	2	5		361852.251(0.050)	361852.279(0.019)	2.3798	60.647	AND90
0	3	3	0		0	4	1	3			362069.337(0.025)	0.0001	30.764	
1	12	3	10		1	12	2	11		362149.190(0.100)**	362149.602(0.115)	2.0407	403.438	AND92
1	23	−2	21		1	24	1	24			362831.411(0.578)	0.0001	684.629	
0	2	−2	1		0	1	0	1			362908.208(0.017)	$0.2E-4$	10.736	
0	22	1	21		0	22	−1	22			362957.790(0.144)	0.0002	410.529	
1	11	3	9		1	11	2	10		363011.023(0.100)**	363011.315(0.092)	1.8598	384.135	AND92
0	16	1	15	−	0	16	0	16	+		363440.304(0.045)	28.4046	219.081	
0	26	5	22		0	25	6	20			363458.166(0.196)	8.0810	647.800	
1	15	2	14		1	14	3	12			363527.296(0.194)	0.7564	458.864	
1	10	3	8		1	10	2	9		363669.911(0.050)*	363670.113(0.073)	1.6775	366.439	AND90
0	7	2	5		0	6	1	5		363739.820(0.050)	363739.817(0.017)	4.5728	48.514	SAS84
1	9	3	7		1	9	2	8		364158.760(0.050)	364158.847(0.058)	1.4939	350.351	AND90
1	8	3	6		1	8	2	7		364508.078(0.050)	364508.172(0.047)	1.3087	335.870	AND90
0	15	−1	15		0	14	2	12			364640.874(0.033)	0.2011	184.972	
1	7	3	5		1	7	2	6		364746.187(0.050)	364746.206(0.040)	1.1212	322.998	AND90
1	12	6	7	−	1	13	5	8	−		364753.510(0.165)	2.7581	438.645	
1	12	6	6	+	1	13	5	9	+		364753.511(0.165)	2.7581	438.645	
0	16	2	14		0	16	−1	16			364858.900(0.040)	0.2524	222.849	
1	6	3	4		1	6	2	5		364898.325(0.050)	364898.282(0.039)	0.9300	311.735	AND90
1	5	3	3		1	5	2	4		364986.810(0.050)	364986.766(0.043)	0.7324	302.080	AND90
1	4	3	2		1	4	2	3		365030.999(0.050)	365030.935(0.050)	0.5230	294.034	AND90
1	3	3	1		1	3	2	2		365047.031(0.050)	365046.901(0.058)	0.2899	287.597	AND90
0	7	−5	2		0	8	−4	5			365474.759(0.025)	0.7443	119.170	
0	14	3	11		0	13	−3	11			365827.361(0.020)	$0.1E-6$	190.370	
0	6	−2	5		0	5	2	3			366474.983(0.015)	$0.3E-4$	39.665	
1	19	−2	17		1	20	0	20			368394.149(0.225)	0.0002	546.492	
0	17	2	15		0	17	−1	17			368730.623(0.046)	0.4662	250.157	
0	22	7	16		0	23	6	18			368874.383(0.138)	5.7836	568.957	
1	19	2	17	+	1	18	1	18	+		369342.405(0.219)	11.0832	500.717	
0	25	0	25		0	24	3	21			369415.895(0.349)	0.2026	517.205	
0	23	1	22		0	23	−1	23			369756.387(0.187)	$0.1E-5$	447.356	
0	13	−3	11		0	14	0	14			370088.579(0.029)	0.0592	178.025	
1	14	8	6	+	1	15	7	9	+		370420.360(0.220)	0.3008	630.714	
1	14	8	7	−	1	15	7	8	−		370420.360(0.220)	0.3008	630.714	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	22	−2	21		0	22	0	22			370585.515(0.184)	0.0062	414.727	
0	22	−7	15		0	23	−6	17			371297.953(0.163)	5.4852	576.075	
0	17	1	16	−	0	17	0	17	+		371415.450(0.058)	29.5785	246.416	
1	25	2	24		1	26	−3	23			371775.149(0.805)	0.0001	788.060	
0	25	2	23		0	24	−3	22			372785.390(0.205)	1.7551	527.080	
0	18	2	16		0	18	−1	18			373005.936(0.055)	0.7901	279.056	
1	9	6	3		1	8	8	0			373689.314(0.355)	0.0001	471.596	
1	20	11	9	−	1	19	12	8	−		373957.552(8.456)	0.8187	1031.430	
1	20	11	10	+	1	19	12	7	+		373957.552(8.456)	0.8187	1031.430	
0	23	9	15		0	24	8	17			374241.535(0.299)	4.8964	716.071	
0	17	−1	17		0	16	−2	15			374293.569(0.028)	4.0275	237.672	
1	14	3	12		1	15	−2	13			374461.077(0.165)	$0.3E-5$	446.373	
0	13	2	12	−	0	12	3	9	−		375156.414(0.021)	4.0468	160.434	
0	11	−1	11		0	10	0	10			375758.411(0.018)	7.5900	97.724	
0	16	5	12	+	0	17	4	13	+		376078.046(0.029)	4.3989	302.592	
0	16	5	11	−	0	17	4	14	−		376098.940(0.029)	4.3990	302.592	
0	21	3	19	+	0	20	4	16	+		376135.079(0.073)	6.6588	394.480	
0	25	4	21		0	24	5	20			376261.641(0.180)	8.0459	577.892	
0	12	4	8		0	13	3	10			376268.561(0.025)	3.2812	179.984	
0	17	−2	16		0	16	3	13			377080.236(0.023)	0.1763	252.591	
0	24	1	23		0	24	−1	24			377217.920(0.241)	0.0003	485.762	
0	19	2	17		0	19	−1	19			377660.738(0.068)	1.2446	309.545	
1	20	5	15		1	21	4	18			378289.574(0.936)	2.0389	623.822	
0	13	2	11	+	0	12	3	10	+		378326.022(0.023)	4.1025	160.431	
0	21	3	18	−	0	20	4	17	−		378652.591(0.067)	6.6921	394.477	
1	14	7	7		1	13	8	5			379312.461(0.573)	0.7577	560.054	
0	7	−3	5		0	8	−2	7		379493.994(0.050)	379494.100(0.019)	1.7502	76.102	AND90
0	18	1	17	−	0	18	0	18	+		379940.364(0.076)	30.6620	275.347	
0	12	0	12		0	11	2	9			380510.807(0.024)	0.0026	121.997	
0	20	1	20	+	0	19	2	17	+		381837.766(0.135)	6.1936	332.785	
0	10	1	9		0	9	−2	8			381949.093(0.019)	0.0571	90.632	
0	16	−3	14		0	17	−1	17			382506.176(0.038)	0.0002	250.157	
1	4	0	4		1	3	1	3		382666.474(0.050)	382666.506(0.013)	1.3426	212.241	HER84
0	20	2	18		0	20	−1	20			382672.505(0.088)	1.8398	341.622	
0	6	3	3		0	7	0	7			383027.037(0.021)	0.0014	54.266	
0	8	1	8	+	0	7	1	7	+	383477.880(0.050)	383477.900(0.008)	6.3729	54.888	SAS84
0	24	8	17	−	0	25	7	18	−		383498.431(0.275)	6.0824	693.447	
0	24	8	16	+	0	25	7	19	+		383498.433(0.275)	6.0824	693.447	
0	4	2	2		0	3	0	3			383539.350(0.015)	0.0001	18.803	
1	26	−3	23		1	25	−2	23			383756.461(0.746)	17.8890	775.259	
0	13	7	6	−	0	14	6	9	−		384813.309(0.039)	1.9761	303.936	
0	13	7	7	+	0	14	6	8	+		384813.309(0.039)	1.9761	303.936	
0	26	2	24	+	0	26	1	25	−		385020.658(0.347)	28.8936	579.624	
0	25	1	24		0	25	−1	25			385342.099(0.305)	0.0015	525.745	
1	8	1	8	+	1	7	1	7	+	385449.012(0.050)	385449.070(0.012)	6.3771	271.076	AND90
1	8	7	1		1	7	7	0			385551.266(0.069)	1.4330	448.967	
1	8	6	2	+	1	7	6	1	+	385598.481(0.050)*	385598.184(0.018)	2.8397	370.467	AND90
1	8	6	3	−	1	7	6	2	−	385598.481(0.050)*	385598.184(0.018)	2.8397	370.467	AND90
1	8	−7	2		1	7	−7	1			385632.372(0.027)	1.5375	408.828	
1	8	3	6		1	7	3	5		385654.853(0.050)	385654.865(0.014)	5.5531	335.165	AND90
1	8	−6	3		1	7	−6	2		385675.008(0.050)	385674.826(0.031)	2.7394	388.000	AND90
1	8	7	1	−	1	7	7	0	−	385678.853(0.050)	385678.796(0.024)	1.5204	482.815	AND90
1	8	7	2	+	1	7	7	1	+	385678.853(0.050)	385678.796(0.024)	1.5204	482.815	AND90
1	8	5	3	−	1	7	5	2	−	385739.192(0.050)	385739.123(0.020)	3.8737	337.345	AND90
1	8	5	4	+	1	7	5	3	+	385739.192(0.050)	385739.123(0.020)	3.8737	337.345	AND90
1	8	6	2		1	7	6	1			385773.721(0.053)	2.7086	456.719	
1	8	4	5		1	7	4	4		385778.195(0.050)	385778.130(0.014)	4.8034	297.615	AND90
1	8	−2	6		1	7	−2	5		385793.822(0.050)	385793.823(0.012)	6.0789	298.470	AND90
1	8	−3	5		1	7	−3	4		385811.305(0.050)	385811.309(0.012)	5.5275	269.292	AND90
1	8	2	6	+	1	7	2	5	+	385826.367(0.050)	385826.399(0.012)	6.0466	252.643	AND90
1	8	2	7	−	1	7	2	6	−	385841.333(0.050)	385841.398(0.012)	6.0466	252.644	AND90
1	8	1	8		1	7	1	7			385846.625(0.012)	6.3611	247.640	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	8	0	8		1	7	0	7			385846.966(0.012)	6.4713	253.968	
1	8	−4	4		1	7	−4	3		385872.714(0.050)	385872.708(0.014)	4.8462	326.822	AND90
1	8	3	6	+	1	7	3	5	+	385875.666(0.050)	385875.617(0.013)	5.5542	320.367	AND90
1	8	3	5	−	1	7	3	4	−	385875.666(0.050)	385875.690(0.013)	5.5542	320.367	AND90
1	8	−5	4		1	7	−5	3		385880.178(0.050)	385880.202(0.026)	3.9191	424.640	AND90
1	8	2	7		1	7	2	6		385892.906(0.050)	385892.899(0.015)	6.0771	322.998	AND90
1	8	−1	7		1	7	−1	6		385933.006(0.050)	385932.991(0.020)	6.3580	332.373	AND90
1	8	4	4	+	1	7	4	3	+	385951.775(0.050)	385951.751(0.020)	4.8519	379.418	AND90
1	8	4	5	−	1	7	4	4	−	385951.775(0.050)	385951.751(0.020)	4.8519	379.418	AND90
1	8	5	3		1	7	5	2		385958.092(0.050)	385958.048(0.019)	3.9432	343.313	AND90
1	8	0	8	+	1	7	0	7	+	385979.907(0.050)	385979.887(0.029)	6.4649	339.518	AND90
1	8	1	7	−	1	7	1	6	−	386216.202(0.050)	386216.262(0.012)	6.3770	271.166	AND90
0	19	−6	13		0	20	−5	15			386220.684(0.057)	5.0840	424.713	
0	8	0	8		0	7	0	7		386247.660(0.050)	386247.669(0.008)	6.4601	54.266	SAS84
0	8	−1	8		0	7	−1	7		386587.270(0.050)	386587.291(0.008)	6.3685	49.035	SAS84
0	8	7	1	−	0	7	7	0	−	386663.916(0.050)	386663.922(0.015)	1.4993	215.227	AND90
0	8	7	2	+	0	7	7	1	+	386663.916(0.050)	386663.922(0.015)	1.4993	215.227	AND90
0	8	0	8	+	0	7	0	7	+	386682.025(0.050)	386682.062(0.008)	6.4679	45.164	AND90
0	8	7	2		0	7	7	1		386683.240(0.050)*	386683.599(0.015)	1.5108	218.789	AND90
0	8	−7	1		0	7	−7	0		386716.267(0.050)	386716.278(0.016)	1.5086	226.019	AND90
0	8	6	3		0	7	6	2		386725.190(0.050)	386725.196(0.010)	2.8095	169.443	AND90
0	8	−6	2		0	7	−6	1		386756.938(0.050)	386756.968(0.011)	2.8271	176.502	AND90
0	8	6	2	+	0	7	6	1	+	386764.518(0.050)	386764.521(0.011)	2.8168	179.803	AND90
0	8	6	3	−	0	7	6	2	−	386764.518(0.050)	386764.521(0.011)	2.8168	179.803	AND90
0	8	−5	3		0	7	−5	2		386788.660(0.050)	386788.706(0.008)	3.9255	131.361	SAS84
0	8	5	4		0	7	5	3		386802.263(0.050)	386802.253(0.009)	3.9244	139.744	AND90
0	8	5	3	−	0	7	5	2	−	386820.000(0.050)	386820.044(0.009)	3.9454	141.012	SAS84
0	8	5	4	+	0	7	5	3	+	386820.000(0.050)	386820.044(0.009)	3.9454	141.012	SAS84
0	8	2	7	−	0	7	2	6	−	386824.430(0.050)	386824.465(0.008)	6.0973	71.382	HER84
0	8	−4	5		0	7	−4	4		386837.132(0.050)	386837.136(0.007)	4.8320	106.266	AND90
0	8	4	5	−	0	7	4	4	−	386859.820(0.050)	386859.774(0.007)	4.8429	101.011	SAS84
0	8	4	4	+	0	7	4	3	+	386859.820(0.050)	386859.808(0.007)	4.8429	101.011	SAS84
0	8	4	4		0	7	4	3		386869.410(0.050)	386869.413(0.008)	4.8634	111.894	SAS84
0	8	3	6	+	0	7	3	5	+	386885.540(0.050)	386885.596(0.007)	5.5383	79.785	SAS84
0	8	3	5	−	0	7	3	4	−	386890.120(0.050)	386890.244(0.007)	5.5383	79.785	SAS84
0	8	−3	6		0	7	−3	5		386901.950(0.050)	386901.912(0.007)	5.5801	88.761	SAS84
0	8	3	5		0	7	3	4		386953.820(0.050)	386953.786(0.007)	5.5581	78.337	SAS84
0	8	1	7		0	7	1	6		386977.140(0.050)	386977.144(0.008)	6.5187	59.809	SAS84
0	8	2	6	+	0	7	2	5	+	387014.800(0.050)	387014.729(0.008)	6.0974	71.391	SAS84
0	8	2	6		0	7	2	5		387146.560(0.050)*	387146.681(0.008)	5.9956	60.647	SAS84
0	8	−2	7		0	7	−2	6		387153.550(0.050)	387153.534(0.007)	6.0687	63.188	SAS84
0	23	−2	22		0	23	0	23			388001.074(0.249)	0.0057	451.418	
0	21	2	19		0	21	−1	21			388024.787(0.115)	2.5722	375.284	
0	23	−2	22		0	22	−3	20			388246.917(0.149)	6.7834	451.410	
1	12	1	12		1	11	0	11			388836.560(0.017)	5.9964	315.093	
0	15	6	10	−	0	16	5	11	−		388857.486(0.039)	3.1591	315.137	
0	15	6	9	+	0	16	5	12	+		388857.533(0.039)	3.1591	315.137	
0	25	2	23	+	0	25	1	24	−		388948.638(0.300)	27.7727	537.568	
0	19	1	18	−	0	19	0	19	+		389021.160(0.099)	31.6525	305.872	
0	8	1	7	−	0	7	1	6	−	390141.459(0.050)	390141.459(0.008)	6.3738	55.667	AND90
0	9	9	0	−	1	8	5	3	−		391017.240(0.281)	$1.7E-7$	350.212	
0	9	9	1	+	1	8	5	4	+		391017.240(0.281)	$1.7E-7$	350.212	
1	12	−1	11		1	13	−2	11			391183.719(0.475)	1.9396	399.772	
0	6	−2	5		0	5	1	4			391434.067(0.018)	0.0061	38.833	
1	21	−6	16		1	20	−7	14			391717.559(0.676)	6.6816	701.064	
0	19	2	17		0	18	3	15			392116.272(0.063)	5.4840	309.063	
1	9	−2	7		1	10	−3	7			392529.278(0.066)	7.3188	312.721	
0	14	0	14		0	13	−2	12			392587.718(0.027)	0.0023	164.930	
0	15	−1	15		0	14	1	13			392810.311(0.028)	0.0040	184.032	
0	24	2	22	+	0	24	1	23	−		393216.792(0.257)	26.6054	497.108	
0	22	2	20		0	22	−1	22			393709.874(0.149)	3.4254	410.529	
1	14	2	13		1	13	−1	12			393727.616(0.419)	0.0050	433.733	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	26	1	25		0	26	−1	26			394121.364(0.383)	0.0041	567.303	
0	19	−3	17		0	18	−4	15			394272.763(0.042)	6.0979	336.784	
0	4	4	1	−	0	5	3	2	−	394587.099(0.100)**	394586.792(0.023)	0.1989	58.813	AND92
0	4	4	0	+	0	5	3	3	+	394587.099(0.100)**	394587.310(0.023)	0.1989	58.813	AND92
0	3	3	1	+	0	2	2	0	+	397039.090(0.050)	397039.120(0.018)	4.6631	31.049	SAS84
0	3	3	0	−	0	2	2	1	−	397041.410(0.050)	397041.409(0.018)	4.6630	31.049	SAS84
0	23	2	21	+	0	23	1	22	−		397771.498(0.219)	25.4026	458.247	
0	2	1	2	+	0	1	0	1	+	398446.920(0.050)	398446.917(0.014)	2.9660	1.614	SAS84
0	20	1	19	−	0	20	0	20	+		398661.856(0.129)	32.5479	337.989	
0	5	0	5		0	4	−1	4		398946.230(0.050)	398946.209(0.015)	2.1282	20.009	SAS84
1	14	3	12		1	15	4	12			399569.829(0.225)	12.1751	445.535	
0	8	5	4		0	9	4	5			399637.511(0.030)	1.0180	139.316	
0	23	2	21		0	23	−1	23			399729.230(0.191)	4.3728	447.356	
0	17	1	16	−	0	16	2	15	−		400917.173(0.044)	7.8301	245.432	
1	20	2	19	−	1	19	1	18	−		401518.985(0.254)	11.3593	531.803	
0	26	0	26		0	25	3	22			401783.948(0.440)	0.2031	557.541	
0	22	2	20	+	0	22	1	21	−		402559.777(0.185)	24.1745	420.988	
1	24	−2	22		1	23	2	22			403345.840(0.729)	$0.2E-5$	721.746	
0	24	−4	21		0	23	−5	18			404276.459(0.135)	7.6217	531.008	
0	17	−8	9		0	18	−7	11			405287.914(0.061)	3.0026	456.456	
0	24	2	22		0	24	−1	24			406092.047(0.242)	5.3830	485.762	
0	26	3	23		0	26	−2	25			406336.467(0.194)	7.8003	585.936	
0	9	6	4		0	10	5	6			406791.189(0.034)	0.9905	183.285	
0	12	0	12		0	11	1	10			406823.900(0.022)	5.6121	121.119	
0	24	−2	23		0	24	0	24			406977.465(0.330)	0.0053	489.686	
0	8	−3	6		0	9	2	7			406989.813(0.023)	0.0008	88.091	
0	5	1	4		0	4	0	4		407069.553(0.050)	407069.578(0.009)	2.6531	25.254	HER84
0	21	2	19	+	0	21	1	20	−		407529.661(0.155)	22.9305	385.334	
1	18	0	18		1	17	−3	14			407794.226(0.132)	0.0014	470.255	
0	10	2	8		0	9	−2	8			407827.332(0.018)	0.0012	90.632	
0	20	1	19		0	19	3	16			408338.713(0.080)	0.0398	339.720	
0	14	0	14	+	0	13	1	13	+		408557.011(0.028)	14.3281	155.578	
0	21	1	20	−	0	21	0	21	+		408863.935(0.165)	33.3469	371.696	
1	2	1	2	+	1	3	2	1	+	409035.534(0.050)	409035.517(0.026)	3.0047	217.245	HER84
1	2	1	1	−	1	3	2	2	−	409323.292(0.050)	409323.448(0.026)	3.0031	217.245	HER84
0	16	−1	16		0	15	2	13			409474.524(0.036)	0.2979	209.190	
0	9	1	8		0	8	2	6		410040.134(0.050)	410040.142(0.021)	2.7835	73.561	AND90
0	3	−2	2		0	2	0	2			411290.051(0.017)	0.0001	13.963	
1	22	−2	20		1	23	1	23			411685.763(0.477)	0.0001	646.121	
0	8	2	6		0	7	1	6		412271.587(0.050)	412271.545(0.019)	4.9147	59.809	AND90
0	25	3	22		0	25	−2	24			412352.897(0.159)	6.5904	543.787	
0	20	2	18	+	0	20	1	19	−		412630.504(0.129)	21.6792	351.287	
0	25	2	23		0	25	−1	25			412812.706(0.303)	6.4240	525.745	
1	16	2	15		1	15	3	13			413352.570(0.245)	0.8105	482.931	
1	11	6	6	−	1	12	5	7	−		413455.987(0.189)	2.1651	417.747	
1	11	6	5	+	1	12	5	8	+		413455.988(0.189)	2.1651	417.747	
0	6	−5	1		0	7	−4	4			413855.374(0.027)	0.4256	106.266	
0	15	3	12		0	14	−3	12			414680.457(0.022)	$0.3E-6$	212.942	
0	7	−2	6		0	6	2	4			414890.158(0.015)	0.0001	49.349	
0	12	−3	10		0	13	0	13			415059.274(0.028)	0.0415	155.562	
0	18	−1	18		0	17	−2	16			416339.151(0.033)	3.8990	265.169	
1	18	−2	16		1	19	0	19			416878.823(0.185)	0.0002	514.375	
0	21	7	15		0	22	6	17			416959.152(0.116)	5.3448	531.938	
0	19	2	17	+	0	19	1	18	−		417813.244(0.106)	20.4282	318.848	
1	24	2	23		1	25	−3	22			417886.793(0.661)	$0.5E-4$	746.364	
0	24	3	21		0	24	−2	23			418037.917(0.128)	5.4538	503.261	
1	20	2	18	+	1	19	1	19	+		418283.009(0.280)	11.7227	531.201	
0	21	1	21	+	0	20	2	18	+		418448.063(0.175)	6.3635	365.051	
0	2	1	1		0	1	−1	1			419076.554(0.020)	$0.3E-5$	5.490	
0	26	2	24		0	25	−3	23			419460.702(0.247)	2.0132	567.318	
1	13	8	5	+	1	14	7	8	+		419543.637(0.215)	0.2465	606.607	
1	13	8	6	−	1	14	7	7	−		419543.637(0.215)	0.2465	606.607	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	22	1	21	−	0	22	0	22	+		419625.896(0.210)	34.0486	406.991	
0	21	−7	14		0	22	−6	16			419873.569(0.129)	5.0544	539.049	
1	10	6	4		1	9	8	1			421810.490(0.346)	0.0002	486.069	
1	21	11	10	−	1	20	12	9	−		422601.003(8.968)	0.9853	1063.500	
1	21	11	11	+	1	20	12	8	+		422601.003(8.968)	0.9853	1063.500	
1	19	5	14		1	20	4	17			422756.015(0.790)	2.0828	590.107	
0	22	9	14		0	23	8	16			422757.598(0.253)	4.4559	677.466	
0	14	2	13	−	0	13	3	10	−		422846.403(0.024)	4.5082	181.400	
0	18	2	16	+	0	18	1	17	−		423030.631(0.087)	19.1838	288.020	
1	13	3	11		1	14	−2	12			423330.097(0.143)	0.1E−5	422.271	
0	23	3	20		0	23	−2	22			423336.326(0.102)	4.4060	464.361	
0	2	−2	1		0	2	−1	2		423439.721(0.050)	423439.663(0.014)	1.6757	8.717	AND90
0	3	−2	2		0	3	−1	3		423468.663(0.050)	423468.612(0.014)	2.9530	13.556	PIC81
0	4	−2	3		0	4	−1	4		423538.258(0.050)	423538.235(0.013)	4.1379	20.009	PIC81
0	22	3	20	+	0	21	4	17	+		423659.420(0.095)	7.0374	428.328	
0	5	−2	4		0	5	−1	5		423675.155(0.050)	423675.146(0.013)	5.3027	28.073	PIC81
0	6	−2	5		0	6	−1	6		423912.696(0.050)	423912.678(0.012)	6.4758	37.749	PIC81
0	7	−2	6		0	7	−1	7		424291.006(0.050)	424290.987(0.012)	7.6714	49.035	AND90
0	15	5	11	+	0	16	4	12	+		424691.161(0.029)	3.9629	275.183	
0	15	5	10	−	0	16	4	13	−		424704.119(0.029)	3.9630	275.183	
0	12	−1	12		0	11	0	11			424725.238(0.019)	8.6006	115.409	
0	8	−2	7		0	8	−1	8		424857.263(0.050)	424857.230(0.012)	8.8969	61.930	PIC81
0	11	4	7		0	12	3	9			424959.114(0.026)	2.8482	159.009	
0	26	4	22		0	25	5	21			424968.201(0.222)	8.5402	618.108	
0	13	0	13		0	12	2	10			425357.552(0.028)	0.0035	141.374	
1	3	−1	2		1	2	2	1			425661.931(0.436)	0.8E−6	282.769	
0	9	−2	8		0	9	−1	9		425665.845(0.050)	425665.832(0.013)	10.1549	76.433	AND90
1	15	7	8		1	14	8	6			426488.964(0.676)	0.8740	582.574	
0	10	−2	9		0	10	−1	10		426778.845(0.050)	426778.850(0.014)	11.4436	92.543	AND90
0	22	3	19	−	0	21	4	18	−		426974.079(0.086)	7.0839	428.324	
0	14	2	12	+	0	13	3	11	+		427089.409(0.026)	4.5913	181.395	
0	25	−2	24		0	25	0	25			427481.030(0.429)	0.0048	529.528	
0	18	−2	17		0	17	3	14			427901.786(0.030)	0.2699	280.020	
0	15	−3	13		0	16	−1	16			427979.329(0.034)	0.0002	222.849	
0	6	−3	4		0	7	−2	6		428087.588(0.050)	428087.671(0.020)	1.3343	63.188	AND90
0	22	3	19		0	22	−2	21			428199.874(0.080)	3.4626	427.088	
0	17	2	15	+	0	17	1	16	−		428237.412(0.071)	17.9514	258.805	
0	11	−2	10		0	11	−1	11			428266.406(0.016)	12.7571	110.258	
0	11	1	10		0	10	−2	9			429908.706(0.020)	0.0866	106.779	
0	12	−2	11		0	12	−1	12			430207.126(0.018)	14.0834	129.577	
1	5	0	5		1	4	1	4		430900.319(0.050)	430900.423(0.014)	1.7954	218.678	HER84
0	5	3	2		0	6	0	6			430938.349(0.022)	0.0006	42.988	
0	23	1	22	−	0	23	0	23	+		430942.812(0.264)	34.6531	443.872	
0	9	1	9	+	0	8	1	8	+	431356.366(0.050)	431356.391(0.008)	7.1930	67.679	AND90
0	23	8	15	+	0	24	7	18	+		431359.964(0.231)	5.6370	653.241	
0	23	8	16	−	0	24	7	17	−		431359.964(0.231)	5.6370	653.241	
0	5	2	3		0	4	0	4			432028.662(0.014)	0.0002	25.254	
0	21	3	18		0	21	−2	20			432591.176(0.062)	2.6372	391.444	
0	13	−2	12		0	13	−1	13			432688.431(0.020)	15.4047	150.497	
1	9	8	1	+	1	8	8	0	+		433106.225(0.067)	0.3300	532.321	
1	9	8	2	−	1	8	8	1	−		433106.225(0.067)	0.3300	532.321	
0	12	7	5	−	0	13	6	8	−		433199.807(0.044)	1.5931	281.373	
0	12	7	6	+	0	13	6	7	+		433199.807(0.044)	1.5931	281.373	
0	16	2	14	+	0	16	1	15	−		433390.486(0.057)	16.7352	231.204	
1	9	1	9	+	1	8	1	8	+	433587.148(0.050)	433587.167(0.012)	7.1980	283.933	AND90
1	9	6	3	+	1	8	6	2	+	433703.322(0.050)	433703.243(0.018)	4.0565	383.329	AND90
1	9	6	4	−	1	8	6	3	−	433703.322(0.050)	433703.243(0.018)	4.0565	383.329	AND90
1	9	7	2		1	8	7	1			433707.616(0.075)	2.7175	461.827	
1	9	3	7		1	8	3	6		433758.400(0.050)	433758.451(0.016)	6.4598	348.029	AND90
1	9	−7	3		1	8	−7	2			433777.059(0.028)	2.9152	421.691	
1	9	−8	2		1	8	−8	1			433786.399(0.032)	1.5239	527.314	
1	9	−6	4		1	8	−6	3		433848.070(0.050)	433847.892(0.033)	3.9138	400.865	AND90

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	9	7	2	−	1	8	7	1	−	433860.493(0.050)	433860.459(0.025)	2.8830	495.680	AND90
1	9	7	3	+	1	8	7	2	+	433860.493(0.050)	433860.459(0.025)	2.8830	495.680	AND90
1	9	8	1		1	8	8	0			433894.733(0.043)	1.6102	471.596	
1	9	6	3		1	8	6	2			433909.882(0.059)	3.8676	469.587	
1	9	5	4	−	1	8	5	3	−	433921.287(0.050)	433921.176(0.021)	4.9444	350.212	AND90
1	9	5	5	+	1	8	5	4	+	433921.287(0.050)	433921.176(0.021)	4.9444	350.212	AND90
1	9	4	6		1	8	4	5		433962.910(0.050)	433962.897(0.014)	5.7819	310.483	AND90
1	9	−2	7		1	8	−2	6		433966.044(0.050)	433966.091(0.012)	6.9341	311.339	AND90
1	9	−3	6		1	8	−3	5		434000.209(0.050)	434000.235(0.012)	6.4321	282.161	AND90
1	9	2	7	+	1	8	2	6	+	434014.389(0.050)	434014.424(0.012)	6.8976	265.513	AND90
1	9	2	8	−	1	8	2	7	−	434035.754(0.050)	434035.839(0.012)	6.8976	265.514	AND90
1	9	0	9		1	8	0	8		434037.236(0.050)	434037.301(0.012)	7.2802	266.838	AND90
1	9	1	9		1	8	1	8		434038.575(0.050)	434038.573(0.012)	7.1801	260.511	AND90
1	9	3	7	+	1	8	3	6	+	434089.722(0.050)	434089.640(0.013)	6.4630	333.239	AND90
1	9	3	6	−	1	8	3	5	−	434089.722(0.050)	434089.774(0.013)	6.4630	333.239	AND90
1	9	−4	5		1	8	−4	4		434096.016(0.050)	434095.987(0.014)	5.8334	339.693	AND90
1	9	2	8		1	8	2	7		434107.821(0.050)	434107.776(0.016)	6.9325	335.870	AND90
1	9	−5	5		1	8	−5	4		434110.756(0.050)	434110.777(0.028)	5.0023	437.511	AND90
1	9	−1	8		1	8	−1	7		434151.122(0.050)	434151.069(0.022)	7.1765	345.246	AND90
1	9	0	9	+	1	8	0	8	+	434203.565(0.050)	434203.512(0.032)	7.2730	352.393	AND90
1	9	4	6	−	1	8	4	5	−	434227.719(0.050)	434227.742(0.022)	5.8403	392.292	AND90
1	9	4	5	+	1	8	4	4	+	434227.719(0.050)	434227.743(0.022)	5.8403	392.292	AND90
1	9	5	4		1	8	5	3		434243.318(0.050)	434243.370(0.023)	5.0337	356.187	AND90
0	9	0	9		0	8	0	8		434302.069(0.050)	434302.048(0.008)	7.2657	67.150	AND90
1	9	1	8	−	1	8	1	7	−	434449.265(0.050)	434449.290(0.013)	7.1979	284.048	AND90
0	18	−6	12		0	19	−5	14			434595.379(0.050)	4.6478	392.494	
0	9	−1	9		0	8	−1	8		434793.421(0.050)	434793.433(0.008)	7.1881	61.930	AND90
0	9	−8	1		0	8	−8	0			434893.045(0.023)	1.5041	281.485	
0	9	8	1	+	0	8	8	0	+	434898.966(0.050)	434899.029(0.021)	1.5173	281.135	AND90
0	9	8	2	−	0	8	8	1	−	434898.966(0.050)	434899.029(0.021)	1.5173	281.135	AND90
0	9	0	9	+	0	8	0	8	+	434927.217(0.050)	434927.222(0.008)	7.2761	58.062	AND90
0	9	8	2		0	8	8	1		434951.838(0.050)	434951.880(0.022)	1.5189	290.967	AND90
0	9	7	2	−	0	8	7	1	−	434964.396(0.050)	434964.452(0.015)	2.8432	228.125	AND90
0	9	7	3	+	0	8	7	2	+	434964.396(0.050)	434964.452(0.015)	2.8432	228.125	AND90
0	9	7	3		0	8	7	2		434991.269(0.050)	434991.355(0.015)	2.8649	231.687	AND90
0	9	−7	2		0	8	−7	1		435022.337(0.050)	435022.381(0.016)	2.8608	238.918	AND90
0	9	6	4		0	8	6	3		435036.622(0.050)	435036.630(0.011)	4.0135	182.343	AND90
0	9	−6	3		0	8	−6	2		435074.353(0.050)	435074.433(0.012)	4.0387	189.403	AND90
0	9	6	3	+	0	8	6	2	+	435075.996(0.050)	435075.969(0.012)	4.0241	192.704	AND90
0	9	6	4	−	0	8	6	3	−	435075.996(0.050)	435075.969(0.012)	4.0241	192.704	AND90
0	9	−5	4		0	8	−5	3		435113.369(0.050)	435113.387(0.009)	5.0104	144.263	AND90
0	9	2	8	−	0	8	2	7	−	435117.121(0.050)	435117.148(0.008)	6.9553	84.285	AND90
0	9	5	5		0	8	5	4		435118.719(0.050)	435118.658(0.009)	5.0091	152.646	AND90
0	9	5	5	+	0	8	5	4	+	435145.137(0.050)	435145.174(0.009)	5.0357	153.915	AND90
0	9	5	4	−	0	8	5	3	−	435145.137(0.050)	435145.175(0.009)	5.0357	153.915	AND90
0	9	−4	6		0	8	−4	5		435160.368(0.050)	435160.355(0.008)	5.8165	119.170	AND90
0	9	4	5		0	8	4	4		435199.595(0.050)	435199.643(0.008)	5.8541	124.799	AND90
0	9	4	6	−	0	8	4	5	−	435202.184(0.050)	435202.185(0.008)	5.8294	113.915	AND90
0	9	4	5	+	0	8	4	4	+	435202.184(0.050)	435202.267(0.008)	5.8294	113.915	AND90
0	9	3	7	+	0	8	3	6	+	435222.748(0.050)	435222.714(0.007)	6.4449	92.690	AND90
0	9	3	6	−	0	8	3	5	−	435231.249(0.050)	435231.231(0.007)	6.4449	92.691	AND90
0	9	−3	7		0	8	−3	6		435234.371(0.050)	435234.354(0.008)	6.4931	101.666	AND90
0	9	3	6		0	8	3	5		435324.925(0.050)	435324.937(0.008)	6.4676	91.244	AND90
0	9	1	8		0	8	1	7		435334.544(0.050)	435334.543(0.008)	7.3514	72.717	AND90
0	15	0	15		0	14	−2	13			435345.845(0.030)	0.0026	187.554	
0	9	2	7	+	0	8	2	6	+	435388.657(0.050)	435388.658(0.008)	6.9554	84.301	AND90
0	9	2	7		0	8	2	6		435581.509(0.050)	435581.517(0.008)	6.8408	73.561	AND90
0	9	−2	8		0	8	−2	7		435602.003(0.050)	435602.035(0.008)	6.9225	76.102	AND90
0	14	−2	13		0	14	−1	14			435806.466(0.022)	16.6956	173.017	
0	20	3	17		0	20	−2	19			436487.393(0.048)	1.9396	357.431	
1	13	1	13		1	12	0	12			436974.418(0.019)	6.4999	334.390	
0	14	6	9	−	0	15	5	10	−		437302.721(0.039)	2.7523	289.349	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	14	6	8	+	0	15	5	11	+		437302.746(0.039)	2.7523	289.349	
0	16	−1	16		0	15	1	14			438380.311(0.031)	0.0054	208.226	
0	15	2	13	+	0	15	1	14	−	438449.073(0.100)**	438449.027(0.047)	15.5387	205.219	AND92
0	9	1	8	−	0	8	1	7	−	438847.758(0.050)	438847.768(0.008)	7.1942	68.680	AND90
1	11	−1	10		1	12	−2	10			438884.265(0.475)	1.8304	378.876	
0	15	−2	14		0	15	−1	15			439665.320(0.024)	17.9234	197.135	
0	20	2	18		0	19	3	16			439697.063(0.080)	5.6043	339.720	
0	19	3	16		0	19	−2	18			439882.830(0.037)	1.3730	325.047	
0	7	−2	6		0	6	1	5			439908.281(0.018)	0.0124	48.514	
0	10	9	1	−	1	9	5	4	−		440236.975(0.258)	0.9E−6	364.686	
0	10	9	2	+	1	9	5	5	+		440236.975(0.258)	0.9E−6	364.686	
1	8	−2	6		1	9	−3	6			440739.128(0.066)	6.8392	296.638	
0	25	−9	16		0	26	−8	18			440784.257(0.412)	5.9843	788.490	
1	22	−6	17		1	21	−7	15			440849.507(0.806)	7.4638	734.730	
1	15	2	14		1	14	−1	13			441834.703(0.420)	0.0070	456.252	
0	20	−3	18		0	19	−4	16			442619.705(0.052)	6.5904	367.391	
0	18	3	15		0	18	−2	17			442789.604(0.029)	0.9328	294.293	
0	24	1	23	−	0	24	0	24	+		442805.924(0.326)	35.1611	482.337	
0	14	2	12	+	0	14	1	13	−	443374.633(0.100)**	443374.580(0.039)	14.3640	180.851	AND92
0	2	2	0		0	1	−1	1			444010.952(0.011)	0.2E−5	5.490	
0	24	−2	23		0	23	−3	21			444212.099(0.187)	6.9174	488.444	
0	16	−2	15		0	16	−1	16			444375.190(0.026)	19.0492	222.849	
0	17	3	14		0	17	−2	16			445235.955(0.024)	0.6069	265.169	
0	4	3	2	+	0	3	2	1	+	445377.128(0.050)	445377.134(0.017)	4.8872	35.890	AND90
0	4	3	1	−	0	3	2	2	−	445388.609(0.050)	445388.618(0.017)	4.8870	35.890	AND90
0	3	1	3	+	0	2	0	2	+	445571.414(0.050)	445571.335(0.015)	3.9586	4.840	HER84
1	11	11	0		1	10	10	0			445778.953(3.807)	16.0583	723.316	
1	8	8	0		1	7	6	1			445994.289(0.368)	0.0010	456.719	
0	6	0	6		0	5	−1	5		447118.400(0.050)	447118.348(0.015)	2.7440	28.073	AND90
0	16	3	13		0	16	−2	15			447262.491(0.020)	0.3773	237.672	
0	7	5	3		0	8	4	4			448034.901(0.033)	0.6858	124.799	
0	13	2	11	+	0	13	1	12	−	448131.178(0.100)**	448131.133(0.032)	13.2127	158.103	AND92
1	25	−2	23		1	24	2	23			448362.276(0.884)	0.3E−5	760.303	
1	13	3	11		1	14	4	11			448635.950(0.205)	11.4110	421.427	
1	21	2	20	−	1	20	1	19	−		448893.229(0.316)	11.9636	563.946	
0	15	3	12		0	15	−2	14			448917.301(0.017)	0.2237	211.800	
0	26	−2	25		0	26	0	26			449468.808(0.546)	0.0043	570.943	
0	17	−2	16		0	17	−1	17		450049.087(0.050)	450049.158(0.029)	20.0305	250.157	BAS92
0	14	3	11		0	14	−2	13			450251.067(0.015)	0.1261	187.554	
0	13	3	10		0	13	−2	12			451313.115(0.014)	0.0674	164.930	
0	25	−4	22		0	24	−5	19			451827.198(0.170)	8.0617	569.650	
0	12	3	9		0	12	−2	11			452148.803(0.013)	0.0339	143.927	
0	13	0	13		0	12	1	11		452204.744(0.050)	452204.756(0.025)	6.1319	140.478	BAS92
0	12	2	10	+	0	12	1	11	−	452685.155(0.100)**	452685.161(0.028)	12.0853	136.974	AND92
0	11	3	8		0	11	−2	10			452798.210(0.012)	0.0160	124.544	
0	10	3	7		0	10	−2	9			453295.835(0.011)	0.0070	106.779	
0	9	3	6		0	9	−2	8			453670.906(0.011)	0.0028	90.632	
0	16	−8	8		0	17	−7	10			453705.323(0.056)	2.5941	427.466	
0	17	−1	17		0	16	2	14		453809.802(0.050)	453809.859(0.041)	0.4236	235.019	BAS92
0	8	3	5		0	8	−2	7			453948.005(0.011)	0.0010	76.102	
0	7	3	4		0	7	−2	6			454147.752(0.011)	0.0003	63.188	
0	22	1	22	+	0	21	2	19	+		454250.983(0.224)	6.5041	398.928	
0	6	3	3		0	6	−2	5			454287.443(0.011)	0.0001	51.889	
0	5	3	2		0	5	−2	4			454381.551(0.012)	0.2E−4	42.206	
0	4	3	1		0	4	−2	3			454442.101(0.012)	0.1E−5	34.137	
0	3	3	0		0	3	−2	2			454478.916(0.013)	0.1E−6	27.682	
0	8	6	3		0	9	5	5		455177.726(0.050)	455177.659(0.037)	0.6599	167.160	BAS92
0	25	1	24	−	0	25	0	25	+		455202.274(0.399)	35.5738	522.384	
0	21	1	20		0	20	3	17			455562.904(0.103)	0.0435	371.990	
0	6	1	5		0	5	0	5		455618.116(0.050)	455618.110(0.011)	3.0970	33.316	HER84
0	7	−3	5		0	8	2	6			455669.417(0.023)	0.0002	73.561	
1	19	0	19		1	18	−3	15			455758.689(0.158)	0.0018	499.172	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	10	8	2	+	1	9	9	1	+		455899.369(0.101)	0.2052	547.612	
1	10	8	3	−	1	9	9	0	−		455899.369(0.101)	0.2052	547.612	
0	11	2	9		0	10	−2	9			456221.799(0.019)	0.0022	106.779	
0	18	1	17	−	0	17	2	16	−	456269.893(0.050)	456269.788(0.055)	8.5656	272.800	BAS92
0	18	−2	17		0	18	−1	18		456798.526(0.050)	456798.590(0.035)	20.8264	279.056	BAS92
0	11	2	9	+	0	11	1	10	−	457005.692(0.100)**	457005.658(0.024)	10.9816	117.466	AND92
0	19	−1	19		0	18	−2	17		457245.229(0.050)	457245.138(0.043)	3.7095	294.293	BAS92
1	1	1	1	+	1	2	2	0	+	457367.889(0.050)	457367.818(0.028)	2.7026	212.418	HER84
1	1	1	0	−	1	2	2	1	−	457463.899(0.050)	457463.926(0.028)	2.7021	212.418	HER84
0	10	1	9		0	9	2	7		458144.928(0.050)	458144.929(0.023)	3.1777	88.091	AND90
1	9	9	0	−	1	8	8	1	−		458429.018(0.130)	16.9305	532.321	
1	9	9	1	+	1	8	8	0	+		458429.018(0.130)	16.9305	532.321	
1	17	−3	14		1	17	0	17			459124.077(0.101)	0.0031	454.940	
1	16	−3	13		1	16	0	16			459124.124(0.090)	0.0023	427.624	
1	15	−3	12		1	15	0	15			459134.554(0.084)	0.0017	401.910	
1	18	−3	15		1	18	0	18			459136.391(0.116)	0.0041	483.857	
1	14	−3	11		1	14	0	14			459153.500(0.081)	0.0012	377.799	
1	19	−3	16		1	19	0	19			459163.148(0.138)	0.0054	514.375	
1	13	−3	10		1	13	0	13			459179.204(0.080)	0.0008	355.292	
1	20	−3	17		1	20	0	20			459206.536(0.166)	0.0069	546.492	
1	12	−3	9		1	12	0	12			459210.019(0.081)	0.0006	334.390	
1	11	−3	8		1	11	0	11			459244.411(0.082)	0.0004	315.093	
1	21	−3	18		1	21	0	21			459268.845(0.201)	0.0088	580.207	
1	10	−3	7		1	10	0	10			459280.961(0.084)	0.0002	297.401	
1	9	−3	6		1	9	0	9			459318.363(0.086)	0.0001	281.316	
1	22	−3	19		1	22	0	22			459352.458(0.243)	0.0111	615.519	
1	8	−3	5		1	8	0	8			459355.428(0.089)	0.0001	266.838	
1	7	−3	4		1	7	0	7			459391.085(0.092)	$0.4E-4$	253.968	
1	6	−3	3		1	6	0	6			459424.379(0.094)	$0.2E-4$	242.705	
1	5	−3	2		1	5	0	5			459454.474(0.097)	$0.7E-5$	233.051	
1	23	−3	20		1	23	0	23			459459.869(0.293)	0.0139	652.428	
1	4	−3	1		1	4	0	4			459480.651(0.099)	$0.2E-5$	225.005	
1	3	−3	0		1	3	0	3			459502.312(0.101)	$0.4E-6$	218.568	
1	24	−3	21		1	24	0	24			459593.654(0.352)	0.0171	690.931	
0	4	−2	3		0	3	0	3			459707.525(0.017)	0.0001	18.803	
1	25	−3	22		1	25	0	25			459756.484(0.421)	0.0210	731.028	
1	26	−3	23		1	26	0	26			459951.116(0.499)	0.0255	772.717	
1	21	−2	19		1	22	1	22			460454.264(0.391)	0.0001	609.209	
0	11	−3	9		0	12	0	12			460645.991(0.027)	0.0279	134.689	
0	9	2	7		0	8	1	7		460875.945(0.050)	460875.918(0.022)	5.2409	72.717	AND90
0	10	2	8	+	0	10	1	9	−	461064.182(0.050)	461064.147(0.021)	9.9007	99.581	AND90
0	15	0	15	+	0	14	1	14	+		461753.600(0.032)	15.6368	177.941	
1	10	6	4	+	1	11	5	7	+		462031.546(0.212)	1.6311	398.454	
1	10	6	5	−	1	11	5	6	−		462031.546(0.212)	1.6311	398.454	
0	5	−5	0		0	6	−4	3		462241.686(0.050)	462241.656(0.029)	0.1656	94.975	BAS92
0	8	−2	7		0	7	2	5			463321.998(0.016)	0.0002	60.647	
1	17	2	16		1	16	3	14			463510.482(0.310)	0.8603	508.593	
0	16	3	13		0	15	−3	13			463658.352(0.024)	$0.7E-6$	237.125	
1	23	2	22		1	24	−3	21			464214.281(0.538)	$0.4E-4$	706.262	
0	19	−2	18		0	19	−1	19		464727.477(0.050)	464727.557(0.046)	21.4039	309.545	BAS92
0	9	2	7	+	0	9	1	8	−	464834.684(0.050)	464834.670(0.019)	8.8410	83.319	AND90
0	20	7	14		0	21	6	16			465077.059(0.099)	4.9077	496.522	
1	17	−2	15		1	18	0	18			465317.980(0.153)	0.0002	483.857	
1	21	2	19	+	1	20	1	20	+		467257.635(0.354)	12.3830	563.281	
0	3	1	2		0	2	−1	2			467469.063(0.019)	$0.1E-4$	8.717	
1	18	5	13		1	19	4	16			467700.515(0.659)	2.1040	557.991	
0	26	1	25	−	0	26	0	26	+		468114.425(0.484)	35.8935	564.010	
0	8	2	6	+	0	8	1	7	−	468293.771(0.050)	468293.780(0.018)	7.8001	68.680	PIC81
0	20	−7	13		0	21	−6	15			468413.682(0.103)	4.6283	503.626	
1	12	8	4	+	1	13	7	7	+		468630.748(0.225)	0.1936	584.105	
1	12	8	5	−	1	13	7	6	−		468630.748(0.225)	0.1936	584.105	
0	14	0	14		0	13	2	11			469451.853(0.032)	0.0046	162.366	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	11	6	5		1	10	8	2			469769.149(0.354)	0.0006	502.151	
0	15	2	14	−	0	14	3	11	−	470362.162(0.050)	470362.222(0.029)	4.9687	203.976	BAS92
0	23	3	21	+	0	22	4	18	+		471022.250(0.120)	7.4048	463.785	
1	22	11	11	−	1	21	12	10	−		471257.255(9.543)	1.1625	1097.170	
1	22	11	12	+	1	21	12	9	+		471257.255(9.543)	1.1625	1097.170	
0	21	9	13		0	22	8	15			471262.674(0.213)	4.0244	640.462	
0	7	2	5	+	0	7	1	6	−	471420.477(0.050)	471420.510(0.017)	6.7745	55.667	HER84
1	12	3	10		1	13	−2	11			472060.707(0.128)	$0.6E-6$	399.772	
0	14	5	10	+	0	15	4	11	+	473254.784(0.050)	473254.913(0.029)	3.5293	249.385	BAS92
0	14	5	9	−	0	15	4	12	−	473262.493(0.050)	473262.700(0.029)	3.5293	249.385	BAS92
1	16	7	9		1	15	8	7			473436.334(0.790)	0.9715	606.704	
0	10	4	6		0	11	3	8		473572.503(0.050)	473572.588(0.026)	2.4199	139.647	BAS92
0	13	−1	13		0	12	0	12		473889.274(0.050)	473889.296(0.021)	9.7020	134.689	BAS92
0	14	−3	12		0	15	−1	15			473902.164(0.032)	0.0001	197.135	
1	4	−1	3		1	3	2	2			473924.708(0.434)	$0.5E-5$	287.597	
0	20	−2	19		0	20	−1	20		473927.191(0.050)	473927.226(0.064)	21.7430	341.622	BAS92
0	6	2	4	+	0	6	1	5	−	474196.319(0.050)	474196.344(0.016)	5.7595	44.278	HER84
0	23	3	20	−	0	22	4	19	−		475333.223(0.108)	7.4685	463.779	
0	15	2	13	+	0	14	3	12	+	475933.501(0.050)*	475933.882(0.031)	5.0889	203.969	BAS92
0	5	−3	3		0	6	−2	5		476600.759(0.050)	476600.890(0.021)	0.9343	51.889	AND90
0	5	2	3	+	0	5	1	4	−	476605.142(0.050)	476605.186(0.016)	4.7476	34.516	HER84
0	16	0	16		0	15	−2	14			476986.559(0.034)	0.0028	211.800	
0	12	1	11		0	11	−2	10		477710.598(0.050)	477710.514(0.020)	0.1240	124.544	BAS92
0	4	2	2	+	0	4	1	3	−	478633.272(0.050)	478633.319(0.016)	3.7269	26.380	HER84
0	4	3	1		0	5	0	5			479034.127(0.023)	0.0002	33.316	
1	6	0	6		1	5	1	5		479126.480(0.050)	479126.463(0.014)	2.2519	226.723	HER84
0	19	−2	18		0	18	3	15			479183.091(0.039)	0.3946	309.063	
0	10	1	10	+	0	9	1	9	+	479215.578(0.050)	479215.551(0.009)	8.0108	82.068	AND90
0	22	8	15	−	0	23	7	16	−		479281.521(0.195)	5.1946	614.635	
0	22	8	14	+	0	23	7	17	+		479281.522(0.195)	5.1946	614.635	
0	3	2	1	+	0	3	1	2	−	480269.321(0.050)	480269.375(0.017)	2.6731	19.870	HER84
0	6	2	4		0	5	0	5			480636.233(0.014)	0.0003	33.316	
1	10	8	2	+	1	9	8	1	+		481222.162(0.067)	0.7085	546.768	
1	10	8	3	−	1	9	8	2	−		481222.162(0.067)	0.7085	546.768	
0	2	2	0	+	0	2	1	1	−	481504.232(0.050)	481504.299(0.018)	1.5228	14.988	HER84
0	11	7	4	−	0	12	6	7	−		481595.528(0.049)	1.2306	260.419	
0	11	7	5	+	0	12	6	6	+		481595.528(0.049)	1.2306	260.419	
1	10	1	10	+	1	9	1	9	+	481710.079(0.050)	481710.101(0.012)	8.0167	298.396	AND90
1	10	6	4	+	1	9	6	3	+	481775.466(0.050)	481775.414(0.019)	5.1920	397.796	AND90
1	10	6	5	−	1	9	6	4	−	481775.466(0.050)	481775.414(0.019)	5.1920	397.796	AND90
1	10	3	8		1	9	3	7		481826.241(0.050)	481826.225(0.019)	7.3454	362.498	AND90
1	10	7	3		1	9	7	2			481850.719(0.081)	3.8983	476.294	
1	10	9	1		1	9	9	0			481862.123(0.045)	1.5318	582.126	
1	10	−7	4		1	9	−7	3			481900.901(0.029)	4.1809	436.160	
1	10	−9	2		1	9	−9	1			481910.026(0.110)	1.7678	625.346	
1	10	−8	3		1	9	−8	2			481951.904(0.032)	2.9043	541.783	
1	10	−6	5		1	9	−6	4		482008.411(0.050)*	482008.159(0.035)	5.0102	415.337	AND90
1	10	6	4		1	9	6	3			482015.909(0.066)	4.9486	484.061	
1	10	7	3	−	1	9	7	2	−	482032.201(0.050)	482032.171(0.026)	4.1353	510.152	AND90
1	10	7	4	+	1	9	7	3	+	482032.201(0.050)	482032.171(0.026)	4.1353	510.152	AND90
1	10	5	5	−	1	9	5	4	−	482090.915(0.050)	482090.766(0.022)	5.9601	364.686	AND90
1	10	5	6	+	1	9	5	5	+	482090.915(0.050)	482090.766(0.022)	5.9601	364.686	AND90
1	10	−2	8		1	9	−2	7		482120.071(0.050)	482120.058(0.013)	7.7803	325.815	AND90
1	10	8	2		1	9	8	1			482130.344(0.044)	3.0688	486.069	
1	10	4	7		1	9	4	6		482134.535(0.050)	482134.443(0.015)	6.7250	324.958	AND90
1	10	−3	7		1	9	−3	6		482175.963(0.050)	482175.941(0.012)	7.3166	296.638	AND90
1	10	2	8	+	1	9	2	7	+	482188.215(0.050)	482188.247(0.012)	7.7397	279.990	AND90
1	10	0	10		1	9	0	9		482213.312(0.050)	482213.342(0.012)	8.0890	281.316	AND90
1	10	1	10		1	9	1	9		482216.798(0.050)	482216.810(0.012)	7.9968	274.989	AND90
1	10	2	9	−	1	9	2	8	−	482217.657(0.050)	482217.675(0.012)	7.7397	279.992	AND90
0	10	0	10		0	9	0	9		482282.248(0.050)	482282.138(0.008)	8.0708	81.637	AND90
1	10	3	8	+	1	9	3	7	+	482296.564(0.050)	482296.429(0.014)	7.3516	347.718	AND90

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	10	3	7	−	1	9	3	6	−	482296.564(0.050)	482296.657(0.014)	7.3516	347.718	AND90
1	10	2	9		1	9	2	8			482314.960(0.016)	7.7789	350.351	
1	10	−4	6		1	9	−4	5			482315.412(0.015)	6.7848	354.173	
1	10	−5	6		1	9	−5	5		482339.677(0.050)	482339.681(0.030)	6.0298	451.992	AND90
1	10	−1	9		1	9	−1	8		482360.866(0.050)	482360.823(0.023)	7.9929	359.728	AND90
1	10	0	10	+	1	9	0	9	+	482418.744(0.050)	482418.702(0.035)	8.0811	366.877	AND90
1	10	9	1	−	1	9	9	0	−		482449.561(0.065)	3.2040	547.612	
1	10	9	2	+	1	9	9	1	+		482449.561(0.065)	3.2040	547.612	
1	10	4	7	−	1	9	4	6	−	482514.508(0.050)	482514.496(0.025)	6.7927	406.776	AND90
1	10	4	6	+	1	9	4	5	+	482514.508(0.050)	482514.497(0.025)	6.7927	406.776	AND90
0	11	−9	2		1	10	−4	6			482519.055(0.213)	0.1E−8	370.261	
1	10	5	5		1	9	5	4		482542.369(0.050)	482542.377(0.028)	6.0685	370.672	AND90
1	10	1	9	−	1	9	1	8	−	482666.786(0.050)	482666.799(0.014)	8.0165	298.540	AND90
0	10	−1	10		0	9	−1	9		482958.789(0.050)	482958.776(0.008)	8.0053	76.433	AND90
0	17	6	11		0	18	5	13		482963.351(0.050)*	482963.639(0.045)	4.2135	361.881	BAS92
0	10	−9	1		0	9	−9	0			483072.875(0.030)	1.5203	352.520	
0	10	9	2		0	9	9	1			483089.197(0.037)	1.5070	356.710	
0	10	0	10	+	0	9	0	9	+	483140.737(0.050)	483140.774(0.008)	8.0843	72.570	AND90
0	10	9	1	−	0	9	9	0	−		483140.911(0.031)	1.5260	363.255	
0	10	9	2	+	0	9	9	1	+		483140.911(0.031)	1.5260	363.255	
0	10	−8	2		0	9	−8	1		483171.858(0.050)	483171.870(0.024)	2.8668	295.992	AND90
0	10	8	3	−	0	9	8	2	−	483185.163(0.050)	483185.241(0.021)	2.8918	295.641	AND90
0	10	8	2	+	0	9	8	1	+	483185.163(0.050)	483185.242(0.021)	2.8918	295.641	AND90
0	10	8	3		0	9	8	2		483239.547(0.050)	483239.590(0.023)	2.8949	305.475	AND90
0	10	7	3	−	0	9	7	2	−	483253.501(0.050)	483253.520(0.016)	4.0782	242.634	AND90
0	10	7	4	+	0	9	7	3	+	483253.501(0.050)	483253.520(0.016)	4.0782	242.634	AND90
0	10	7	4		0	9	7	3		483289.291(0.050)	483289.334(0.016)	4.1094	246.197	AND90
0	10	−7	3		0	9	−7	2		483316.624(0.050)	483316.680(0.017)	4.1035	253.429	AND90
0	10	6	5		0	9	6	4		483337.783(0.050)	483337.748(0.011)	5.1373	196.854	AND90
0	10	6	4	+	0	9	6	3	+	483375.359(0.050)	483375.371(0.012)	5.1510	207.217	AND90
0	10	6	5	−	0	9	6	4	−	483375.359(0.050)	483375.371(0.012)	5.1510	207.217	AND90
0	10	−6	4		0	9	−6	3		483382.254(0.050)	483382.309(0.012)	5.1695	203.916	AND90
0	10	2	9	−	0	9	2	8	−	483388.545(0.050)	483388.560(0.008)	7.8041	98.799	AND90
0	10	5	6		0	9	5	5		483423.114(0.050)	483423.100(0.010)	6.0380	167.160	AND90
0	10	−5	5		0	9	−5	4		483429.629(0.050)	483429.624(0.009)	6.0393	158.776	AND90
0	17	−1	17		0	16	1	15			483446.779(0.036)	0.0070	234.031	
0	10	5	5	−	0	9	5	4	−	483460.660(0.050)	483460.638(0.010)	6.0698	168.430	AND90
0	10	5	6	+	0	9	5	5	+	483460.660(0.050)	483460.638(0.010)	6.0698	168.430	AND90
0	10	−4	7		0	9	−4	6		483472.503(0.050)	483472.477(0.008)	6.7653	133.685	AND90
0	10	4	6		0	9	4	5		483519.796(0.050)	483519.826(0.009)	6.8087	139.316	AND90
0	10	4	7	−	0	9	4	6	−	483539.311(0.100)	483539.251(0.008)	6.7800	128.432	AND90
0	10	4	6	+	0	9	4	5	+	483539.311(0.100)	483539.429(0.008)	6.7800	128.432	AND90
0	10	3	8	+	0	9	3	7	+	483551.002(0.050)	483550.997(0.008)	7.3315	107.208	AND90
0	10	−3	8		0	9	−3	7		483556.112(0.050)	483556.100(0.008)	7.3858	116.184	AND90
0	10	3	7	−	0	9	3	6	−	483565.603(0.050)	483565.586(0.008)	7.3315	107.208	AND90
0	10	1	9		0	9	1	8		483686.308(0.050)	483686.304(0.008)	8.1786	87.239	AND90
0	10	3	7		0	9	3	6		483696.739(0.050)	483696.722(0.008)	7.3569	105.765	AND90
0	10	2	8	+	0	9	2	7	+	483761.387(0.050)	483761.371(0.008)	7.8042	98.824	AND90
0	2	2	1	−	0	2	1	2	+	484004.740(0.050)	484004.812(0.017)	1.5133	14.904	HER84
0	10	2	8		0	9	2	7		484023.168(0.050)	484023.168(0.008)	7.6773	88.091	AND90
0	10	−2	9		0	9	−2	8		484071.775(0.050)	484071.793(0.008)	7.7672	90.632	AND90
0	21	−2	20		0	21	−1	21			484471.391(0.091)	21.8410	375.284	
1	14	1	14		1	13	0	13			485096.820(0.024)	7.0134	355.292	
0	3	2	2	−	0	3	1	3	+	485263.263(0.050)*	485263.351(0.017)	2.6401	19.703	HER84
0	13	6	8	−	0	14	5	9	−	485732.280(0.050)	485732.221(0.040)	2.3552	265.171	BAS92
0	13	6	7	+	0	14	5	10	+	485732.280(0.050)	485732.234(0.040)	2.3552	265.171	BAS92
1	10	−1	9		1	11	−2	9			486688.028(0.477)	1.7194	359.584	
0	21	2	19		0	20	3	17		486772.430(0.050)	486772.589(0.101)	5.6748	371.990	BAS92
0	4	2	3	−	0	4	1	4	+	486940.837(0.050)	486940.899(0.016)	3.6509	26.101	HER84
0	10	1	9	−	0	9	1	8	−	487531.887(0.050)	487531.895(0.008)	8.0123	83.319	AND90
0	8	−2	7		0	7	1	6			488446.863(0.018)	0.0226	59.809	
0	24	−9	15		0	25	−8	17			488623.322(0.350)	5.5293	746.698	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	7	−2	5		1	8	−3	5			488945.540(0.067)	6.3788	282.161	
0	5	2	4	−	0	5	1	5	+	489036.955(0.050)	489036.966(0.016)	4.6037	34.098	HER84
0	23	1	23	+	0	22	2	20	+		489224.311(0.284)	6.6151	434.416	
0	11	9	2	−	1	10	5	5	−		489553.627(0.237)	0.3E−5	380.767	
0	11	9	3	+	1	10	5	6	+		489553.627(0.237)	0.3E−5	380.767	
1	16	2	15		1	15	−1	14			489930.361(0.422)	0.0097	480.377	
1	23	−6	18		1	22	−7	16			490129.630(0.958)	8.2847	769.988	
0	21	−3	19		0	20	−4	17		490960.291(0.050)*	490960.009(0.066)	7.0885	399.604	BAS92
0	6	2	5	−	0	6	1	6	+	491550.827(0.050)	491550.873(0.016)	5.5177	43.694	HER84
1	25	−4	21		1	26	−3	23			491584.594(0.984)	6.3865	788.060	
0	4	1	4	+	0	3	0	3	+	492278.713(0.050)	492278.644(0.015)	4.9580	9.681	HER84
0	3	2	1		0	2	−1	2			492397.779(0.012)	0.2E−4	8.717	
1	26	−2	24		1	25	2	24			493003.153(1.062)	0.3E−5	800.461	
1	12	11	1		1	11	10	1			493502.368(3.953)	16.1278	740.993	
0	5	3	3	+	0	4	2	2	+	493699.095(0.050)	493699.097(0.016)	5.2037	42.345	AND90
0	5	3	2	−	0	4	2	3	−	493733.672(0.050)	493733.672(0.016)	5.2029	42.344	AND90
1	9	8	1		1	8	6	2			494115.302(0.340)	0.0020	469.587	
0	7	2	6	−	0	7	1	7	+	494481.683(0.050)	494481.707(0.017)	6.4003	54.888	HER84
0	7	0	7		0	6	−1	6		495173.104(0.050)	495173.084(0.015)	3.4102	37.749	AND90
1	22	2	21	−	1	21	1	20	−		496254.774(0.388)	12.5840	597.687	
0	22	−2	21		0	22	−1	22			496414.076(0.129)	21.7113	410.529	
0	6	5	2		0	7	4	3		496429.108(0.050)	496429.098(0.036)	0.3911	111.894	BAS92
0	20	−1	20		0	19	−2	18		496907.463(0.050)	496907.388(0.059)	3.4693	325.047	BAS92
0	14	0	14		0	13	1	12		496924.326(0.050)	496924.354(0.028)	6.6255	161.449	BAS92
1	12	3	10		1	13	4	10			497512.764(0.195)	10.6929	398.923	
0	18	−1	18		0	17	2	15		497657.633(0.050)	497657.686(0.049)	0.5787	262.456	BAS92
0	8	2	7	−	0	8	1	8	+	497828.231(0.050)	497828.272(0.018)	7.2542	67.679	HER84
0	26	−4	23		0	25	−5	20			499272.083(0.210)	8.4987	609.895	
0	25	−2	24		0	24	−3	22			500862.385(0.233)	7.0418	527.080	
0	9	2	8	−	0	9	1	9	+	501588.989(0.050)	501589.028(0.020)	8.0801	82.068	AND90
0	15	−8	7		0	16	−7	9		502126.161(0.050)*	502126.409(0.056)	2.1992	400.083	BAS92
0	22	1	21		0	21	3	18			502522.321(0.131)	0.0476	405.874	
1	11	8	3	+	1	10	9	2	+		502779.382(0.083)	0.5519	563.705	
1	11	8	4	−	1	10	9	1	−		502779.383(0.083)	0.5519	563.705	
0	12	12	1		1	11	9	2			503053.542(0.699)	0.3E−5	615.879	
0	7	6	2		0	8	5	4		503571.161(0.050)	503571.121(0.040)	0.3709	152.646	BAS92
1	20	0	20		1	19	−3	16			503678.815(0.190)	0.0023	529.691	
0	6	−3	4		0	7	2	5			504256.135(0.024)	0.0001	60.647	
0	7	1	6		0	6	0	6		504293.685(0.050)	504293.677(0.012)	3.5442	42.988	HER84
0	12	2	10		0	11	−2	10			504557.718(0.020)	0.0038	124.544	
0	10	2	9	−	0	10	1	10	+	505762.040(0.050)	505762.037(0.022)	8.8781	98.053	AND90
0	11	1	10		0	10	2	8			506153.168(0.025)	3.5644	104.236	
0	10	−3	8		0	11	0	11			506786.477(0.026)	0.0179	115.409	
1	10	9	1	−	1	9	8	2	−		507772.354(0.103)	16.2010	546.768	
1	10	9	2	+	1	9	8	1	+		507772.354(0.103)	16.2010	546.768	
0	5	−2	4		0	4	0	4			508196.352(0.016)	0.0002	25.254	
1	20	−2	18		1	21	1	21			509144.353(0.318)	0.0001	573.893	
0	10	2	8		0	9	1	8		509564.594(0.050)	509564.542(0.024)	5.5533	87.239	AND90
1	3	3	1		1	2	2	1			509780.145(0.062)	0.8279	282.769	
0	23	−2	22		0	23	−1	23			509789.531(0.179)	21.3802	447.356	
0	11	2	10	−	0	11	1	11	+	510344.912(0.100)**	510344.892(0.025)	9.6473	115.633	AND92
1	9	6	3	+	1	10	5	6	+		510502.649(0.234)	1.1575	380.767	
1	9	6	4	−	1	10	5	5	−		510502.649(0.234)	1.1575	380.767	
1	22	2	21		1	23	−3	20			510743.127(0.434)	0.2E−4	667.754	
0	9	−2	8		0	8	2	6			511777.353(0.017)	0.0005	73.561	
0	19	1	18	−	0	18	2	17	−	511949.745(0.050)	511949.630(0.069)	9.3411	301.771	BAS92
0	15	0	15		0	14	2	12			512752.793(0.036)	0.0060	184.972	
0	17	3	14		0	16	−3	14			512778.937(0.028)	0.1E−5	262.916	
1	17	5	12		1	18	4	15			513093.953(0.544)	2.0995	527.476	
0	19	7	13		0	20	6	15		513225.335(0.050)*	513225.755(0.086)	4.4733	462.711	BAS92
1	16	−2	14		1	17	0	17			513717.273(0.130)	0.0001	454.940	
1	18	2	17		1	17	3	15			514035.998(0.391)	0.9053	535.847	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	16	0	16	+	0	15	1	15	+		515170.351(0.037)	16.9866	201.897	
0	12	2	11	−	0	12	1	12	+	515334.690(0.100)**	515334.657(0.029)	10.3872	134.809	AND92
0	4	1	3		0	3	−1	3			515878.191(0.018)	0.3E−4	13.556	
1	22	2	20	+	1	21	1	21	+		516266.547(0.441)	13.0649	596.957	
0	19	−7	12		0	20	−6	14			516922.300(0.083)	4.2074	469.808	
0	17	0	17		0	16	−2	15			517401.907(0.039)	0.0030	237.672	
1	12	6	6		1	11	8	3			517522.749(0.384)	0.0011	519.843	
0	16	2	15	−	0	15	3	12	−		517676.577(0.035)	5.4264	228.164	
1	11	8	3	+	1	12	7	6	+		517680.973(0.249)	0.1430	563.208	
1	11	8	4	−	1	12	7	5	−		517680.973(0.249)	0.1430	563.208	
0	24	3	22	+	0	23	4	19	+		518201.790(0.151)	7.7599	500.850	
0	25	8	18		0	26	7	20			519537.679(0.384)	6.1697	738.946	
0	20	9	12		0	21	8	14			519757.783(0.180)	3.6025	605.059	
1	17	7	10		1	16	8	8			520132.952(0.916)	1.0494	632.444	
0	2	−2	1		0	1	−1	1		520179.066(0.050)	520179.026(0.015)	2.9795	5.490	HER84
0	13	−3	11		0	14	−1	14			520230.172(0.031)	0.0001	173.017	
1	11	3	9		1	12	−2	10			520671.811(0.118)	0.3E−6	378.876	
0	13	2	12	−	0	13	1	13	+	520727.880(0.100)**	520727.796(0.034)	11.0969	155.578	AND92
0	26	−4	23		0	26	−3	24			521384.362(0.202)	22.8979	609.157	
0	25	−4	22		0	25	−3	23			521729.343(0.165)	22.0658	567.318	
0	13	5	9	+	0	14	4	10	+		521776.243(0.031)	3.0992	225.197	
0	13	5	8	−	0	14	4	11	−		521780.756(0.031)	3.0992	225.197	
0	24	−4	21		0	24	−3	22			522047.290(0.134)	21.2265	527.080	
0	9	4	5		0	10	3	7			522121.939(0.027)	1.9987	121.899	
1	5	−1	4		1	4	2	3			522189.126(0.432)	0.2E−4	294.034	
0	23	−4	20		0	23	−3	21			522340.702(0.107)	20.3797	488.444	
0	22	−4	19		0	22	−3	20			522611.667(0.085)	19.5251	451.410	
0	21	−4	18		0	21	−3	19			522861.953(0.067)	18.6625	415.980	
0	20	−4	17		0	20	−3	18			523093.077(0.053)	17.7916	382.155	
0	14	−1	14		0	13	0	13			523274.386(0.022)	10.8974	155.562	
0	19	−4	16		0	19	−3	17			523306.363(0.042)	16.9122	349.935	
0	24	1	24	+	0	23	2	21	+		523347.829(0.356)	6.6964	471.515	
0	18	−4	15		0	18	−3	16			523502.981(0.034)	16.0239	319.322	
0	17	−4	14		0	17	−3	15			523683.971(0.029)	15.1264	290.315	
0	24	3	21	−	0	23	4	20	−		523745.533(0.135)	7.8460	500.842	
0	16	−4	13		0	16	−3	14			523850.275(0.025)	14.2192	262.916	
0	15	−4	12		0	15	−3	13			524002.742(0.023)	13.3018	237.125	
0	14	−4	11		0	14	−3	12		524142.239(0.100)**	524142.150(0.021)	12.3733	212.942	AND92
0	13	−4	10		0	13	−3	11		524269.303(0.100)**	524269.208(0.020)	11.4327	190.370	AND92
0	12	−4	9		0	12	−3	10		524384.696(0.100)**	524384.566(0.018)	10.4785	169.407	AND92
0	11	−4	8		0	11	−3	9		524488.851(0.100)**	524488.820(0.017)	9.5085	150.055	AND92
0	10	−4	7		0	10	−3	8		524582.501(0.050)	524582.511(0.017)	8.5199	132.314	AND90
0	24	−2	23		0	24	−1	24			524614.180(0.243)	20.8817	485.762	
0	9	−4	6		0	9	−3	7		524666.201(0.050)	524666.133(0.017)	7.5083	116.184	AND90
0	8	−4	5		0	8	−3	6		524740.167(0.050)	524740.133(0.017)	6.4669	101.666	HER84
0	7	−4	4		0	7	−3	5		524804.969(0.050)	524804.909(0.018)	5.3855	88.761	HER84
0	6	−4	3		0	6	−3	4		524860.820(0.050)	524860.816(0.020)	4.2469	77.468	HER84
0	16	2	14	+	0	15	3	13	+		524870.940(0.037)	5.5960	228.152	
0	5	−4	2		0	5	−3	3		524908.133(0.050)	524908.162(0.022)	3.0209	67.787	HER84
0	4	−4	1		0	4	−3	2		524947.234(0.050)	524947.214(0.023)	1.6488	59.720	HER84
1	10	5	5	−	0	9	9	0	−		524994.701(0.264)	0.2E−7	363.255	
1	10	5	6	+	0	9	9	1	+		524994.701(0.264)	0.2E−7	363.255	
0	4	−3	2		0	5	−2	4		525055.620(0.050)*	525055.884(0.022)	0.5605	42.206	AND90
0	13	1	12		0	12	−2	11			525315.172(0.021)	0.1690	143.927	
0	14	2	13	−	0	14	1	14	+	526520.241(0.100)**	526520.114(0.041)	11.7757	177.941	AND92
0	17	3	14		0	17	2	15			526554.490(0.042)	18.4513	262.456	
0	18	3	15		0	18	2	16			526582.259(0.052)	19.4874	291.498	
0	16	3	13		0	16	2	14			526778.781(0.035)	17.3572	235.019	
0	19	3	16		0	19	2	17			526949.650(0.065)	20.4520	322.143	
0	11	1	11	+	0	10	1	10	+		527053.509(0.009)	8.8268	98.053	
0	15	3	12		0	15	2	13			527171.429(0.030)	16.2207	209.190	
0	21	8	14	−	0	22	7	15	−		527258.648(0.165)	4.7558	577.630	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	21	8	13	+	0	22	7	16	+		527258.649(0.165)	4.7558	577.630	
0	3	3	0		0	4	0	4			527259.877(0.024)	0.3E−4	25.254	
1	7	0	7		1	6	1	6		527342.624(0.050)	527342.712(0.015)	2.7131	236.378	HER84
0	14	3	11		0	14	2	12			527658.015(0.027)	15.0577	184.972	
0	20	3	17		0	20	2	18			527742.114(0.082)	21.3370	354.387	
0	18	−1	18		0	17	1	16			527965.701(0.044)	0.0089	261.445	
0	13	3	10		0	13	2	11			528177.251(0.024)	13.8813	162.366	
0	12	3	9		0	12	2	10			528682.807(0.022)	12.7012	141.374	
0	21	3	18		0	21	2	19			529037.779(0.103)	22.1418	388.227	
0	11	3	8		0	11	2	9			529143.213(0.021)	11.5237	121.997	
1	11	8	3	+	1	10	8	2	+		529329.575(0.065)	1.1345	562.819	
1	11	8	4	−	1	10	8	3	−		529329.575(0.065)	1.1345	562.819	
0	7	2	5		0	6	0	6			529418.541(0.015)	0.0004	42.988	
0	10	3	7		0	10	2	8		529540.261(0.050)	529540.297(0.019)	10.3516	104.236	AND90
1	11	−10	2		1	10	−10	1			529668.523(0.149)	1.2804	636.603	
1	11	6	5	+	1	10	6	4	+		529811.502(0.021)	6.2684	413.866	
1	11	6	6	−	1	10	6	5	−		529811.502(0.021)	6.2684	413.866	
1	11	1	11	+	1	10	1	10	+		529816.202(0.013)	8.8337	314.464	
1	11	3	9		1	10	3	8			529854.786(0.024)	8.2155	378.570	
0	9	3	6		0	9	2	7		529866.663(0.050)	529866.742(0.018)	9.1850	88.091	AND90
1	11	10	1	+	1	10	10	0	+		529896.783(0.067)	1.5413	648.354	
1	11	10	2	−	1	10	10	1	−		529896.783(0.067)	1.5413	648.354	
1	11	10	1		1	10	10	0			529937.523(0.119)	1.6311	723.316	
1	11	7	4		1	10	7	3			529979.109(0.086)	5.0035	492.367	
0	10	7	3	−	0	11	6	6	−		529998.348(0.054)	0.8934	241.075	
0	10	7	4	+	0	11	6	5	+		529998.348(0.054)	0.8934	241.075	
1	11	−7	5		1	10	−7	4			530001.656(0.030)	5.3651	452.235	
1	11	9	2		1	10	9	1			530010.232(0.045)	2.9316	598.200	
1	11	−9	3		1	10	−9	2			530038.195(0.112)	3.3775	641.421	
1	11	6	5		1	10	6	4			530089.003(0.072)	5.9731	500.139	
1	11	−8	4		1	10	−8	3			530106.986(0.032)	4.1805	557.859	
0	8	3	5		0	8	2	6		530123.294(0.050)	530123.322(0.017)	8.0208	73.561	PIC81
1	11	−6	6		1	10	−6	5			530154.208(0.036)	6.0499	431.415	
0	11	0	11		0	10	0	10			530184.176(0.009)	8.8755	97.724	
1	11	7	4	−	1	10	7	3	−		530192.824(0.026)	5.3072	526.231	
1	11	7	5	+	1	10	7	4	+		530192.824(0.026)	5.3072	526.231	
1	11	5	6	−	1	10	5	5	−		530246.517(0.024)	6.9358	380.767	
1	11	5	7	+	1	10	5	6	+		530246.517(0.024)	6.9358	380.767	
1	11	−2	9		1	10	−2	8			530253.720(0.014)	8.6197	341.896	
1	11	4	8		1	10	4	7			530291.305(0.016)	7.6422	341.040	
0	7	3	4		0	7	2	5		530316.196(0.050)	530316.217(0.017)	6.8532	60.647	PIC81
1	11	−3	8		1	10	−3	7			530336.962(0.012)	8.1865	312.721	
1	11	2	9	+	1	10	2	8	+		530346.299(0.012)	8.5753	296.074	
1	11	8	3		1	10	8	2			530373.289(0.044)	4.4167	502.151	
1	11	0	11		1	10	0	10			530373.512(0.013)	8.8979	297.401	
1	11	1	11		1	10	1	10			530379.818(0.013)	8.8119	291.074	
1	11	2	10	−	1	10	2	9	−		530385.507(0.012)	8.5753	296.077	
0	6	3	3		0	6	2	4		530454.695(0.050)	530454.688(0.017)	5.6718	49.349	PIC81
1	11	3	9	+	1	10	3	8	+		530495.165(0.014)	8.2255	363.806	
1	11	3	8	−	1	10	3	7	−		530495.535(0.014)	8.2255	363.806	
1	11	2	10		1	10	2	9			530513.584(0.017)	8.6188	366.439	
1	11	−4	7		1	10	−4	6			530530.528(0.017)	7.7101	370.261	
0	5	3	2		0	5	2	3		530549.271(0.050)	530549.241(0.017)	4.4584	39.665	PIC81
1	11	−1	10		1	10	−1	9			530561.320(0.025)	8.8076	375.818	
1	11	−5	7		1	10	−5	6			530566.656(0.032)	7.0168	468.081	
1	11	9	2	−	1	10	9	1	−		530596.824(0.064)	5.9361	563.705	
1	11	9	3	+	1	10	9	2	+		530596.824(0.064)	5.9361	563.705	
0	4	3	1		0	4	2	2		530610.288(0.050)	530610.275(0.018)	3.1791	31.596	PIC81
1	11	0	11	+	1	10	0	10	+		530624.514(0.038)	8.8893	382.968	
0	3	3	0		0	3	2	1		530647.277(0.050)	530647.192(0.019)	1.7604	25.141	PIC81
1	11	4	8	−	1	10	4	7	−		530812.751(0.030)	7.7189	422.871	
1	11	4	7	+	1	10	4	6	+		530812.753(0.030)	7.7189	422.871	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	11	5	6		1	10	5	5			530856.014(0.034)	7.0630	386.768	
1	11	1	10	−	1	10	1	9	−		530867.073(0.016)	8.8334	314.640	
0	22	3	19		0	22	2	20			530904.076(0.128)	22.8723	423.662	
0	20	−2	19		0	19	3	16			530951.784(0.051)	0.5528	339.720	
0	11	−1	11		0	10	−1	10			531079.246(0.008)	8.8208	92.543	
0	11	10	2		0	10	10	1			531200.565(0.045)	1.5199	433.110	
0	11	10	1	+	0	10	10	0	+		531248.704(0.055)	1.5095	440.584	
0	11	10	2	−	0	10	10	1	−		531248.704(0.055)	1.5095	440.584	
0	11	−10	1		0	10	−10	0			531277.365(0.043)	1.5301	443.042	
0	11	0	11	+	0	10	0	10	+		531319.347(0.009)	8.8924	88.686	
0	16	−6	10		0	17	−5	12			531326.799(0.042)	3.7820	332.876	
0	11	−9	2		0	10	−9	1			531333.755(0.030)	2.9096	368.633	
0	11	9	3		0	10	9	2			531344.994(0.037)	2.8843	372.824	
0	11	9	2	−	0	10	9	1	−		531407.417(0.031)	2.9205	379.371	
0	11	9	3	+	0	10	9	2	+		531407.417(0.031)	2.9205	379.371	
0	11	−8	3		0	10	−8	2			531437.227(0.024)	4.1265	312.109	
0	11	8	3	+	0	10	8	2	+		531460.112(0.021)	4.1624	311.759	
0	11	8	4	−	0	10	8	3	−		531460.112(0.021)	4.1624	311.759	
0	11	8	4		0	10	8	3			531514.577(0.022)	4.1669	321.594	
0	11	7	4	−	0	10	7	3	−		531529.850(0.016)	5.2341	258.753	
0	11	7	5	+	0	10	7	4	+		531529.850(0.016)	5.2341	258.753	
0	12	−9	3		1	11	−4	7			531569.896(0.205)	$0.3E-8$	387.958	
0	11	7	5		0	10	7	4			531576.447(0.016)	5.2741	262.318	
0	11	−7	4		0	10	−7	3			531597.861(0.017)	5.2667	269.551	
0	11	6	6		0	10	6	5			531627.401(0.012)	6.2028	212.977	
0	11	2	10	−	0	10	2	9	−		531636.364(0.008)	8.6462	114.923	
0	11	6	5	+	0	10	6	4	+		531661.385(0.013)	6.2194	223.340	
0	11	6	6	−	0	10	6	5	−		531661.385(0.013)	6.2194	223.340	
0	11	−6	5		0	10	−6	4			531679.529(0.013)	6.2415	220.040	
0	11	5	7		0	10	5	6			531714.249(0.010)	7.0263	183.285	
0	11	−5	6		0	10	−5	5			531736.475(0.010)	7.0275	174.902	
0	11	5	6	−	0	10	5	5	−		531765.357(0.010)	7.0630	184.556	
0	11	5	7	+	0	10	5	6	+		531765.357(0.010)	7.0630	184.556	
0	11	−4	8		0	10	−4	7			531772.269(0.009)	7.6882	149.812	
0	11	4	7		0	10	4	6			531828.841(0.009)	7.7371	155.444	
0	11	−3	9		0	10	−3	8			531865.960(0.008)	8.2638	132.314	
0	11	3	9	+	0	10	3	8	+		531869.189(0.008)	8.2036	123.337	
0	11	4	8	−	0	10	4	7	−		531870.357(0.009)	7.7046	144.561	
0	11	4	7	+	0	10	4	6	+		531870.712(0.009)	7.7046	144.561	
0	11	3	8	−	0	10	3	7	−		531892.876(0.008)	8.2036	123.338	
1	26	1	26	+	1	26	2	25	−		532030.724(0.999)	19.2765	771.490	
0	11	1	10		0	10	1	9			532031.407(0.008)	9.0007	103.373	
0	11	3	8		0	10	3	7			532069.178(0.008)	8.2315	121.899	
0	11	2	9	+	0	10	2	8	+		532132.590(0.009)	8.6465	114.960	
0	11	2	9		0	10	2	8			532466.261(0.009)	8.5076	104.236	
0	11	−2	10		0	10	−2	9			532566.802(0.008)	8.6051	106.779	
0	15	2	14	−	0	15	1	15	+	532706.839(0.100)**	532706.690(0.052)	12.4230	201.897	AND92
1	15	1	15		1	14	0	14			533203.085(0.031)	7.5376	377.799	
0	22	2	20		0	21	3	18			533274.405(0.127)	5.6982	405.874	
0	23	3	20		0	23	2	21			533396.627(0.157)	23.5399	460.689	
1	25	1	25	+	1	25	2	24	−		534029.041(0.832)	18.8508	729.785	
0	12	6	7	−	0	13	5	8	−		534148.586(0.042)	1.9695	242.602	
0	12	6	6	+	0	13	5	9	+		534148.592(0.042)	1.9695	242.602	
1	9	−1	8		1	10	−2	8			534580.925(0.479)	1.6068	341.896	
0	21	−1	21		0	20	−2	19			535235.194(0.084)	3.1920	357.431	
1	24	1	24	+	1	24	2	23	−		535895.886(0.687)	18.3924	689.675	
0	11	1	10	−	0	10	1	9	−		536191.078(0.009)	8.8288	99.581	
0	23	−9	14		0	24	−8	16			536526.429(0.297)	5.0795	706.504	
0	24	3	21		0	24	2	22			536560.049(0.191)	24.1586	499.307	
1	24	−4	20		1	25	−3	22			536812.466(0.830)	6.2197	746.364	
0	9	−2	8		0	8	1	7			537071.754(0.018)	0.0375	72.717	
1	6	−2	4		1	7	−3	4			537151.578(0.069)	5.9394	269.292	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Linc str.	Energy lower st. (cm^{-1})	Ref.
1	23	1	23	+	1	23	2	22	−		537637.050(0.561)	17.9020	651.159	
1	17	2	16		1	16	−1	15			538014.685(0.427)	0.0131	506.108	
0	5	1	5	+	0	4	0	4	+	538570.582(0.050)	538570.493(0.015)	5.9669	16.134	HER84
0	12	9	3	−	1	11	5	6	−		538967.415(0.218)	$0.8E-5$	398.454	
0	12	9	4	+	1	11	5	7	+		538967.415(0.218)	$0.8E-5$	398.454	
1	22	1	22	+	1	22	2	21	−		539258.239(0.454)	17.3803	614.241	
0	16	2	15	−	0	16	1	16	+		539281.830(0.066)	13.0383	227.443	
0	22	−3	20		0	21	−4	18			539293.838(0.084)	7.5923	433.421	
1	24	−6	19		1	23	−7	17			539569.331(1.135)	9.1443	806.836	
0	25	3	22		0	25	2	23			540429.892(0.231)	24.7420	539.515	
1	21	1	21	+	1	21	2	20	−		540765.051(0.363)	16.8279	578.919	
0	4	2	2		0	3	−1	3			540811.670(0.012)	0.0001	13.556	
0	25	−2	24		0	25	−1	25			540889.702(0.323)	20.2521	525.745	
0	15	0	15		0	14	1	13			540922.230(0.032)	7.0830	184.032	
0	19	−1	19		0	18	2	16			541037.792(0.061)	0.7601	291.498	
1	13	11	2		1	12	10	2			541189.209(4.117)	16.2565	760.275	
0	6	3	4	+	0	5	2	3	+	542000.981(0.050)	542000.932(0.016)	5.5658	50.413	AND90
0	6	3	3	−	0	5	2	4	−	542081.936(0.050)	542081.932(0.016)	5.5638	50.411	AND90
1	20	1	20	+	1	20	2	19	−		542162.955(0.286)	16.2458	545.196	
1	10	8	2		1	9	6	3			542335.763(0.322)	0.0029	484.061	
0	8	0	8		0	7	−1	7		543076.194(0.050)	543076.149(0.016)	4.1354	49.035	AND90
1	19	1	19	+	1	19	2	18	−		543457.269(0.223)	15.6348	513.073	
1	23	2	22	−	1	22	1	21	−		543608.648(0.473)	13.2215	633.027	
1	18	1	18	+	1	18	2	17	−		544653.148(0.172)	14.9959	482.550	
0	5	5	1		0	6	4	2			544820.472(0.039)	0.1518	100.602	
0	26	3	23		0	26	2	24			545034.830(0.276)	25.3017	581.310	
1	25	4	22	−	1	26	3	23	−		545460.190(1.983)	2.0883	839.596	
1	25	4	21	+	1	26	3	24	+		545589.652(1.991)	2.0859	839.592	
1	17	1	17	+	1	17	2	16	−		545755.562(0.132)	14.3301	453.628	
1	11	3	9		1	12	4	9			546226.849(0.191)	10.0208	378.024	
0	17	2	16	−	0	17	1	17	+		546239.012(0.084)	13.6215	254.580	
1	16	1	16	+	1	16	2	15	−		546769.286(0.101)	13.6385	426.308	
1	15	1	15	+	1	15	2	14	−		547698.883(0.079)	12.9221	400.592	
1	14	1	14	+	1	14	2	13	−		548548.694(0.064)	12.1820	376.479	
0	23	1	22		0	22	3	19			549172.761(0.164)	0.0521	441.371	
1	13	1	13	+	1	13	2	12	−		549322.829(0.054)	11.4193	353.970	
1	12	8	4	+	1	11	9	3	+		549608.850(0.073)	0.9973	581.404	
1	12	8	5	−	1	11	9	2	−		549608.850(0.073)	0.9973	581.404	
1	12	1	12	+	1	12	2	11	−		550025.156(0.047)	10.6350	333.067	
0	14	−8	6		0	15	−7	8			550550.411(0.059)	1.8198	374.306	
1	11	1	11	+	1	11	2	10	−		550659.291(0.042)	9.8301	313.769	
1	10	1	10	+	1	10	2	9	−	551228.587(0.050)	551228.596(0.038)	9.0054	296.077	AND90
1	21	0	21		1	20	−3	17			551550.893(0.229)	0.0030	561.809	
1	9	1	9	+	1	9	2	8	−	551736.221(0.050)	551736.169(0.033)	8.1616	279.992	AND90
0	6	6	1		0	7	5	3			551968.781(0.043)	0.1412	139.744	
0	25	10	16		0	26	9	18			552168.962(0.446)	5.4591	849.106	
1	8	1	8	+	1	8	2	7	−	552184.860(0.050)	552184.841(0.030)	7.2991	265.514	AND90
0	13	12	2		1	12	9	3			552337.147(0.651)	$0.9E-5$	635.164	
1	7	1	7	+	1	7	2	6	−	552577.199(0.050)	552577.170(0.027)	6.4175	252.644	AND90
0	5	−3	3		0	6	2	4			552768.135(0.024)	$0.1E-4$	49.349	
0	13	2	11		0	12	−2	11			552787.673(0.022)	0.0062	143.927	
1	6	1	6	+	1	6	2	5	−	552915.356(0.050)	552915.436(0.025)	5.5154	241.381	HER84
0	8	1	7		0	7	0	7		553146.296(0.050)	553146.323(0.014)	3.9942	54.266	HER84
1	5	1	5	+	1	5	2	4	−	553201.597(0.050)	553201.643(0.024)	4.5894	231.727	HER84
0	9	−3	7		0	10	0	10			553414.553(0.026)	0.0108	97.724	
1	4	1	4	+	1	4	2	3	−	553437.476(0.050)	553437.511(0.025)	3.6313	223.682	HER84
0	18	2	17	−	0	18	1	18	+		553570.851(0.107)	14.1725	283.306	
1	3	1	3	+	1	3	2	2	−	553624.453(0.050)	553624.478(0.026)	2.6212	217.245	HER84
1	2	1	2	+	1	2	2	1	−	553763.582(0.050)	553763.694(0.028)	1.5004	212.418	HER84
1	2	1	1	−	1	2	2	0	+	554052.056(0.050)*	554052.698(0.028)	1.4996	212.418	HER84
0	12	1	11		0	11	2	9			554055.517(0.027)	3.9478	121.997	
1	3	1	2	−	1	3	2	1	+	554202.988(0.050)	554202.915(0.027)	2.6183	217.245	HER84

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	4	1	3	−	1	4	2	2	+	554402.514(0.050)	554402.522(0.026)	3.6247	223.682	HER84
1	5	1	4	−	1	5	2	3	+	554651.031(0.050)	554650.936(0.025)	4.5769	231.727	HER84
1	6	1	5	−	1	6	2	4	+	554947.481(0.050)	554947.426(0.025)	5.4943	241.381	HER84
0	16	0	16		0	15	2	13			555240.687(0.042)	0.0075	209.190	
1	7	1	6	−	1	7	2	5	+	555291.142(0.050)	555291.114(0.026)	6.3846	252.643	HER84
0	9	3	6		0	9	1	8			555408.117(0.021)	0.0207	87.239	
0	8	3	5		0	8	1	7			555417.724(0.021)	0.0146	72.717	
0	10	3	7		0	10	1	9			555418.536(0.022)	0.0280	103.373	
0	7	3	4		0	7	1	6			555441.081(0.021)	0.0097	59.809	
0	11	3	8		0	11	1	10			555456.306(0.023)	0.0364	121.119	
0	6	3	3		0	6	1	5			555472.811(0.022)	0.0060	48.514	
0	5	3	2		0	5	1	4			555508.325(0.023)	0.0033	38.833	
0	12	3	9		0	12	1	11			555530.012(0.023)	0.0458	140.478	
0	4	3	1		0	4	1	3			555543.755(0.024)	0.0015	30.764	
0	3	3	0		0	3	1	2			555575.908(0.026)	0.0005	24.310	
0	13	3	10		0	13	1	12			555649.752(0.024)	0.0560	161.449	
1	8	1	7	−	1	8	2	6	+	555680.931(0.050)	555680.977(0.029)	7.2508	265.513	AND90
0	14	3	11		0	14	1	13			555827.452(0.025)	0.0668	184.032	
0	15	3	12		0	15	1	14			556077.216(0.028)	0.0780	208.226	
1	9	1	8	−	1	9	2	7	+	556115.860(0.050)	556115.843(0.032)	8.0939	279.990	LEE94
0	16	3	13		0	16	1	15			556415.701(0.032)	0.0895	234.031	
0	18	0	18		0	17	−2	16			556490.339(0.049)	0.0031	265.169	
1	10	1	9	−	1	10	2	8	+	556594.391(0.050)	556594.395(0.037)	8.9137	296.074	LEE94
0	25	1	25	+	0	24	2	22	+		556603.714(0.441)	6.7482	510.224	
0	6	−2	5		0	5	0	5			556803.478(0.016)	0.0004	33.316	
0	17	3	14		0	17	1	16			556862.505(0.039)	0.1013	261.445	
1	11	1	10	−	1	11	2	9	+		557115.169(0.043)	9.7095	313.764	
1	11	9	2	−	1	10	8	3	−		557147.016(0.083)	15.6712	562.819	
1	11	9	3	+	1	10	8	2	+		557147.016(0.083)	15.6712	562.819	
0	18	3	15		0	18	1	17			557440.537(0.049)	0.1136	290.469	
1	21	2	20		1	22	−3	19			557459.189(0.348)	$0.2E-4$	630.842	
1	12	1	11	−	1	12	2	10	+		557676.555(0.052)	10.4801	333.061	
1	19	−2	17		1	20	1	20			557763.400(0.258)	$0.5E-4$	540.175	
1	4	3	2		1	3	2	2			558004.624(0.055)	0.8690	287.597	
0	26	−2	25		0	25	−3	23			558159.066(0.286)	7.1624	567.318	
0	19	3	16		0	19	1	18			558176.359(0.064)	0.1267	321.101	
1	13	1	12	−	1	13	2	11	+		558276.801(0.063)	11.2244	353.962	
0	11	2	9		0	10	1	9			558344.500(0.026)	5.8562	103.373	
0	26	−2	25		0	26	−1	26			558606.374(0.419)	19.5261	567.303	
1	8	6	2	+	1	9	5	5	+		558890.171(0.255)	0.7476	364.686	
1	8	6	3	−	1	9	5	4	−		558890.171(0.255)	0.7476	364.686	
1	16	5	11		1	17	4	14			558904.590(0.445)	2.0669	498.560	
1	14	1	13	−	1	14	2	12	+		558914.009(0.078)	11.9409	376.468	
0	20	3	17		0	20	1	19			559100.464(0.083)	0.1409	353.341	
1	15	1	14	−	1	15	2	13	+		559586.144(0.098)	12.6282	400.578	
0	21	3	18		0	21	1	20			560247.464(0.106)	0.1568	387.186	
0	10	−2	9		0	9	2	7			560267.630(0.017)	0.0011	88.091	
1	16	1	15	−	1	16	2	14	+		560291.031(0.123)	13.2850	426.290	
1	17	1	16	−	1	17	2	15	+		561026.363(0.156)	13.9097	453.605	
0	19	2	18	−	0	19	1	19	+		561269.072(0.136)	14.6912	313.620	
0	18	7	12		0	19	6	14			561402.933(0.076)	4.0422	430.505	
0	22	3	19		0	22	1	21			561656.161(0.134)	0.1748	422.636	
1	18	1	17	−	1	18	2	16	+		561789.703(0.196)	14.5011	482.521	
0	18	3	15		0	17	−3	15			562060.915(0.035)	$0.3E-5$	290.315	
1	15	−2	13		1	16	0	16			562082.110(0.113)	0.0001	427.624	
1	19	1	18	−	1	19	2	17	+		562578.493(0.245)	15.0577	513.037	
0	23	3	20		0	23	1	22			563369.470(0.167)	0.1961	459.690	
1	20	1	19	−	1	20	2	18	+		563390.057(0.304)	15.5785	545.153	
1	21	1	20	−	1	21	2	19	+		564221.613(0.375)	16.0621	578.867	
0	5	1	4		0	4	−1	4			564315.619(0.018)	0.0001	20.009	
0	17	2	16	−	0	16	3	13	−		564759.819(0.044)	5.8795	253.962	
1	19	2	18		1	18	3	16			564962.715(0.489)	0.9450	564.692	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	13	6	7		1	12	8	4			565027.443(0.434)	0.0018	539.144	
1	22	1	21	−	1	22	2	20	+		565070.280(0.458)	16.5076	614.178	
0	25	3	23	+	0	24	4	20	+		565174.348(0.187)	8.1016	539.523	
1	23	2	21	+	1	22	1	22	+		565310.046(0.542)	13.7696	632.228	
0	18	−7	11		0	19	−6	13			565403.203(0.070)	3.7923	437.596	
0	24	3	21		0	24	1	23			565434.176(0.206)	0.2216	498.344	
1	23	1	22	−	1	23	2	21	+		565933.091(0.554)	16.9139	651.085	
1	18	7	11		1	17	8	9			566559.912(1.054)	1.1083	659.794	
1	10	8	2	+	1	11	7	5	+		566692.707(0.285)	0.0958	543.917	
1	10	8	3	−	1	11	7	4	−		566692.707(0.285)	0.0958	543.917	
1	24	1	23	−	1	24	2	22	+		566807.007(0.665)	17.2802	689.587	
0	12	−3	10		0	13	−1	13			566919.444(0.030)	0.0001	150.497	
1	25	1	24	−	1	25	2	23	+		567688.928(0.792)	17.6058	729.682	
0	25	3	22		0	25	1	24			567900.499(0.251)	0.2530	538.598	
0	20	1	19	−	0	19	2	18	−		567942.593(0.087)	10.1602	332.342	
0	24	8	17		0	25	7	19			568062.288(0.316)	5.7388	697.122	
0	19	9	11		0	20	8	13			568243.857(0.152)	3.1910	571.260	
0	3	−2	2		0	2	−1	2		568566.054(0.050)	568566.055(0.015)	3.2898	8.717	HER84
1	26	1	25	−	1	26	2	24	+		568575.712(0.937)	17.8901	771.370	
0	17	0	17	+	0	16	1	16	+		568783.553(0.043)	18.3792	227.443	
1	10	3	8		1	11	−2	9			569182.107(0.113)	$0.1E-6$	359.584	
0	20	2	19	−	0	20	1	20	+		569324.494(0.171)	15.1780	345.521	
0	12	5	8	+	0	13	4	9	+		570261.528(0.032)	2.6743	202.621	
0	12	5	7	−	0	13	4	10	−		570264.039(0.032)	2.6743	202.621	
1	6	−1	5		1	5	2	4			570453.977(0.429)	0.0001	302.080	
0	8	4	4		0	9	3	6			570619.018(0.028)	1.5877	105.765	
0	26	3	23		0	26	1	25			570821.478(0.304)	0.2926	580.449	
0	19	−1	19		0	18	1	17			571896.070(0.057)	0.0111	290.469	
1	11	5	6	−	0	10	9	1	−		572100.307(0.241)	$1.4E-7$	379.371	
1	11	5	7	+	0	10	9	2	+		572100.307(0.241)	$1.4E-7$	379.371	
0	22	−1	22		0	21	−2	20			572155.707(0.118)	2.8929	391.444	
0	25	3	22	−	0	24	4	21	−		572229.195(0.167)	8.2163	539.513	
0	14	1	13		0	13	−2	12			572676.205(0.022)	0.2198	164.930	
0	15	−1	15		0	14	0	14			572898.799(0.025)	12.1886	178.025	
0	3	−3	1		0	4	−2	3		573470.701(0.050)*	573471.078(0.024)	0.2335	34.137	AND90
0	17	2	15	+	0	16	3	14	+		573912.680(0.045)	6.1136	253.946	
0	12	1	12	+	0	11	1	11	+		574868.476(0.010)	9.6413	115.633	
0	20	8	12	+	0	21	7	15	+		575287.014(0.140)	4.3213	542.227	
0	20	8	13	−	0	21	7	14	−		575287.014(0.140)	4.3213	542.227	
1	8	0	8		1	7	1	7		575547.119(0.050)	575547.194(0.015)	3.1796	247.640	AND90
0	25	10	15	+	0	26	9	18	+		577017.933(1.071)	4.7140	855.757	
0	25	10	16	−	0	26	9	17	−		577017.936(1.071)	4.7140	855.757	
1	12	8	4	+	1	11	8	3	+		577426.292(0.062)	1.6057	580.476	
1	12	8	5	−	1	11	8	4	−		577426.292(0.062)	1.6057	580.476	
1	12	11	1		1	11	11	0			577660.939(0.246)	1.3637	738.186	
0	21	2	20	−	0	21	1	21	+		577727.029(0.212)	15.6333	379.008	
1	12	−10	3		1	11	−10	2			577759.894(0.156)	2.4635	654.271	
1	12	6	6	+	1	11	6	5	+		577808.560(0.026)	7.3004	431.538	
1	12	6	7	−	1	11	6	6	−		577808.560(0.026)	7.3004	431.538	
1	12	3	10		1	11	3	9			577841.065(0.030)	9.0737	396.244	
1	12	−11	2		1	11	−11	1			577878.694(0.114)	1.5531	726.660	
1	12	1	12	+	1	11	1	11	+		577903.806(0.015)	9.6494	332.137	
1	12	11	1	−	1	11	11	0	−		577920.533(0.143)	1.5802	812.708	
1	12	11	2	+	1	11	11	1	+		577920.533(0.143)	1.5802	812.708	
0	12	0	12		0	11	0	11			578006.446(0.009)	9.6798	115.409	
1	12	10	2	+	1	11	10	1	+		578027.141(0.067)	2.9603	666.029	
1	12	10	3	−	1	11	10	2	−		578027.141(0.067)	2.9603	666.029	
1	12	10	2		1	11	10	1			578042.782(0.121)	3.1252	740.993	
1	12	−7	6		1	11	−7	5			578077.119(0.031)	6.4879	469.914	
1	12	7	5		1	11	7	4			578091.321(0.091)	6.0522	510.045	
1	12	6	6		1	11	6	5			578126.889(0.079)	6.9560	517.821	
1	12	9	3		1	11	9	2			578147.453(0.044)	4.2326	615.879	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	12	−9	4		1	11	−9	3			578148.483(0.113)	4.8670	659.101	
1	12	−8	5		1	11	−8	4			578250.599(0.032)	5.3784	575.542	
1	12	−6	7		1	11	−6	6			578284.621(0.038)	7.0472	449.099	
1	12	7	5	−	1	11	7	4	−		578341.309(0.028)	6.4189	543.917	
1	12	7	6	+	1	11	7	5	+		578341.309(0.028)	6.4189	543.917	
1	12	−2	10		1	11	−2	9			578365.082(0.017)	9.4542	359.584	
1	12	5	7	−	1	11	5	6	−		578387.060(0.025)	7.8915	398.454	
1	12	5	8	+	1	11	5	7	+		578387.060(0.025)	7.8915	398.454	
0	9	7	2	−	0	10	6	5	−		578406.213(0.060)	0.5887	223.340	
0	9	7	3	+	0	10	6	4	+		578406.213(0.060)	0.5887	223.340	
1	12	4	9		1	11	4	8			578432.026(0.017)	8.5402	358.729	
0	8	2	6		0	7	0	7			578440.724(0.016)	0.0006	54.266	
1	12	−3	9		1	11	−3	8			578481.839(0.014)	9.0455	330.411	
1	12	2	10	+	1	11	2	9	+		578487.012(0.014)	9.4060	313.764	
1	12	0	12		1	11	0	11			578516.231(0.014)	9.7067	315.093	
1	12	1	12		1	11	1	11			578526.082(0.014)	9.6258	308.765	
1	12	2	11	−	1	11	2	10	−		578537.941(0.014)	9.4060	313.769	
1	12	8	4		1	11	8	3			578623.290(0.043)	5.6807	519.843	
1	12	3	10	+	1	11	3	9	+		578685.025(0.016)	9.0884	381.501	
1	12	3	9	−	1	11	3	8	−		578685.599(0.016)	9.0884	381.502	
1	12	2	11		1	11	2	10			578702.778(0.019)	9.4538	384.135	
1	12	9	3	−	1	11	9	2	−		578722.682(0.062)	8.3069	581.404	
1	12	9	4	+	1	11	9	3	+		578722.683(0.062)	8.3069	581.404	
1	12	−4	8		1	11	−4	7			578740.867(0.019)	8.6159	387.958	
1	12	−1	11		1	11	−1	10			578751.623(0.027)	9.6211	393.516	
1	12	−5	8		1	11	−5	7			578791.410(0.035)	7.9735	485.779	
1	12	0	12	+	1	11	0	11	+		578820.001(0.042)	9.6974	400.668	
1	12	1	11	−	1	11	1	10	−		579048.398(0.020)	9.6491	332.348	
0	2	2	1	−	0	1	1	0	−	579084.700(0.050)	579084.836(0.018)	2.7244	11.733	HER84
1	12	4	9	−	1	11	4	8	−		579122.995(0.037)	8.6256	440.577	
1	12	4	8	+	1	11	4	7	+		579122.999(0.037)	8.6256	440.577	
0	23	2	21		0	22	3	19			579145.605(0.156)	5.6784	441.371	
0	12	−1	12		0	11	−1	11			579151.003(0.009)	9.6349	110.258	
1	12	5	7		1	11	5	6			579184.896(0.042)	8.0273	404.475	
0	12	11	1	−	0	11	11	0	−		579278.175(0.069)	1.5164	522.976	
0	12	11	2	+	0	11	11	1	+		579278.176(0.069)	1.5164	522.976	
0	12	11	2		0	11	11	1			579357.214(0.060)	1.5316	530.674	
0	12	−11	1		0	11	−11	0			579365.701(0.080)	1.5125	532.709	
0	12	10	3		0	11	10	2			579431.897(0.044)	2.9192	450.829	
0	12	0	12	+	0	11	0	11	+		579459.639(0.009)	9.7005	106.409	
0	12	10	2	+	0	11	10	1	+		579480.361(0.056)	2.8993	458.305	
0	12	10	3	−	0	11	10	2	−		579480.361(0.056)	2.8993	458.305	
0	12	−10	2		0	11	−10	1			579519.546(0.042)	2.9388	460.763	
0	12	−9	3		0	11	−9	2			579581.369(0.029)	4.2007	386.357	
0	12	9	4		0	11	9	3			579585.603(0.037)	4.1644	390.548	
0	12	9	3	−	0	11	9	2	−		579660.305(0.030)	4.2166	397.097	
0	12	9	4	+	0	11	9	3	+		579660.305(0.030)	4.2166	397.097	
0	15	−6	9		0	16	−5	11			579686.065(0.040)	3.3545	305.480	
0	12	−8	4		0	11	−8	3			579687.767(0.024)	5.3091	329.836	
0	12	8	4	+	0	11	8	3	+		579722.506(0.020)	5.3552	329.486	
0	12	8	5	−	0	11	8	4	−		579722.506(0.020)	5.3552	329.486	
0	12	8	5		0	11	8	4			579775.564(0.022)	5.3611	339.324	
0	12	7	5	−	0	11	7	4	−		579792.165(0.016)	6.3307	276.483	
0	12	7	6	+	0	11	7	5	+		579792.165(0.016)	6.3307	276.483	
0	12	7	6		0	11	7	5			579851.605(0.016)	6.3789	280.049	
0	12	2	11	−	0	11	2	10	−		579858.240(0.009)	9.4832	132.657	
0	12	−7	5		0	11	−7	4			579864.611(0.016)	6.3702	287.283	
0	12	6	7		0	11	6	6			579904.438(0.012)	7.2245	230.710	
0	2	2	0	+	0	1	1	1	+	579921.342(0.050)	579921.393(0.018)	2.7187	11.705	AND90
0	12	6	6	+	0	11	6	5	+		579932.671(0.013)	7.2440	241.075	
0	12	6	7	−	0	11	6	6	−		579932.671(0.013)	7.2440	241.075	
0	12	−6	6		0	11	−6	5			579965.024(0.013)	7.2695	237.774	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	12	5	8		0	11	5	7			579990.772(0.011)	7.9842	201.021	
0	12	−5	7		0	11	−5	6			580032.997(0.010)	7.9853	192.639	
0	12	5	8	+	0	11	5	7	+		580058.252(0.011)	8.0255	202.294	
0	12	5	7	−	0	11	5	6	−		580058.253(0.011)	8.0255	202.294	
0	12	−4	9		0	11	−4	8			580058.496(0.009)	8.5917	167.550	
0	12	4	8		0	11	4	7			580125.568(0.010)	8.6459	173.184	
0	12	−3	10		0	11	−3	9			580162.749(0.009)	9.1306	150.055	
0	12	3	10	+	0	11	3	9	+		580175.955(0.008)	9.0649	141.079	
0	12	4	9	−	0	11	4	8	−		580194.872(0.009)	8.6095	162.303	
0	12	4	8	+	0	11	4	7	+		580195.536(0.009)	8.6095	162.303	
0	12	3	9	−	0	11	3	8	−		580212.763(0.008)	9.0649	141.080	
0	12	1	11		0	11	1	10			580368.610(0.009)	9.8180	121.119	
0	12	3	9		0	11	3	8			580442.315(0.009)	9.0950	139.647	
0	12	2	10	+	0	11	2	9	+		580501.961(0.009)	9.4837	132.710	
0	13	−9	4		1	12	−4	8			580643.537(0.200)	0.8E−8	407.263	
0	12	2	10		0	11	2	9			580902.721(0.009)	9.3333	121.997	
0	12	−2	11		0	11	−2	10			581091.723(0.009)	9.4376	124.544	
1	16	1	16		1	15	0	15			581292.592(0.040)	8.0734	401.910	
1	23	−4	19		1	24	−3	21			582364.303(0.695)	6.0331	706.262	
1	8	−1	7		1	9	−2	7			582549.914(0.482)	1.4931	325.815	
0	11	6	6	−	0	12	5	7	−		582554.160(0.045)	1.5977	221.643	
0	11	6	5	+	0	12	5	8	+		582554.163(0.045)	1.5977	221.643	
0	21	−2	20		0	20	3	17			583219.192(0.066)	0.7444	371.990	
0	20	−1	20		0	19	2	17			583974.207(0.079)	0.9611	322.143	
0	16	0	16		0	15	1	14			584146.474(0.037)	7.4946	208.226	
0	6	1	6	+	0	5	0	5	+	584449.713(0.050)*	584449.896(0.016)	6.9884	24.199	HER84
0	22	−9	13		0	23	−8	15			584488.816(0.252)	4.6354	667.909	
0	12	1	11	−	0	11	1	10	−		584822.459(0.009)	9.6439	117.466	
1	5	−2	3		1	6	−3	3			585359.746(0.072)	5.5253	258.030	
0	10	−2	9		0	9	1	8			585809.004(0.019)	0.0580	87.239	
1	18	2	17		1	17	−1	16			586087.818(0.434)	0.0174	533.444	
0	22	2	21	−	0	22	1	22	+		586465.692(0.261)	16.0577	414.080	
0	23	−3	21		0	22	−4	19			587621.570(0.105)	8.1017	468.843	
0	13	9	4	−	1	12	5	7	−		588478.671(0.201)	1.7E−5	417.747	
0	13	9	5	+	1	12	5	8	+		588478.671(0.201)	1.7E−5	417.747	
1	14	11	3		1	13	10	3			588841.135(4.298)	16.4343	781.160	
0	26	1	26	+	0	25	2	23	+		588976.928(0.541)	6.7712	550.542	
1	25	−6	20		1	24	−7	18			589179.511(1.337)	10.0421	845.272	
0	5	2	3		0	4	−1	4			589274.703(0.013)	0.0004	20.009	
1	24	4	21	−	1	25	3	22	−		589709.241(1.707)	1.9985	797.835	
1	24	4	20	+	1	25	3	23	+		589812.594(1.713)	1.9967	797.832	
0	7	3	5	+	0	6	2	4	+	590277.688(0.050)	590277.684(0.015)	5.9536	60.096	PIC81
0	7	3	4	−	0	6	2	5	−	590440.291(0.050)	590440.404(0.015)	5.9493	60.090	AND90
1	11	8	3		1	10	6	4			590693.143(0.320)	0.0038	500.139	
0	9	0	9		0	8	−1	8		590790.957(0.050)	590790.905(0.016)	4.9276	61.930	AND90
1	24	2	23	−	1	23	1	22	−		590960.105(0.571)	13.8766	669.962	
0	19	0	19		0	18	−2	17			594160.442(0.066)	0.0030	294.293	
1	10	3	8		1	11	4	8			594804.088(0.190)	9.3946	358.729	
0	24	1	23		0	23	3	20			595465.834(0.203)	0.0572	478.482	
0	23	2	22	−	0	23	1	23	+		595528.634(0.319)	16.4518	450.735	
1	13	8	5	+	1	12	9	4	+		596396.393(0.069)	1.5123	600.708	
1	13	8	6	−	1	12	9	3	−		596396.393(0.069)	1.5123	600.708	
0	17	0	17		0	16	2	14			596918.197(0.049)	0.0093	235.019	
0	13	−8	5		0	14	−7	7			598976.532(0.066)	1.4588	350.137	
1	22	0	22		1	21	−3	18			599371.117(0.276)	0.0038	595.527	
0	3	3	0		0	2	−2	1			599605.308(0.014)	0.1E−7	22.841	
0	24	10	15		0	25	9	17			600202.323(0.387)	4.9982	807.325	
0	8	−3	6		0	9	0	9			600462.337(0.025)	0.0061	81.637	
0	14	2	12		0	13	−2	12			600845.642(0.024)	0.0096	164.930	
0	4	−3	2		0	5	2	3			601223.574(0.025)	0.2E−5	39.665	
0	14	12	3		1	13	9	4			601674.940(0.613)	0.2E−4	656.054	
0	13	1	12		0	12	2	10			601849.176(0.028)	4.3345	141.374	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	9	1	8		0	8	0	8		602233.197(0.050)	602233.197(0.016)	4.4456	67.150	AND90
1	3	−3	0		1	2	0	2			604238.664(0.102)	0.2*E*−6	213.740	
1	20	2	19		1	21	−3	18			604348.701(0.280)	0.1*E*−4	595.527	
0	24	2	23	−	0	24	1	24	+		604903.184(0.385)	16.8167	488.972	
1	15	5	10		1	16	4	13			605098.602(0.362)	2.0046	471.247	
0	7	−2	6		0	6	0	6			605587.005(0.016)	0.0006	42.988	
1	5	3	3		1	4	2	3			606197.499(0.049)	0.9258	294.034	
1	18	−2	16		1	19	1	19			606318.645(0.209)	0.3*E*−4	508.056	
1	12	9	3	−	1	11	8	4	−		606540.124(0.072)	15.3012	580.476	
1	12	9	4	+	1	11	8	3	+		606540.124(0.072)	15.3012	580.476	
1	7	6	1	+	1	8	5	4	+		607213.163(0.274)	0.4080	350.212	
1	7	6	2	−	1	8	5	3	−		607213.163(0.274)	0.4080	350.212	
0	12	2	10		0	11	1	10			607215.814(0.028)	6.1566	121.119	
0	23	−1	23		0	22	−2	21			607616.249(0.164)	2.5870	427.088	
0	11	−2	10		0	10	2	8			608811.264(0.019)	0.0021	104.236	
0	17	7	11		0	18	6	13			609606.328(0.068)	3.6155	399.904	
1	14	−2	12		1	15	0	15			610417.608(0.101)	0.0001	401.910	
1	25	−7	19		1	25	−6	20			610707.750(1.385)	13.7112	864.925	
0	19	3	16		0	18	−3	16			611523.674(0.044)	0.5*E*−5	319.322	
0	18	2	17	−	0	17	3	14	−		611579.832(0.055)	6.3259	281.371	
0	26	3	24	+	0	25	4	21	+		611914.255(0.230)	8.4289	579.804	
1	14	6	8		1	13	8	5			612239.591(0.501)	0.0026	560.054	
1	19	7	12		1	18	8	10			612701.448(1.205)	1.1501	688.752	
1	24	−7	18		1	24	−6	19			612735.188(1.176)	13.6222	824.834	
0	6	1	5		0	5	−1	5			612797.072(0.017)	0.0001	28.073	
0	17	−7	10		0	18	−6	12			613859.942(0.062)	3.3837	406.990	
0	11	−3	9		0	12	−1	12			613927.198(0.028)	0.0001	129.577	
1	24	2	22	+	1	23	1	23	+		614388.456(0.660)	14.4979	669.093	
1	23	−7	17		1	23	−6	18			614546.575(0.994)	13.4754	786.337	
0	25	2	24	−	0	25	1	25	+		614575.905(0.460)	17.1530	528.790	
0	20	−1	20		0	19	1	18			615200.916(0.075)	0.0135	321.101	
1	9	8	1	+	1	10	7	4	+		615663.370(0.331)	0.0540	526.231	
1	9	8	2	−	1	10	7	3	−		615663.370(0.331)	0.0540	526.231	
1	22	−7	16		1	22	−6	17			616153.550(0.837)	13.2687	749.435	
1	20	2	19		1	19	3	17			616322.230(0.606)	0.9793	595.127	
0	23	8	16		0	24	7	18			616556.287(0.258)	5.3117	656.900	
0	18	9	10		0	19	8	12			616721.734(0.129)	2.7910	539.064	
0	4	−2	3		0	3	−1	3		616979.984(0.050)	616979.845(0.015)	3.6683	13.556	HER84
1	21	−7	15		1	21	−6	16			617568.412(0.702)	13.0003	714.130	
1	9	3	7		1	10	−2	8			617609.602(0.110)	0.5*E*−7	341.896	
1	8	6	2		1	7	7	0			618193.220(0.474)	0.0885	448.967	
0	11	5	7	+	0	12	4	8	+		618716.607(0.034)	2.2566	181.656	
0	11	5	6	−	0	12	4	9	−		618717.937(0.034)	2.2566	181.656	
1	7	−1	6		1	6	2	5			618717.978(0.426)	0.0001	311.735	
1	20	−7	14		1	20	−6	15			618803.963(0.587)	12.6684	680.423	
0	7	4	3		0	8	3	5			619074.541(0.030)	1.1917	91.244	
1	12	5	7	−	0	11	9	2	−		619079.951(0.220)	0.6*E*−7	397.097	
1	12	5	8	+	0	11	9	3	+		619079.951(0.220)	0.6*E*−7	397.097	
0	15	1	14		0	14	−2	13			619739.331(0.025)	0.2740	187.554	
1	19	−7	13		1	19	−6	14			619873.350(0.491)	12.2720	648.314	
1	18	−7	12		1	18	−6	13			620789.912(0.412)	11.8100	617.805	
0	26	3	23	−	0	25	4	22	−		620805.152(0.204)	8.5796	579.790	
1	17	−7	11		1	17	−6	12			621567.029(0.348)	11.2813	588.896	
1	16	−7	10		1	16	−6	11			622217.984(0.300)	10.6851	561.589	
0	18	0	18	+	0	17	1	17	+		622568.435(0.052)	19.8157	254.580	
0	13	1	13	+	0	12	1	12	+		622658.745(0.011)	10.4549	134.809	
1	15	−7	9		1	15	−6	10			622755.828(0.267)	10.0200	535.884	
0	16	−1	16		0	15	0	15			622773.797(0.027)	13.5755	202.075	
0	18	2	16	+	0	17	3	15	+		623071.654(0.054)	6.6427	281.347	
1	14	−7	8		1	14	−6	9			623193.268(0.249)	9.2845	511.781	
0	19	8	11	+	0	20	7	14	+		623362.416(0.120)	3.8919	508.426	
0	19	8	12	−	0	20	7	13	−		623362.416(0.120)	3.8919	508.426	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	13	−7	7		1	13	−6	8			623542.559(0.245)	8.4761	489.283	
1	9	0	9		1	8	1	8			623737.869(0.015)	3.6524	260.511	
1	12	−7	6		1	12	−6	7			623815.412(0.253)	7.5911	468.388	
1	11	−7	5		1	11	−6	6			624022.914(0.268)	6.6239	449.099	
1	10	−7	4		1	10	−6	5			624175.466(0.290)	5.5657	431.415	
0	21	1	20	−	0	20	2	19	−		624232.419(0.109)	11.0268	364.512	
1	9	−7	3		1	9	−6	4			624282.724(0.314)	4.4031	415.337	
0	24	2	22		0	23	3	20			624339.960(0.191)	5.6196	478.482	
1	8	−7	2		1	8	−6	3			624353.557(0.339)	3.1148	400.865	
1	7	−7	1		1	7	−6	2			624396.011(0.364)	1.6665	388.000	
0	26	2	25	−	0	26	1	26	+		624532.669(0.546)	17.4620	570.188	
0	24	10	14	+	0	25	9	17	+		625352.519(0.730)	4.4748	813.968	
0	24	10	15	−	0	25	9	16	−		625352.520(0.730)	4.4748	813.968	
1	13	8	5	+	1	12	8	4	+		625510.225(0.058)	2.1187	599.737	
1	13	8	6	−	1	12	8	5	−		625510.225(0.058)	2.1187	599.737	
1	13	12	1	+	1	12	12	0	+		625563.293(0.416)	1.3511	851.737	
1	13	12	2	−	1	12	12	1	−		625563.293(0.416)	1.3511	851.737	
1	13	12	1		1	12	12	0			625686.935(0.205)	1.5677	817.565	
1	13	11	2		1	12	11	1			625729.623(0.257)	2.6329	757.455	
0	13	0	13		0	12	0	12			625749.466(0.009)	10.4840	134.689	
1	13	6	7	+	1	12	6	6	+		625763.958(0.032)	8.2982	450.812	
1	13	6	8	−	1	12	6	7	−		625763.958(0.032)	8.2982	450.812	
1	13	3	11		1	12	3	10			625782.413(0.038)	9.9225	415.518	
1	13	−12	2		1	12	−12	1			625806.045(0.233)	1.5521	894.210	
1	13	−10	4		1	12	−10	3			625835.509(0.163)	3.5728	673.543	
1	13	1	13	+	1	12	1	12	+		625971.256(0.018)	10.4641	351.414	
1	13	−11	3		1	12	−11	2			625989.896(0.116)	2.9920	745.936	
1	13	11	2	−	1	12	11	1	−		626013.763(0.155)	3.0444	831.986	
1	13	11	3	+	1	12	11	2	+		626013.763(0.155)	3.0444	831.986	
1	13	−7	7		1	12	−7	6			626125.130(0.033)	7.5634	489.196	
1	13	6	7		1	12	6	6			626127.984(0.087)	7.9077	537.106	
1	13	10	3		1	12	10	2			626129.628(0.124)	4.5122	760.275	
1	13	10	3	+	1	12	10	2	+		626146.530(0.067)	4.2854	685.310	
1	13	10	4	−	1	12	10	3	−		626146.530(0.067)	4.2854	685.310	
1	13	7	6		1	12	7	5			626185.892(0.097)	7.0574	529.328	
1	13	−9	5		1	12	−9	4			626239.296(0.112)	6.2628	678.386	
1	13	9	4		1	12	9	3			626272.795(0.044)	5.4575	635.164	
1	13	−8	6		1	12	−8	5			626381.697(0.033)	6.5162	594.830	
1	13	−6	8		1	12	−6	7			626397.983(0.040)	8.0120	468.388	
1	13	−2	11		1	12	−2	10			626452.169(0.021)	10.2847	378.876	
1	13	7	6	−	1	12	7	5	−		626476.517(0.031)	7.4843	563.208	
1	13	7	7	+	1	12	7	6	+		626476.517(0.031)	7.4843	563.208	
0	21	−1	21		0	20	2	18			626489.915(0.104)	1.1714	354.387	
1	13	5	8	−	1	12	5	7	−		626511.037(0.028)	8.8043	417.747	
1	13	5	9	+	1	12	5	8	+		626511.037(0.028)	8.8043	417.747	
0	17	0	17		0	16	1	15			626555.117(0.045)	7.8519	234.031	
1	13	4	10		1	12	4	9			626555.150(0.020)	9.4232	378.024	
1	13	2	11	+	1	12	2	10	+		626608.821(0.017)	10.2330	333.061	
1	13	−3	10		1	12	−3	9			626609.113(0.017)	9.8961	349.707	
0	3	2	2	−	0	2	1	1	−	626626.302(0.050)	626626.362(0.018)	3.0273	14.988	HER84
1	13	0	13		1	12	0	12			626639.928(0.018)	10.5155	334.390	
1	13	1	13		1	12	1	12			626654.090(0.017)	10.4388	328.063	
1	13	2	12	−	1	12	2	11	−		626673.583(0.017)	10.2330	333.067	
0	8	7	1	−	0	9	6	4	−		626817.132(0.066)	0.3265	207.217	
0	8	7	2	+	0	9	6	3	+		626817.132(0.066)	0.3265	207.217	
1	13	9	4	−	1	12	9	3	−		626826.326(0.059)	10.3958	600.708	
1	13	9	5	+	1	12	9	4	+		626826.327(0.059)	10.3958	600.708	
1	13	3	11	+	1	12	3	10	+		626865.178(0.019)	9.9428	400.804	
1	13	3	10	−	1	12	3	9	−		626866.036(0.019)	9.9428	400.804	
1	13	8	5		1	12	8	4			626879.380(0.041)	6.8791	539.144	
1	13	2	12		1	12	2	11			626881.664(0.022)	10.2851	403.438	
1	13	−1	12		1	12	−1	11			626930.794(0.031)	10.4336	412.821	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	13	−4	9		1	12	−4	8			626945.944(0.023)	9.5066	407.263	
1	13	0	13	+	1	12	0	12	+		627004.212(0.047)	10.5055	419.975	
1	13	−5	9		1	12	−5	8			627013.605(0.038)	8.9068	505.085	
0	13	−1	13		0	12	−1	12			627170.503(0.009)	10.4480	129.577	
1	13	1	12	−	1	12	1	11	−		627209.067(0.025)	10.4637	351.663	
0	13	−12	1		0	12	−12	0			627303.529(0.107)	1.5100	622.097	
0	13	12	1	+	0	12	12	0	+		627376.282(0.089)	1.5306	626.559	
0	13	12	2	−	0	12	12	1	−		627376.282(0.089)	1.5306	626.559	
0	13	12	2		0	12	12	1			627431.058(0.112)	1.5162	632.659	
1	13	4	10	−	1	12	4	9	−		627445.401(0.046)	9.5172	459.895	
1	13	4	9	+	1	12	4	8	+		627445.408(0.046)	9.5172	459.895	
0	13	11	2	−	0	12	11	1	−		627475.729(0.067)	2.9213	542.298	
0	13	11	3	+	0	12	11	2	+		627475.729(0.067)	2.9213	542.298	
1	13	5	8		1	12	5	7			627529.217(0.051)	8.9686	423.795	
0	13	0	13	+	0	12	0	12	+		627558.440(0.009)	10.5084	125.737	
0	13	11	3		0	12	11	2			627571.493(0.058)	2.9504	549.999	
0	13	−11	2		0	12	−11	1			627572.075(0.080)	2.9139	552.035	
0	13	10	4		0	12	10	3			627647.660(0.042)	4.2257	470.156	
0	13	10	3	+	0	12	10	2	+		627695.394(0.056)	4.1971	477.634	
0	13	10	4	−	0	12	10	3	−		627695.394(0.056)	4.1971	477.634	
0	13	−10	3		0	12	−10	2			627747.178(0.040)	4.2540	480.094	
0	9	2	7		0	8	0	8			627774.572(0.017)	0.0009	67.150	
0	13	9	5		0	12	9	4			627809.639(0.037)	5.3698	409.881	
0	13	−9	4		0	12	−9	3			627814.509(0.028)	5.4162	405.689	
0	13	9	4	−	0	12	9	3	−		627898.317(0.028)	5.4368	416.432	
0	13	9	5	+	0	12	9	4	+		627898.317(0.028)	5.4368	416.432	
0	13	−8	5		0	12	−8	4			627922.137(0.024)	6.4324	349.172	
0	13	8	5	+	0	12	8	4	+		627971.284(0.020)	6.4879	348.824	
0	13	8	6	−	0	12	8	5	−		627971.284(0.020)	6.4879	348.824	
0	13	8	6		0	12	8	5			628021.276(0.021)	6.4953	358.663	
0	13	7	6	−	0	12	7	5	−		628039.186(0.017)	7.3817	295.823	
0	13	7	7	+	0	12	7	6	+		628039.186(0.017)	7.3817	295.823	
0	14	−6	8		0	15	−5	10			628042.516(0.040)	2.9323	279.692	
0	13	2	12	−	0	12	2	11	−		628051.884(0.010)	10.3163	151.999	
0	13	7	7		0	12	7	6			628113.718(0.016)	7.4377	299.391	
0	13	−7	6		0	12	−7	5			628115.613(0.017)	7.4278	306.625	
0	13	6	8		0	12	6	7			628167.709(0.014)	8.2125	250.053	
0	13	6	7	+	0	12	6	6	+		628187.885(0.013)	8.2350	260.419	
0	13	6	8	−	0	12	6	7	−		628187.885(0.013)	8.2350	260.419	
1	22	−4	18		1	23	−3	20			628218.170(0.578)	5.8271	667.754	
0	13	−6	7		0	12	−6	6			628237.723(0.014)	8.2636	257.120	
0	13	5	9		0	12	5	8			628251.336(0.011)	8.9188	220.368	
0	13	−5	8		0	12	−5	7			628318.246(0.011)	8.9196	211.986	
0	13	−4	10		0	12	−4	9			628329.925(0.010)	9.4803	186.899	
0	13	5	9	+	0	12	5	8	+		628338.242(0.012)	8.9644	221.643	
0	13	5	8	−	0	12	5	7	−		628338.245(0.012)	8.9644	221.643	
0	13	4	9		0	12	4	8			628408.882(0.010)	9.5395	192.535	
0	13	−3	11		0	12	−3	10			628445.283(0.010)	9.9888	169.407	
0	13	3	11	+	0	12	3	10	+		628469.879(0.009)	9.9179	160.431	
0	13	4	10	−	0	12	4	9	−		628512.151(0.010)	9.4994	181.656	
0	13	4	9	+	0	12	4	8	+		628513.330(0.010)	9.4994	181.656	
0	13	3	10	−	0	12	3	9	−		628525.026(0.009)	9.9179	160.434	
0	13	1	12		0	12	1	11			628696.381(0.009)	10.6311	140.478	
0	13	3	10		0	12	3	9			628816.121(0.009)	9.9501	159.009	
0	13	2	11	+	0	12	2	10	+		628869.040(0.010)	10.3170	152.074	
0	3	2	1	+	0	2	1	2	+	629140.493(0.050)	629140.501(0.018)	3.0084	14.904	HER84
0	13	2	11		0	12	2	10			629321.677(0.010)	10.1554	141.374	
1	17	1	17		1	16	0	16			629364.781(0.051)	8.6214	427.624	
0	13	−2	12		0	12	−2	11			629651.808(0.009)	10.2659	143.927	
0	14	−9	5		1	13	−4	9			629729.558(0.200)	0.2E−7	428.175	
0	7	1	7	+	0	6	0	6	+	629921.337(0.050)	629921.263(0.017)	8.0253	33.876	HER84
0	20	0	20		0	19	−2	18			630335.154(0.091)	0.0029	325.047	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	7	−1	6		1	8	−2	6			630583.013(0.486)	1.3785	311.339	
0	10	6	5	−	0	11	5	6	−		630951.028(0.048)	1.2431	202.294	
0	10	6	4	+	0	11	5	7	+		630951.029(0.048)	1.2431	202.294	
0	21	−9	12		0	22	−8	14			632505.861(0.214)	4.1978	630.914	
0	13	1	12	−	0	12	1	11	−		633423.069(0.010)	10.4580	136.974	
1	4	−2	2		1	5	−3	2			633571.984(0.075)	5.1450	248.377	
1	19	2	18		1	18	−1	17			634149.945(0.444)	0.0229	562.385	
1	23	4	20	−	1	24	3	21	−		634297.069(1.459)	1.9061	757.675	
1	23	4	19	+	1	24	3	22	+		634378.770(1.464)	1.9048	757.672	
0	11	−2	10		0	10	1	9			634689.503(0.020)	0.0842	103.373	
0	26	4	22	+	0	26	3	23	−		635389.856(0.222)	29.6918	600.497	
0	25	4	21	+	0	25	3	22	−		635668.931(0.183)	28.2548	558.600	
0	24	4	20	+	0	24	3	21	−		635871.057(0.150)	26.8516	518.313	
0	24	−3	22		0	23	−4	20			635943.853(0.131)	8.6165	505.867	
0	22	−2	21		0	21	3	18			635978.607(0.086)	0.9674	405.874	
0	23	4	19	+	0	23	3	20	−		636011.458(0.121)	25.4802	479.635	
0	22	4	18	+	0	22	3	19	−		636103.692(0.097)	24.1384	442.566	
0	21	4	17	+	0	21	3	18	−		636159.596(0.077)	22.8241	407.108	
0	20	4	16	+	0	20	3	17	−		636189.302(0.061)	21.5353	373.259	
0	15	4	11	+	0	15	3	12	−		636190.088(0.023)	15.3984	228.164	
0	14	4	10	+	0	14	3	11	−		636190.924(0.021)	14.2168	203.976	
0	16	4	12	+	0	16	3	13	−		636193.270(0.026)	16.5921	253.962	
0	13	4	9	+	0	13	3	10	−		636196.960(0.020)	13.0445	181.400	
0	17	4	13	+	0	17	3	14	−		636198.424(0.031)	17.8003	281.371	
0	19	4	15	+	0	19	3	16	−		636201.292(0.048)	20.2697	341.020	
0	18	4	14	+	0	18	3	15	−		636202.500(0.038)	19.0255	310.390	
0	12	4	8	+	0	12	3	9	−		636208.656(0.018)	11.8782	160.434	
0	11	4	7	+	0	11	3	8	−		636225.884(0.018)	10.7140	141.080	
0	10	4	6	+	0	10	3	7	−		636248.048(0.017)	9.5472	123.338	
0	9	4	5	+	0	9	3	6	−	636274.077(0.050)*	636274.205(0.017)	8.3713	107.208	PIC81
0	10	4	7	−	0	10	3	8	+	636279.998(0.050)*	636279.367(0.017)	9.5466	123.337	PIC81
0	11	4	8	−	0	11	3	9	+		636280.535(0.018)	10.7129	141.079	
0	9	4	6	−	0	9	3	7	+	636291.164(0.050)	636291.113(0.017)	8.3710	107.208	AND90
0	12	4	9	−	0	12	3	10	+		636299.453(0.018)	11.8762	160.431	
0	8	4	4	+	0	8	3	5	−	636303.355(0.000)	636303.169(0.018)	7.1776	92.691	AND90
0	8	4	5	−	0	8	3	6	+	636311.690(0.050)	636311.642(0.018)	7.1775	92.690	PIC81
0	7	4	3	+	0	7	3	4	−	636333.470(0.050)	636333.605(0.019)	5.9532	79.785	PIC81
0	7	4	4	−	0	7	3	5	+	636337.419(0.050)	636337.464(0.019)	5.9532	79.785	PIC81
0	13	4	10	−	0	13	3	11	+		636341.725(0.019)	13.0410	181.395	
0	6	4	2	+	0	6	3	3	−	636363.843(1.000)	636364.115(0.021)	4.6780	68.493	PIC81
0	6	4	3	−	0	6	3	4	+	636366.248(1.000)	636365.661(0.021)	4.6780	68.493	PIC81
0	5	4	1	+	0	5	3	2	−	636393.568(0.200)	636393.314(0.022)	3.3174	58.813	PIC81
0	5	4	2	−	0	5	3	3	+	636393.568(0.200)	636393.830(0.022)	3.3174	58.813	PIC81
0	14	4	11	−	0	14	3	12	+		636413.793(0.021)	14.2110	203.969	
0	4	4	0	+	0	4	3	1	−	636420.231(0.200)	636419.896(0.024)	1.8061	50.746	PIC81
0	4	4	1	−	0	4	3	2	+	636420.231(0.200)	636420.026(0.024)	1.8061	50.746	PIC81
1	15	11	4		1	14	10	4			636460.022(4.499)	16.6538	803.649	
0	15	4	12	−	0	15	3	13	+		636522.990(0.023)	15.3889	228.152	
0	16	4	13	−	0	16	3	14	+		636677.598(0.026)	16.5773	253.946	
0	17	4	14	−	0	17	3	15	+		636886.893(0.032)	17.7778	281.347	
0	18	4	15	−	0	18	3	16	+		637161.182(0.039)	18.9921	310.357	
0	19	4	16	−	0	19	3	17	+		637511.827(0.050)	20.2215	340.974	
0	18	0	18		0	17	2	15			637808.874(0.061)	0.0112	262.456	
0	6	2	4		0	5	−1	5			637815.195(0.014)	0.0012	28.073	
0	20	4	17	−	0	20	3	18	+		637951.258(0.064)	21.4667	373.197	
0	14	9	5	−	1	13	5	8	−		638087.814(0.188)	3.6E−5	438.645	
0	14	9	6	+	1	13	5	9	+		638087.815(0.188)	3.6E−5	438.645	
0	10	0	10		0	9	−1	9		638279.564(0.050)	638279.610(0.017)	5.7946	76.433	AND90
1	25	2	24	−	1	24	1	23	−		638314.605(0.682)	14.5501	708.494	
0	21	4	18	−	0	21	3	19	+		638492.967(0.082)	22.7287	407.026	
0	8	3	6	+	0	7	2	5	+	638523.486(0.050)	638523.473(0.015)	6.3574	71.391	PIC81
0	8	3	5	−	0	7	2	6	−	638817.830(0.050)	638817.792(0.015)	6.3492	71.382	PIC81

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	26	−6	21		1	25	−7	19			638970.415(1.569)	10.9778	885.296	
1	26	−6	21		1	25	−7	19			638970.415(1.569)	10.9778	885.296	
0	22	4	19	−	0	22	3	20	+		639151.496(0.103)	24.0076	442.459	
1	12	8	4		1	11	6	5			639227.430(0.339)	0.0045	517.821	
0	23	4	20	−	0	23	3	21	+		639942.394(0.129)	25.3037	479.496	
0	24	4	21	−	0	24	3	22	+		640882.172(0.160)	26.6169	518.135	
0	25	1	24		0	24	3	21			641349.323(0.249)	0.0633	517.205	
0	24	−1	24		0	23	−2	22			641584.239(0.222)	2.2875	464.361	
0	25	4	22	−	0	25	3	23	+		641988.234(0.196)	27.9466	558.375	
1	14	8	6	+	1	13	9	5	+		643149.442(0.067)	2.0768	621.617	
1	14	8	7	−	1	13	9	4	−		643149.442(0.067)	2.0768	621.617	
1	9	3	7		1	10	4	7			643269.168(0.192)	8.8141	341.040	
0	26	4	23	−	0	26	3	24	+		643278.791(0.237)	29.2922	600.215	
1	23	0	23		1	22	−3	19			647135.603(0.331)	0.0047	630.842	
0	12	−8	4		0	13	−7	6			647403.947(0.074)	1.1195	327.577	
0	7	−3	5		0	8	0	8			647862.472(0.025)	0.0032	67.150	
0	4	3	1		0	3	−2	2			647953.334(0.014)	0.4E−6	27.682	
0	23	10	14		0	24	9	16			648281.041(0.335)	4.5455	767.140	
0	15	2	13		0	14	−2	13			648645.118(0.028)	0.0140	187.554	
0	14	1	13		0	13	2	11			649540.341(0.028)	4.7336	162.366	
0	3	−3	1		0	4	2	2			649639.253(0.027)	0.2E−6	31.596	
0	15	12	4		1	14	9	5			651061.003(0.585)	0.4E−4	678.549	
1	19	2	18		1	20	−3	17			651398.316(0.227)	0.8E−5	561.809	
0	10	1	9		0	9	0	9		651617.433(0.050)	651617.453(0.018)	4.8960	81.637	AND90
1	14	5	9		1	15	4	12			651640.712(0.293)	1.9117	445.535	
1	4	−3	1		1	3	0	3			652455.028(0.100)	0.1E−5	218.568	
1	25	−1	24		1	26	−3	23			653326.890(1.137)	0.0010	788.060	
1	6	3	4		1	5	2	4			654341.801(0.043)	0.9900	302.080	
0	8	−2	7		0	7	0	7			654616.042(0.016)	0.0008	54.266	
1	17	−2	15		1	18	1	18			654817.131(0.171)	0.3E−4	477.536	
1	6	6	0	+	1	7	5	3	+		655488.662(0.292)	0.1510	337.345	
1	6	6	1	−	1	7	5	2	−		655488.662(0.292)	0.1510	337.345	
1	13	9	4	−	1	12	8	5	−		655940.159(0.068)	15.0613	599.737	
1	13	9	5	+	1	12	8	4	+		655940.159(0.068)	15.0613	599.737	
0	13	2	11		0	12	1	11			656168.882(0.029)	6.4635	140.478	
0	12	−2	11		0	11	2	9			657436.726(0.020)	0.0037	121.997	
0	16	7	10		0	17	6	12			657833.726(0.061)	3.1945	370.909	
0	21	−1	21		0	20	1	19			657848.265(0.100)	0.0161	353.341	
0	19	2	18	−	0	18	3	15	−		658101.932(0.069)	6.7634	310.390	
1	20	7	13		1	19	8	11			658545.064(1.370)	1.1770	719.320	
1	13	−2	11		1	14	0	14			658728.565(0.094)	0.0001	377.799	
1	15	6	9		1	14	8	6			659117.454(0.582)	0.0035	582.574	
0	20	3	17		0	19	−3	17			661187.107(0.058)	0.8E−5	349.935	
0	10	−3	8		0	11	−1	11			661212.241(0.027)	0.0001	110.258	
0	7	1	6		0	6	−1	6			661342.263(0.017)	0.0002	37.749	
1	12	10	2		1	11	11	0			662201.353(3.844)	0.0742	738.186	
0	16	−7	9		0	17	−6	11			662295.834(0.058)	2.9827	377.991	
1	25	2	23	+	1	24	1	24	+		663502.108(0.795)	15.2508	707.550	
1	8	8	0	+	1	9	7	3	+		664589.316(0.383)	0.0205	510.152	
1	8	8	1	−	1	9	7	2	−		664589.316(0.383)	0.0205	510.152	
0	21	0	21		0	20	−2	19			664955.697(0.126)	0.0028	357.431	
0	22	8	15		0	23	7	17			665023.099(0.210)	4.8886	618.279	
0	17	9	9		0	18	8	11			665192.157(0.111)	2.4036	508.473	
0	5	−2	4		0	4	−1	4		665442.450(0.050)	665442.393(0.015)	4.0608	20.009	HER84
1	13	5	8	−	0	12	9	3	−		665930.683(0.202)	0.2E−5	416.432	
1	13	5	9	+	0	12	9	4	+		665930.683(0.202)	0.2E−5	416.432	
1	8	3	6		1	9	−2	7			665971.209(0.109)	0.2E−7	325.815	
0	16	1	15		0	15	−2	14			666442.375(0.029)	0.3280	211.800	
1	9	6	3		1	8	7	1			666551.836(0.454)	0.2580	461.827	
1	8	−1	7		1	7	2	6			666979.776(0.422)	0.0002	322.998	
0	10	5	6	+	0	11	4	7	+		667146.786(0.036)	1.8486	162.303	
0	10	5	5	−	0	11	4	8	−		667147.451(0.036)	1.8486	162.303	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	6	4	2		0	7	3	4			667498.072(0.031)	0.8176	78.337	
0	18	0	18		0	17	1	16			668116.889(0.058)	8.1477	261.445	
1	21	2	20		1	20	3	18			668143.583(0.742)	1.0077	627.150	
0	22	−1	22		0	21	2	19			668602.310(0.137)	1.3793	388.227	
0	25	2	23		0	24	3	21			668819.930(0.230)	5.5263	517.205	
0	14	1	14	+	0	13	1	13	+		670422.699(0.013)	11.2675	155.578	
0	18	8	10	+	0	19	7	13	+		671480.786(0.104)	3.4688	476.229	
0	18	8	11	−	0	19	7	12	−		671480.786(0.104)	3.4688	476.229	
1	10	0	10		1	9	1	9			671912.639(0.016)	4.1320	274.989	
0	19	2	17	+	0	18	3	16	+		672360.692(0.067)	7.1847	310.357	
0	17	−1	17		0	16	0	16			672902.595(0.031)	15.0565	227.711	
1	14	−13	2		1	13	−13	1			673405.326(0.646)	1.3407	976.511	
0	14	0	14		0	13	0	13			673415.979(0.010)	11.2882	155.562	
1	14	8	6	+	1	13	8	5	+		673579.376(0.055)	2.6697	620.602	
1	14	8	7	−	1	13	8	6	−		673579.376(0.055)	2.6697	620.602	
1	14	12	2	+	1	13	12	1	+		673603.988(0.441)	2.6105	872.603	
1	14	12	3	−	1	13	12	2	−		673603.988(0.441)	2.6105	872.603	
1	14	13	1		1	13	13	0			673673.565(0.342)	1.5478	981.101	
1	14	6	8	+	1	13	6	7	+		673675.449(0.040)	9.2691	471.685	
1	14	6	9	−	1	13	6	8	−		673675.449(0.040)	9.2691	471.685	
1	14	3	12		1	13	3	11			673676.690(0.048)	10.7637	436.392	
1	14	12	2		1	13	12	1			673710.635(0.207)	3.0271	838.435	
0	4	2	3	−	0	3	1	2	−	673745.931(0.050)	673746.070(0.018)	3.4095	19.870	HER84
1	14	11	3		1	13	11	2			673781.555(0.269)	3.8290	778.327	
0	23	10	13	+	0	24	9	16	+		673792.411(0.553)	4.1270	773.773	
0	23	10	14	−	0	24	9	15	−		673792.411(0.553)	4.1270	773.773	
1	14	−12	3		1	13	−12	2			673874.672(0.247)	2.9978	915.085	
1	14	−10	5		1	13	−10	4			673894.047(0.170)	4.6250	694.418	
1	14	1	14	+	1	13	1	13	+		674016.903(0.023)	11.2780	372.294	
0	25	−1	25		0	24	−2	23			674045.140(0.296)	2.0040	503.261	
1	14	−11	4		1	13	−11	3			674090.207(0.120)	4.3413	766.817	
1	14	11	3	−	1	13	11	2	−		674090.960(0.168)	4.4173	852.867	
1	14	11	4	+	1	13	11	3	+		674090.960(0.168)	4.4173	852.867	
1	14	6	8		1	13	6	7			674091.528(0.095)	8.8362	557.991	
1	14	−7	8		1	13	−7	7			674143.586(0.037)	8.6017	510.082	
1	14	10	4		1	13	10	3			674196.556(0.129)	5.8136	781.160	
1	14	10	4	+	1	13	10	3	+		674254.037(0.067)	5.5367	706.196	
1	14	10	5	−	1	13	10	4	−		674254.037(0.067)	5.5367	706.196	
1	14	7	7		1	13	7	6			674261.363(0.103)	8.0284	550.216	
1	14	−9	6		1	13	−9	5			674309.047(0.113)	7.5835	699.275	
1	21	−4	17		1	22	−3	19			674352.414(0.477)	5.6025	630.842	
1	14	9	5		1	13	9	4			674385.267(0.045)	6.6227	656.054	
1	11	−9	3		1	10	−10	1			674474.839(1.256)	0.0939	636.603	
1	14	−6	9		1	13	−6	8			674492.877(0.044)	8.9513	489.283	
1	14	−8	7		1	13	−8	6			674499.230(0.035)	7.6067	615.724	
1	14	−2	12		1	13	−2	11			674513.023(0.026)	11.1120	399.772	
1	14	7	7	−	1	13	7	6	−		674597.336(0.036)	8.5132	584.105	
1	14	7	8	+	1	13	7	7	+		674597.336(0.036)	8.5132	584.105	
1	14	5	9	−	1	13	5	8	−		674617.102(0.033)	9.7090	438.645	
1	14	5	10	+	1	13	5	9	+		674617.102(0.033)	9.7090	438.645	
1	14	4	11		1	13	4	10			674659.227(0.024)	10.2946	398.923	
1	14	2	12	+	1	13	2	11	+		674710.166(0.022)	11.0571	353.962	
1	14	−3	11		1	13	−3	10			674717.329(0.021)	10.7402	370.609	
1	14	0	14		1	13	0	13			674743.033(0.023)	11.3243	355.292	
1	14	1	14		1	13	1	13			674762.330(0.023)	11.2510	348.966	
1	14	2	13	−	1	13	2	12	−		674791.038(0.022)	11.0571	353.970	
1	14	9	5	−	1	13	9	4	−		674906.862(0.056)	12.2618	621.617	
1	14	9	6	+	1	13	9	5	+		674906.862(0.056)	12.2618	621.617	
0	8	1	8	+	0	7	0	7	+	674990.423(0.050)	674990.446(0.019)	9.0803	45.164	HER84
1	14	3	12	+	1	13	3	11	+		675034.787(0.023)	10.7905	421.714	
1	14	3	11	−	1	13	3	10	−		675036.030(0.023)	10.7905	421.714	
1	14	2	13		1	13	2	12			675049.360(0.027)	11.1134	424.349	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	14	−1	13		1	13	−1	12			675097.889(0.036)	11.2454	433.733	
1	14	13	1	−	1	13	13	0	−		675108.364(1.850)	1.6405	921.467	
1	14	13	2	+	1	13	13	1	+		675108.364(1.850)	1.6405	921.467	
0	14	−1	14		0	13	−1	13			675134.556(0.010)	11.2602	150.497	
1	14	8	6		1	13	8	5			675139.773(0.041)	8.0247	560.054	
1	14	−4	10		1	13	−4	9			675145.256(0.029)	10.3855	428.175	
1	14	0	14	+	1	13	0	13	+		675176.196(0.053)	11.3137	440.890	
0	7	7	0	−	0	8	6	3	−		675229.180(0.071)	0.1222	192.704	
0	7	7	1	+	0	8	6	2	+		675229.180(0.071)	0.1222	192.704	
1	14	−5	10		1	13	−5	9			675232.847(0.044)	9.8218	526.000	
0	14	13	2		0	13	13	1			675276.854(0.166)	1.5012	730.364	
0	14	−13	1		0	13	−13	0			675326.210(0.134)	1.5271	731.069	
1	14	1	13	−	1	13	1	12	−		675347.374(0.032)	11.2776	372.584	
0	14	13	1	−	0	13	13	0	−		675433.070(0.160)	1.5198	740.080	
0	14	13	2	+	0	13	13	1	+		675433.070(0.160)	1.5198	740.080	
0	14	−12	2		0	13	−12	1			675463.893(0.105)	2.9165	643.021	
0	14	12	2	+	0	13	12	1	+		675558.072(0.086)	2.9561	647.486	
0	14	12	3	−	0	13	12	2	−		675558.072(0.086)	2.9561	647.486	
0	14	12	3		0	13	12	2			675610.587(0.114)	2.9286	653.588	
0	14	0	14	+	0	13	0	13	+		675612.646(0.010)	11.3162	146.670	
0	14	11	3	−	0	13	11	2	−		675655.104(0.065)	4.2385	563.229	
0	14	11	4	+	0	13	11	3	+		675655.104(0.065)	4.2385	563.229	
0	14	−11	3		0	13	−11	2			675760.651(0.081)	4.2280	572.969	
0	14	11	4		0	13	11	3			675770.050(0.055)	4.2807	570.932	
0	3	3	0		0	2	2	0		675773.439(0.050)	675773.382(0.020)	4.9879	20.300	HER84
1	14	4	11	−	1	13	4	10	−		675779.760(0.056)	10.3970	480.824	
1	14	4	10	+	1	13	4	9	+		675779.771(0.056)	10.3970	480.824	
0	14	10	5		0	13	10	4			675846.553(0.040)	5.4593	491.093	
1	14	5	9		1	13	5	8			675888.668(0.062)	9.8919	444.727	
0	14	10	4	+	0	13	10	3	+		675892.414(0.056)	5.4227	498.572	
0	14	10	5	−	0	13	10	4	−		675892.414(0.056)	5.4227	498.572	
0	14	−10	4		0	13	−10	3			675959.046(0.037)	5.4959	501.033	
0	14	9	6		0	13	9	5			676015.716(0.038)	6.5164	430.822	
0	14	−9	5		0	13	−9	4			676031.965(0.027)	6.5724	426.631	
0	14	9	5	−	0	13	9	4	−		676120.180(0.027)	6.5976	437.377	
0	14	9	6	+	0	13	9	5	+		676120.180(0.027)	6.5976	437.377	
0	14	−8	6		0	13	−8	5			676138.986(0.025)	7.5091	370.117	
0	14	8	6	+	0	13	8	5	+		676205.311(0.021)	7.5736	369.771	
0	14	8	7	−	0	13	8	6	−		676205.311(0.021)	7.5736	369.771	
0	14	2	13	−	0	13	2	12	−		676215.016(0.011)	11.1462	172.948	
0	14	8	7		0	13	8	6			676250.436(0.021)	7.5824	379.612	
0	14	7	7	−	0	13	7	6	−		676269.636(0.019)	8.3968	316.772	
0	14	7	8	+	0	13	7	7	+		676269.636(0.019)	8.3968	316.772	
0	14	−7	7		0	13	−7	6			676349.551(0.017)	8.4494	327.577	
0	14	7	8		0	13	7	7			676361.695(0.017)	8.4603	320.343	
0	13	−6	7		0	14	−5	9			676397.105(0.040)	2.5172	255.514	
0	14	6	9		0	13	6	8			676416.064(0.015)	9.1740	271.007	
0	14	6	8	+	0	13	6	7	+		676425.685(0.015)	9.1995	281.373	
0	14	6	9	−	0	13	6	8	−		676425.685(0.015)	9.1995	281.373	
0	14	5	10		0	13	5	9			676494.608(0.013)	9.8350	241.324	
0	14	−6	8		0	13	−6	7			676496.553(0.015)	9.2310	278.076	
0	19	0	19	+	0	18	1	18	+		676499.322(0.063)	21.2974	283.306	
0	14	−4	11		0	13	−4	10			676585.326(0.011)	10.3573	207.858	
0	14	−5	9		0	13	−5	8			676591.277(0.013)	9.8354	232.945	
0	14	5	10	+	0	13	5	9	+		676604.244(0.013)	9.8848	242.602	
0	14	5	9	−	0	13	5	8	−		676604.250(0.013)	9.8848	242.602	
0	14	4	10		0	13	4	9			676677.658(0.012)	10.4212	213.496	
0	14	−3	12		0	13	−3	11			676712.384(0.011)	10.8404	190.370	
0	14	3	12	+	0	13	3	11	+		676749.459(0.010)	10.7645	181.395	
0	14	4	11	−	0	13	4	10	−		676821.527(0.011)	10.3776	202.621	
0	14	4	10	+	0	13	4	9	+		676823.527(0.011)	10.3776	202.621	
0	14	3	11	−	0	13	3	10	−		676829.563(0.010)	10.7644	181.400	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	14	1	13		0	13	1	12			677012.842(0.011)	11.4407	161.449	
0	14	3	11		0	13	3	10			677190.542(0.010)	10.7986	179.984	
0	14	2	12	+	0	13	2	11	+		677233.266(0.011)	11.1473	173.051	
1	18	1	18		1	17	0	17			677419.151(0.065)	9.1827	454.940	
0	10	2	8		0	9	0	9			677495.692(0.019)	0.0013	81.637	
0	14	2	12		0	13	2	11			677709.778(0.011)	10.9751	162.366	
0	19	0	19		0	18	2	16			677953.096(0.080)	0.0135	291.498	
0	14	−2	13		0	13	−2	12			678252.591(0.010)	11.0906	164.930	
1	6	−1	5		1	7	−2	5			678669.316(0.490)	1.2635	298.470	
0	4	2	2	+	0	3	1	3	+	678785.455(0.050)	678785.460(0.017)	3.3670	19.703	HER84
0	15	−9	6		1	14	−4	10			678816.830(0.205)	0.3E−7	450.696	
1	22	4	19	−	1	23	3	20	−		679222.539(1.238)	1.8110	719.116	
1	22	4	18	+	1	23	3	21	+		679286.443(1.242)	1.8100	719.114	
0	9	6	4	−	0	10	5	5	−		679341.014(0.052)	0.9103	184.556	
0	9	6	3	+	0	10	5	6	+		679341.015(0.052)	0.9103	184.556	
0	20	−9	11		0	21	−8	13			680573.086(0.180)	3.7675	595.521	
0	22	1	21	−	0	21	2	20	−		680800.486(0.136)	11.9450	398.279	
1	3	−2	1		1	4	−3	1			681789.670(0.078)	4.8168	240.332	
0	25	11	14	−	0	26	10	17	−		681935.541(0.518)	4.9328	916.778	
0	25	11	15	+	0	26	10	16	+		681935.541(0.518)	4.9328	916.778	
0	14	1	13	−	0	13	1	12	−		681989.818(0.011)	11.2712	158.103	
1	20	2	19		1	19	−1	18			682201.291(0.459)	0.0296	592.930	
0	12	−2	11		0	11	1	10			683749.819(0.021)	0.1158	121.119	
1	16	11	5		1	15	10	5			684047.955(4.723)	16.9096	827.740	
0	25	−3	23		0	24	−4	21			684261.682(0.161)	9.1366	544.493	
0	11	0	11		0	10	−1	10			685505.010(0.019)	6.7431	92.543	
1	26	2	25	−	1	25	1	24	−		685677.796(0.809)	15.2426	748.618	
0	7	2	5		0	6	−1	6			686467.128(0.016)	0.0030	37.749	
0	9	3	7	+	0	8	2	6	+	686731.291(0.050)*	686731.459(0.015)	6.7720	84.301	AND90
0	26	1	25		0	25	3	22			686767.745(0.301)	0.0704	557.541	
0	9	3	6	−	0	8	2	7	−	687224.404(0.050)*	687224.558(0.015)	6.7575	84.285	AND90
0	15	9	6	−	1	14	5	9	−		687795.314(0.178)	7.1E−5	461.148	
0	15	9	7	+	1	14	5	10	+		687795.314(0.178)	7.1E−5	461.148	
1	13	8	5		1	12	6	6			687979.921(0.378)	0.0049	537.106	
1	25	3	23		1	26	−3	23			688659.151(1.534)	0.9E−6	788.060	
0	23	−2	22		0	22	3	19			689205.906(0.110)	1.2183	441.371	
1	15	8	7	+	1	14	9	6	+		689874.411(0.067)	2.6769	644.129	
1	15	8	8	−	1	14	9	5	−		689874.411(0.067)	2.6769	644.129	
1	8	3	6		1	9	4	6			691645.159(0.195)	8.2797	324.958	
1	24	0	24		1	23	−3	20			694840.365(0.394)	0.0057	667.754	
0	6	−3	4		0	7	0	7			695550.179(0.026)	0.0015	54.266	
0	11	−8	3		0	12	−7	5			695831.794(0.085)	0.8066	306.625	
0	16	2	14		0	15	−2	14			696079.295(0.033)	0.0192	211.800	
0	26	−3	24		0	26	−2	25			696146.772(0.299)	19.0675	585.936	
0	5	3	2		0	4	−2	3			696285.709(0.014)	0.4E−5	34.137	
0	22	10	13		0	23	9	15			696401.591(0.290)	4.1018	728.554	
0	15	1	14		0	14	2	12			697146.279(0.029)	5.1559	184.972	
0	22	0	22		0	21	−2	20			697984.268(0.173)	0.0025	391.444	
1	3	1	3	+	1	2	2	0	+		698353.728(0.029)	0.3027	212.418	
1	13	5	8		1	14	4	11			698494.856(0.240)	1.7884	421.427	
1	18	2	17		1	19	−3	16			698595.105(0.188)	0.5E−5	529.691	
1	3	1	2	−	1	2	2	1	−		698931.092(0.030)	0.3024	212.418	
1	24	−1	23		1	25	−3	22			699472.849(0.967)	0.0009	746.364	
1	15	13	2	−	1	16	12	5	−		699640.697(6.235)	0.1759	944.815	
1	15	13	3	+	1	16	12	4	+		699640.698(6.235)	0.1759	944.815	
0	22	−1	22		0	21	1	20			699811.994(0.132)	0.0189	387.186	
0	16	12	5		1	15	9	6			700489.055(0.572)	0.0001	702.648	
1	5	−3	2		1	4	0	4			700660.513(0.097)	0.4E−5	225.005	
0	3	3	0		0	2	1	1			700707.780(0.027)	0.0005	19.469	
1	13	9	4		0	12	12	1			701366.705(0.713)	0.7E−7	632.659	
0	11	1	10		0	10	0	10			701366.722(0.020)	5.3415	97.724	
1	7	3	5		1	6	2	5			702417.399(0.041)	1.0576	311.735	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	16	−2	14		1	17	1	17			703265.658(0.142)	0.2E−4	448.617	
0	9	−2	8		0	8	0	8			703970.408(0.017)	0.0011	67.150	
1	21	7	14		1	20	8	12			704081.386(1.553)	1.1921	751.495	
0	20	2	19	−	0	19	3	16	−		704288.757(0.086)	7.1893	341.020	
0	26	−1	26		0	25	−2	24			704999.279(0.386)	1.7432	543.787	
0	14	2	12		0	13	1	12			705182.279(0.031)	6.7882	161.449	
1	14	9	5	−	1	13	8	6	−		705336.796(0.068)	14.9295	620.602	
1	14	9	6	+	1	13	8	5	+		705336.796(0.068)	14.9295	620.602	
0	25	−3	23		0	25	−2	24			705446.587(0.246)	18.7159	543.787	
1	16	6	10		1	15	8	7			705622.903(0.676)	0.0043	606.704	
0	15	7	9		0	16	6	11			706082.965(0.057)	2.7806	343.521	
0	13	−2	12		0	12	2	10			706185.813(0.021)	0.0060	141.374	
1	12	−2	10		1	13	0	13			707019.428(0.089)	0.0001	355.292	
0	9	−3	7		0	10	−1	10			708735.387(0.026)	0.4E−4	92.543	
0	19	0	19		0	18	1	17			708811.374(0.078)	8.3773	290.469	
0	8	1	7		0	7	−1	7			709974.802(0.017)	0.0003	49.035	
0	23	−1	23		0	22	2	20			710320.451(0.178)	1.5732	423.662	
1	13	10	3		1	12	11	1			710670.043(3.989)	0.2080	757.455	
0	15	−7	8		0	16	−6	10			710713.961(0.056)	2.5904	350.599	
0	21	3	18		0	20	−3	18			711071.406(0.075)	0.1E−4	382.155	
0	26	2	24		0	25	3	22			712554.393(0.276)	5.4020	557.541	
1	14	5	9	−	0	13	9	4	−		712649.468(0.189)	0.5E−5	437.377	
1	14	5	10	+	0	13	9	5	+		712649.468(0.189)	0.5E−5	437.377	
1	26	2	24	+	1	25	1	25	+		712651.333(0.948)	16.0293	747.599	
0	17	1	16		0	16	−2	15			712716.177(0.037)	0.3777	237.672	
0	21	8	14		0	22	7	16			713465.951(0.170)	4.4703	581.261	
0	16	9	8		0	17	8	10			713655.771(0.099)	2.0304	479.487	
0	6	−2	5		0	5	−1	5		713982.470(0.050)	713982.440(0.015)	4.4460	28.073	PIC81
0	24	−3	22		0	24	−2	23			714072.457(0.199)	18.3945	503.261	
1	7	3	5		1	8	−2	6			714282.434(0.109)	0.5E−8	311.339	
1	10	6	4		1	9	7	2			714860.130(0.467)	0.5075	476.294	
1	9	−1	8		1	8	2	7			715237.946(0.419)	0.0004	335.870	
0	9	5	5	+	0	10	4	6	+		715556.860(0.038)	1.4541	144.561	
0	9	5	4	−	0	10	4	7	−		715557.170(0.038)	1.4541	144.561	
0	5	4	1		0	6	3	3			715898.006(0.033)	0.4771	67.043	
0	20	0	20		0	19	2	17			717401.973(0.106)	0.0160	322.143	
0	15	1	15	+	0	14	1	14	+		718158.806(0.015)	12.0793	177.941	
0	4	−4	1		0	3	−3	1			718436.178(0.025)	6.3851	53.266	
0	17	8	9	+	0	18	7	12	+		719638.187(0.091)	3.0531	445.637	
0	17	8	10	−	0	18	7	11	−		719638.187(0.091)	3.0531	445.637	
0	9	1	9	+	0	8	0	8	+	719664.884(0.100)**	719664.775(0.020)	10.1563	58.062	AND92
1	11	0	11		1	10	1	10			720069.340(0.018)	4.6194	291.074	
0	5	2	4	−	0	4	1	3	−	720441.306(0.050)*	720441.548(0.018)	3.8268	26.380	AND90
1	22	2	21		1	21	3	19			720452.820(0.899)	1.0303	660.759	
0	3	3	0		0	3	0	3			720675.207(0.025)	0.0001	18.803	
0	4	3	1		0	4	0	4			720734.294(0.024)	0.0004	25.254	
1	20	−4	16		1	21	−3	18			720745.753(0.391)	5.3598	595.527	
0	5	3	2		0	5	0	5			720877.735(0.023)	0.0013	33.316	
0	15	0	15		0	14	0	14			721010.717(0.012)	12.0926	178.025	
0	6	3	3		0	6	0	6			721151.535(0.022)	0.0033	42.988	
1	15	−13	3		1	14	−13	2			721413.219(0.681)	2.5973	998.973	
1	14	−4	10		0	13	−9	4			721447.662(0.211)	0.2E−8	426.631	
1	15	3	13		1	14	3	12			721522.342(0.059)	11.5988	458.864	
1	15	6	9	+	1	14	6	8	+		721541.230(0.051)	10.2184	494.157	
1	15	6	10	−	1	14	6	9	−		721541.230(0.051)	10.2184	494.157	
0	7	3	4		0	7	0	7			721610.260(0.021)	0.0070	54.266	
1	15	12	3	+	1	14	12	2	+		721627.075(0.467)	3.7969	895.072	
1	15	12	4	−	1	14	12	3	−		721627.075(0.467)	3.7969	895.072	
1	15	8	7	+	1	14	8	6	+		721631.832(0.054)	3.2552	643.070	
1	15	8	8	−	1	14	8	7	−		721631.832(0.054)	3.2552	643.070	
1	15	12	3		1	14	12	2			721711.125(0.217)	4.3997	860.908	
1	15	13	2		1	14	13	1			721715.594(0.357)	2.9963	1003.570	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	20	2	18	+	0	19	3	17	+		721792.693(0.082)	7.7411	340.974	
1	15	11	4		1	14	11	3			721815.443(0.281)	4.9677	800.802	
1	15	−12	4		1	14	−12	3			721927.658(0.261)	4.3584	937.563	
1	15	−10	6		1	14	−10	5			721934.188(0.178)	5.6325	716.897	
0	23	−3	21		0	23	−2	22			721986.320(0.160)	18.0838	464.361	
1	15	6	9		1	14	6	8			722017.636(0.104)	9.7477	580.476	
1	15	1	15	+	1	14	1	14	+		722039.105(0.029)	12.0913	394.776	
1	15	−7	9		1	14	−7	8			722130.452(0.043)	9.6101	532.569	
1	15	11	4	−	1	14	11	3	−		722150.891(0.182)	5.7172	875.353	
1	15	11	5	+	1	14	11	4	+		722150.892(0.182)	5.7172	875.353	
1	15	−11	5		1	14	−11	4			722178.786(0.127)	5.6187	789.302	
1	15	10	5		1	14	10	4			722242.065(0.138)	7.0450	803.649	
0	22	10	12	+	0	23	9	15	+		722272.411(0.446)	3.7461	735.177	
0	22	10	13	−	0	23	9	14	−		722272.411(0.446)	3.7461	735.177	
1	15	7	8		1	14	7	7			722316.277(0.111)	8.9721	572.707	
0	8	3	5		0	8	0	8			722316.377(0.021)	0.0136	67.150	
1	15	10	5	+	1	14	10	4	+		722348.750(0.069)	6.7290	728.687	
1	15	10	6	−	1	14	10	5	−		722348.750(0.069)	6.7290	728.687	
1	15	−9	7		1	14	−9	6			722356.158(0.117)	8.8429	721.768	
1	15	9	6		1	14	9	5			722483.878(0.048)	7.7401	678.549	
1	15	−2	13		1	14	−2	12			722545.711(0.033)	11.9369	422.271	
1	15	−6	10		1	14	−6	9			722567.892(0.051)	9.8703	511.781	
1	15	−8	8		1	14	−8	7			722602.147(0.041)	8.6594	638.223	
1	15	7	8	−	1	14	7	7	−		722702.652(0.044)	9.5130	606.607	
1	15	7	9	+	1	14	7	8	+		722702.652(0.044)	9.5130	606.607	
1	15	5	10	−	1	14	5	9	−		722703.936(0.039)	10.5992	461.148	
1	15	5	11	+	1	14	5	10	+		722703.936(0.039)	10.5992	461.148	
1	15	4	12		1	14	4	11			722742.811(0.030)	11.1567	421.427	
1	15	2	13	+	1	14	2	12	+		722789.490(0.029)	11.8788	376.468	
1	15	−3	12		1	14	−3	11			722805.033(0.027)	11.5789	393.115	
1	15	0	15		1	14	0	14			722823.979(0.030)	12.1331	377.799	
1	15	1	15		1	14	1	14			722849.297(0.029)	12.0627	371.473	
1	15	2	14	−	1	14	2	13	−		722888.917(0.028)	11.8788	376.479	
1	12	−9	4		1	11	−10	2			722954.799(1.390)	0.2612	654.271	
1	15	9	6	−	1	14	9	5	−		722963.317(0.055)	13.9495	644.129	
1	15	9	7	+	1	14	9	6	+		722963.317(0.055)	13.9495	644.129	
0	15	−1	15		0	14	−1	14			723040.392(0.012)	12.0716	173.017	
1	15	3	13	+	1	14	3	12	+		723193.004(0.029)	11.6329	444.231	
1	15	3	12	−	1	14	3	11	−		723194.756(0.030)	11.6329	444.231	
0	15	14	1	+	0	14	14	0	+		723199.979(0.254)	1.4916	847.575	
0	15	14	2	−	0	14	14	1	−		723199.979(0.254)	1.4916	847.575	
1	15	2	14		1	14	2	13			723204.977(0.033)	11.9395	446.866	
1	15	−1	14		1	14	−1	13			723251.959(0.042)	12.0566	456.252	
0	18	−1	18		0	17	0	17			723279.970(0.035)	16.6284	254.930	
1	15	0	15	+	1	14	0	14	+		723334.995(0.060)	12.1218	463.411	
1	15	−4	11		1	14	−4	10			723338.273(0.036)	11.2550	450.696	
0	9	3	6		0	9	0	9			723339.266(0.021)	0.0240	81.637	
0	15	13	3		0	14	13	2			723398.374(0.167)	2.9063	752.888	
1	15	8	7		1	14	8	6			723401.810(0.043)	9.1267	582.574	
1	15	−5	11		1	14	−5	10			723448.680(0.050)	10.7223	548.523	
1	15	1	14	−	1	14	1	13	−		723461.624(0.042)	12.0908	395.111	
0	15	−13	2		0	14	−13	1			723467.512(0.131)	2.9560	753.595	
0	15	13	2	−	0	14	13	1	−		723583.555(0.163)	2.9423	762.610	
0	15	13	3	+	0	14	13	2	+		723583.555(0.163)	2.9423	762.610	
0	15	−12	3		0	14	−12	2			723603.373(0.105)	4.2403	665.552	
0	15	0	15	+	0	14	0	14	+		723619.288(0.012)	12.1239	169.206	
0	15	12	3	+	0	14	12	2	+		723722.537(0.083)	4.2977	670.021	
0	15	12	4	−	0	14	12	3	−		723722.537(0.083)	4.2977	670.021	
0	15	12	4		0	14	12	3			723771.329(0.118)	4.2580	676.124	
0	15	11	4	−	0	14	11	3	−		723814.893(0.063)	5.4856	585.766	
0	15	11	5	+	0	14	11	4	+		723814.893(0.063)	5.4856	585.766	
0	15	−11	4		0	14	−11	3			723930.056(0.083)	5.4723	595.509	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	15	11	5		0	14	11	4			723951.674(0.052)	5.5402	593.474	
0	15	10	6		0	14	10	5			724027.272(0.039)	6.6345	513.636	
0	15	10	5	+	0	14	10	4	+		724070.031(0.058)	6.5905	521.117	
0	15	10	6	−	0	14	10	5	−		724070.031(0.058)	6.5905	521.117	
0	4	3	1		0	3	2	1		724121.576(0.050)	724121.610(0.019)	5.2213	25.141	LEE94
1	15	4	12	−	1	14	4	11	−		724125.417(0.069)	11.2673	503.366	
1	15	4	11	+	1	14	4	10	+		724125.435(0.069)	11.2673	503.366	
0	15	−10	5		0	14	−10	4			724153.938(0.035)	6.6791	523.581	
0	15	9	7		0	14	9	6			724202.445(0.039)	7.6161	453.372	
0	15	−9	6		0	14	−9	5			724232.527(0.027)	7.6810	449.181	
1	15	5	10		1	14	5	9			724262.351(0.075)	10.8009	467.272	
0	15	9	6	−	0	14	9	5	−		724324.602(0.027)	7.7107	459.930	
0	15	9	7	+	0	14	9	6	+		724324.602(0.027)	7.7107	459.930	
0	15	−8	7		0	14	−8	6			724336.960(0.027)	8.5485	392.671	
0	15	2	14	−	0	14	2	13	−		724345.382(0.013)	11.9735	195.504	
0	15	8	7	+	0	14	8	6	+		724423.448(0.022)	8.6216	392.327	
0	15	8	8	−	0	14	8	7	−		724423.448(0.022)	8.6216	392.327	
0	15	8	8		0	14	8	7			724461.762(0.022)	8.6319	402.169	
1	21	4	18	−	1	22	3	19	−		724481.289(1.044)	1.7134	682.158	
0	15	7	8	−	0	14	7	7	−		724482.235(0.021)	9.3833	339.330	
0	15	7	9	+	0	14	7	8	+		724482.235(0.021)	9.3833	339.330	
1	15	13	2	−	1	14	13	1	−		724516.593(3.665)	3.1739	943.986	
1	15	13	3	+	1	14	13	2	+		724516.593(3.665)	3.1739	943.986	
1	21	4	17	+	1	22	3	20	+		724530.702(1.047)	1.7127	682.157	
0	15	−7	8		0	14	−7	7			724565.107(0.019)	9.4422	350.137	
0	15	7	9		0	14	7	8			724594.444(0.020)	9.4540	342.904	
0	15	6	9	+	0	14	6	8	+		724644.726(0.017)	10.1430	303.936	
0	15	6	10	−	0	14	6	9	−		724644.726(0.017)	10.1430	303.936	
0	15	6	10		0	14	6	9			724648.350(0.018)	10.1144	293.570	
0	15	5	11		0	14	5	10			724719.257(0.015)	10.7367	263.889	
0	15	−6	9		0	14	−6	8			724740.442(0.017)	10.1772	300.641	
0	12	−6	6		0	13	−5	8			724750.659(0.041)	2.1113	232.945	
0	10	3	7		0	10	0	10			724753.850(0.022)	0.0398	97.724	
0	15	−4	12		0	14	−4	11			724823.472(0.013)	11.2249	230.426	
0	15	−5	10		0	14	−5	9			724851.142(0.015)	10.7365	255.514	
0	15	5	11	+	0	14	5	10	+		724855.173(0.015)	10.7904	265.171	
0	15	5	10	−	0	14	5	9	−		724855.185(0.015)	10.7904	265.171	
0	15	4	11		0	14	4	10			724930.769(0.014)	11.2933	236.068	
0	15	−3	13		0	14	−3	12			724962.880(0.013)	11.6865	212.942	
0	15	3	13	+	0	14	3	12	+		725013.110(0.012)	11.6059	203.969	
0	15	4	12	−	0	14	4	11	−		725122.307(0.013)	11.2462	225.197	
0	15	4	11	+	0	14	4	10	+		725125.573(0.013)	11.2462	225.197	
0	15	3	12	−	0	14	3	11	−		725126.409(0.012)	11.6058	203.976	
0	15	1	14		0	14	1	13			725315.716(0.013)	12.2480	184.032	
1	19	1	19		1	18	0	18			725455.258(0.081)	9.7578	483.857	
0	15	3	12		0	14	3	11			725565.480(0.012)	11.6417	202.572	
0	15	2	13	+	0	14	2	12	+		725593.933(0.013)	11.9750	195.641	
0	15	2	13		0	14	2	12			726052.066(0.013)	11.7931	184.972	
0	11	3	8		0	11	0	11			726638.852(0.024)	0.0622	115.409	
1	5	−1	4		1	6	−2	4			726799.005(0.494)	1.1489	287.209	
0	15	−2	14		0	14	−2	13			726899.246(0.012)	11.9123	187.554	
0	11	2	9		0	10	0	10			727679.815(0.022)	0.0018	97.724	
0	8	6	2	+	0	9	5	5	+		727725.684(0.056)	0.6060	168.430	
0	8	6	3	−	0	9	5	4	−		727725.684(0.056)	0.6060	168.430	
0	16	−9	7		1	15	−4	11			727893.541(0.217)	0.7E−7	474.824	
0	19	−9	10		0	20	−8	12			728686.144(0.154)	3.3456	561.729	
0	5	2	3	+	0	4	1	4	+	728862.523(0.050)	728862.634(0.017)	3.7474	26.101	HER84
0	12	3	9		0	12	0	12			729074.721(0.027)	0.0926	134.689	
0	22	−3	20		0	22	−2	21			729158.863(0.127)	17.7622	427.088	
0	23	0	23		0	22	−2	21			729404.706(0.234)	0.0022	427.088	
1	2	−2	0		1	3	−3	0			730013.610(0.081)	4.5856	233.896	
1	21	2	20		1	20	−1	19			730242.125(0.479)	0.0379	625.078	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	24	11	13	−	0	25	10	16	−		730255.916(0.444)	4.4706	875.005	
0	24	11	14	+	0	25	10	15	+		730255.916(0.444)	4.4706	875.005	
0	15	1	14	−	0	14	1	13	−		730519.486(0.013)	12.0837	180.851	
0	20	0	20	+	0	19	1	19	+		730549.810(0.076)	22.8248	313.620	
1	17	11	6		1	16	10	6			731607.228(4.971)	17.1980	853.433	
0	13	3	10		0	13	0	13			732141.376(0.029)	0.1320	155.562	
0	12	0	12		0	11	−1	11			732432.211(0.020)	7.7787	110.258	
0	26	−3	24		0	25	−4	22			732576.495(0.196)	9.6618	584.721	
0	13	−2	12		0	12	1	11			733033.017(0.022)	0.1515	140.478	
0	10	3	8	+	0	9	2	7	+	734893.742(0.050)	734893.798(0.016)	7.1945	98.824	AND90
0	8	2	6		0	7	−1	7			735269.204(0.017)	0.0068	49.035	
1	7	2	6		1	7	−2	5			735330.052(0.108)	0.1E−8	298.470	
1	8	2	7		1	8	−2	6			735429.128(0.104)	0.4E−8	311.339	
1	9	2	8		1	9	−2	7			735570.813(0.102)	0.8E−8	325.815	
0	21	−3	19		0	21	−2	20			735572.855(0.099)	17.4076	391.444	
0	10	3	7	−	0	9	2	8	−	735673.039(0.050)	735672.996(0.015)	7.1704	98.799	AND90
1	10	2	9		1	10	−2	8			735765.714(0.101)	0.2E−7	341.896	
0	14	3	11		0	14	0	14			735915.940(0.032)	0.1811	178.025	
1	11	2	10		1	11	−2	9			736025.579(0.101)	0.3E−7	359.584	
1	12	2	11		1	12	−2	10			736363.274(0.103)	0.6E−7	378.876	
1	16	8	8	+	1	15	9	7	+		736576.852(0.070)	3.3029	668.245	
1	16	8	9	−	1	15	9	6	−		736576.852(0.070)	3.3029	668.245	
1	13	2	12		1	13	−2	11			736792.769(0.107)	0.1E−6	399.772	
1	14	8	6		1	13	6	7			736991.710(0.434)	0.0051	557.991	
1	14	2	13		1	14	−2	12			737329.106(0.113)	0.2E−6	422.271	
0	16	9	7	−	1	15	5	10	−		737601.633(0.176)	0.0001	485.255	
0	16	9	8	+	1	15	5	11	+		737601.633(0.176)	0.0001	485.255	
0	23	1	22	−	0	22	2	21	−		737625.596(0.167)	12.9188	433.642	
1	15	2	14		1	15	−2	13			737988.372(0.124)	0.3E−6	446.373	
1	16	2	15		1	16	−2	14			738787.660(0.141)	0.4E−6	472.076	
1	17	2	16		1	17	−2	15			739745.023(0.168)	0.6E−6	499.379	
1	7	3	5		1	8	4	5			739953.191(0.198)	7.7927	310.483	
0	15	3	12		0	15	0	15			740470.702(0.035)	0.2400	202.075	
1	18	2	17		1	18	−2	16			740879.430(0.206)	0.1E−5	528.280	
0	23	−1	23		0	22	1	21			741072.535(0.173)	0.0220	422.636	
0	20	−3	18		0	20	−2	19			741226.355(0.077)	16.9990	357.431	
1	24	3	22		1	25	−3	22			741262.897(1.328)	0.5E−6	746.364	
1	19	2	18		1	19	−2	17			742210.702(0.258)	0.1E−5	558.780	
1	25	0	25		1	24	−3	21			742481.347(0.468)	0.0070	706.262	
0	24	−2	23		0	23	3	20			742862.093(0.138)	1.4931	478.482	
0	17	2	15		0	16	−2	15			743024.192(0.041)	0.0251	237.672	
0	5	−3	3		0	6	0	6			743464.982(0.027)	0.0006	42.988	
1	20	2	19		1	20	−2	18			743759.448(0.326)	0.2E−5	590.876	
0	10	−8	2		0	11	−7	4			744259.178(0.096)	0.5268	287.283	
0	21	10	12		0	22	9	14			744560.571(0.250)	3.6679	691.568	
0	6	3	3		0	5	−2	4			744594.737(0.014)	0.2E−4	42.206	
0	16	1	15		0	15	2	13			744696.503(0.032)	5.6139	209.190	
1	14	13	1	−	1	15	12	4	−		744755.423(3.135)	0.0885	919.143	
1	14	13	2	+	1	15	12	3	+		744755.423(3.135)	0.0885	919.143	
1	21	2	20		1	21	−2	19			745546.991(0.410)	0.3E−5	624.568	
1	12	5	7		1	13	4	10			745624.865(0.203)	1.6356	398.923	
1	23	−1	22		1	24	−3	21			745819.579(0.826)	0.0008	706.262	
0	16	3	13		0	16	0	16			745871.518(0.039)	0.3078	227.711	
1	17	2	16		1	18	−3	15			745926.612(0.163)	0.3E−5	499.172	
0	19	−3	17		0	19	−2	18			746134.901(0.060)	16.5200	325.047	
1	4	1	4	+	1	3	2	1	+		746403.959(0.028)	0.6838	217.245	
1	4	1	3	−	1	3	2	2	−		747365.392(0.030)	0.6826	217.245	
1	22	2	21		1	22	−2	20			747595.282(0.513)	0.4E−5	659.853	
0	9	−3	7		0	8	3	5			747682.361(0.020)	0.1E−8	91.244	
1	14	9	5		0	13	12	2			748320.914(0.667)	0.3E−6	653.588	
0	20	0	20		0	19	1	18			748628.682(0.104)	8.5378	321.101	
1	6	−3	3		1	5	0	5			748854.129(0.095)	0.9E−5	233.051	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	4	3	1		0	3	1	2			749050.325(0.026)	0.0014	24.310	
1	22	7	15		1	21	8	13			749303.787(1.754)	1.1980	785.278	
1	23	2	22		1	23	−2	21			749926.810(0.635)	0.6E−5	696.731	
0	17	12	6		1	16	9	7			749952.448(0.581)	0.0001	728.352	
0	21	2	20	−	0	20	3	17	−		750100.177(0.107)	7.6009	373.259	
0	18	−3	16		0	18	−2	17			750331.852(0.047)	15.9608	294.293	
1	8	3	6		1	7	2	6			750401.071(0.045)	1.1265	322.998	
0	12	1	11		0	11	0	11		751563.404(0.100)**	751551.156(0.023)	5.7770	115.409	AND92
0	24	−1	24		0	23	2	21			751644.540(0.229)	1.7432	460.689	
1	15	−2	13		1	16	1	16			751670.727(0.121)	0.1E−4	421.300	
1	17	6	11		1	16	8	8			751722.923(0.782)	0.0050	632.444	
0	13	−5	8		0	13	−4	10			752100.671(0.022)	12.0916	207.858	
0	14	−5	9		0	14	−4	11			752106.621(0.023)	13.2257	230.426	
0	12	−5	7		0	12	−4	9			752112.350(0.022)	10.9465	186.899	
0	15	−5	10		0	15	−4	12			752134.291(0.024)	14.3524	254.603	
0	11	−5	6		0	11	−4	8			752137.849(0.022)	9.7858	167.550	
0	10	−5	5		0	10	−4	7			752173.643(0.022)	8.6030	149.812	
0	17	3	14		0	17	0	17			752176.774(0.044)	0.3833	254.930	
0	16	−5	11		0	16	−4	13			752188.045(0.026)	15.4746	280.389	
0	9	−5	4		0	9	−4	6			752216.497(0.023)	7.3893	133.685	
0	8	−5	3		0	8	−4	5			752263.465(0.024)	6.1318	119.170	
0	17	−5	12		0	17	−4	14			752272.516(0.030)	16.5944	307.783	
0	7	−5	2		0	7	−4	4			752311.895(0.026)	4.8107	106.266	
0	6	−5	1		0	6	−4	3			752359.429(0.028)	3.3940	94.975	
0	18	−5	13		0	18	−4	15			752392.592(0.036)	17.7137	336.784	
0	5	−5	0		0	5	−4	2			752404.004(0.030)	1.8260	85.296	
0	19	−5	14		0	19	−4	16			752553.413(0.046)	18.8341	367.391	
1	24	2	23		1	24	−2	22			752564.502(0.778)	0.8E−5	735.200	
0	20	−5	15		0	20	−4	17			752760.347(0.060)	19.9569	399.604	
0	21	−5	16		0	21	−4	18			753018.983(0.078)	21.0833	433.421	
0	22	−5	17		0	22	−4	19			753335.107(0.100)	22.2142	468.843	
0	23	−5	18		0	23	−4	20			753714.684(0.127)	23.3505	505.867	
0	10	−2	9		0	9	0	9			753740.153(0.018)	0.0015	81.637	
0	17	−3	15		0	17	−2	16			753866.430(0.037)	15.3192	265.169	
0	24	−5	19		0	24	−4	21			754163.828(0.160)	24.4931	544.493	
0	15	2	13		0	14	1	13			754221.503(0.032)	7.1429	184.032	
0	14	7	8		0	15	6	10			754351.937(0.054)	2.3755	317.741	
0	25	−5	20		0	25	−4	22			754688.774(0.198)	25.6428	584.721	
1	15	9	6	−	1	14	8	7	−		754720.737(0.068)	14.8886	643.070	
1	15	9	7	+	1	14	8	6	+		754720.737(0.068)	14.8886	643.070	
0	14	−2	13		0	13	2	11			755116.726(0.023)	0.0092	162.366	
1	11	−2	9		1	12	0	12			755294.274(0.087)	0.5E−4	334.390	
0	26	−5	21		0	26	−4	23			755295.848(0.241)	26.8002	626.549	
1	25	2	24		1	25	−2	23			755531.610(0.945)	0.1E−4	775.259	
0	21	0	21		0	20	2	18			756210.418(0.142)	0.0187	354.387	
0	8	−3	6		0	9	−1	9			756459.809(0.025)	0.3E−4	76.433	
0	16	−3	14		0	16	−2	15			756799.745(0.031)	14.6002	237.672	
0	18	1	17		0	17	−2	16			758486.809(0.048)	0.4189	265.169	
0	9	1	8		0	8	−1	8			758722.055(0.018)	0.0005	61.930	
1	26	2	25		1	26	−2	24			758851.595(1.136)	0.1E−4	816.906	
0	14	−7	7		0	15	−6	9			759117.168(0.057)	2.2084	324.816	
1	14	10	4		1	13	11	2			759136.976(4.152)	0.3914	778.327	
0	15	−3	13		0	15	−2	14			759199.724(0.027)	13.8134	211.800	
0	24	0	24		0	23	−2	22			759220.954(0.310)	0.0020	464.361	
1	15	5	10	−	0	14	9	5	−		759233.224(0.185)	1.2E−5	459.930	
1	15	5	11	+	0	14	9	6	+		759233.224(0.185)	1.2E−5	459.930	
0	18	3	15		0	18	0	18			759437.007(0.054)	0.4645	283.731	
0	14	−3	12		0	14	−2	13			761136.090(0.024)	12.9710	187.554	
0	22	3	19		0	21	−3	19			761196.802(0.096)	0.2E−4	415.980	
0	20	8	13		0	21	7	15			761887.869(0.138)	4.0571	545.846	
0	15	9	7		0	16	8	9			762113.122(0.095)	1.6734	452.107	
1	6	3	4		1	7	−2	5			762557.140(0.109)	0.1E−8	298.470	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	7	−2	6		0	6	−1	6		762635.948(0.050)*	762635.592(0.015)	4.8120	37.749	HER84
0	13	−3	11		0	13	−2	12			762676.296(0.022)	12.0849	164.930	
1	11	6	5		1	10	7	3			763098.414(0.520)	0.8393	492.367	
1	10	−1	9		1	9	2	8			763490.993(0.415)	0.0008	350.351	
0	12	−3	10		0	12	−2	11			763882.821(0.021)	11.1655	143.927	
0	8	5	4	+	0	9	4	5	+		763951.114(0.040)	1.0782	128.432	
0	8	5	3	−	0	9	4	6	−		763951.247(0.040)	1.0782	128.432	
0	10	1	10	+	0	9	0	9	+	763952.404(0.100)**	763953.104(0.022)	11.2560	72.570	AND92
0	4	4	0		0	5	3	2			764281.563(0.034)	0.1909	57.362	
0	11	−3	9		0	11	−2	10			764811.795(0.020)	10.2204	124.544	
0	10	−3	8		0	10	−2	9			765512.637(0.019)	9.2550	106.779	
0	16	1	16	+	0	15	1	15	+		765865.625(0.019)	12.8905	201.897	
0	9	−3	7		0	9	−2	8			766028.331(0.019)	8.2717	90.632	
0	8	−3	6		0	8	−2	7			766396.012(0.019)	7.2705	76.102	
0	7	−3	5		0	7	−2	6			766647.634(0.019)	6.2481	63.188	
0	6	2	5	−	0	5	1	4	−	766710.345(0.050)	766710.415(0.018)	4.2657	34.516	HER84
0	5	−4	2		0	4	−3	2			766760.462(0.023)	6.5605	59.720	
0	6	−3	4		0	6	−2	5			766810.585(0.020)	5.1971	51.889	
0	5	−3	3		0	5	−2	4			766908.184(0.022)	4.1030	42.206	
0	4	−3	2		0	4	−2	3			766960.042(0.023)	2.9363	34.137	
0	3	−3	1		0	3	−2	2			766982.311(0.024)	1.6307	27.682	
1	19	−4	15		1	20	−3	17			767377.382(0.319)	5.0999	561.809	
0	19	3	16		0	19	0	19			767695.084(0.068)	0.5491	314.112	
0	16	8	9	−	0	17	7	10	−		767830.820(0.082)	2.6465	416.651	
0	16	8	8	+	0	17	7	11	+		767830.821(0.082)	2.6465	416.651	
1	12	0	12		1	11	1	11			768205.754(0.020)	5.1152	308.765	
0	16	0	16		0	15	0	15			768539.960(0.015)	12.8974	202.075	
1	15	−4	11		0	14	−9	5			768753.971(0.219)	$0.5E-8$	449.181	
1	16	3	14		1	15	3	13			769318.461(0.072)	12.4288	482.931	
1	16	6	11	−	1	15	6	10	−		769359.995(0.064)	11.1502	518.225	
1	16	6	10	+	1	15	6	9	+		769359.996(0.064)	11.1502	518.225	
1	16	−13	4		1	15	−13	3			769402.031(0.718)	3.7860	1023.040	
1	16	12	4	+	1	15	12	3	+		769631.319(0.494)	4.9242	919.143	
1	16	12	5	−	1	15	12	4	−		769631.319(0.494)	4.9242	919.143	
1	16	8	8	+	1	15	8	7	+		769665.758(0.058)	3.8715	667.141	
1	16	8	9	−	1	15	8	8	−		769665.758(0.058)	3.8715	667.141	
1	16	12	4		1	15	12	3			769686.979(0.241)	5.7014	884.982	
1	16	13	3		1	15	13	2			769741.572(0.373)	4.3641	1027.650	
1	16	11	5		1	15	11	4			769829.998(0.296)	6.0610	824.879	
1	16	6	10		1	15	6	9			769907.260(0.114)	10.6467	604.560	
1	16	−10	7		1	15	−10	6			769954.612(0.187)	6.6045	740.978	
1	16	−12	5		1	15	−12	4			769963.880(0.277)	5.6497	961.644	
1	16	1	16	+	1	15	1	15	+		770036.232(0.038)	12.9041	418.861	
1	20	4	17	−	1	21	3	18	−		770065.678(0.875)	1.6134	646.803	
1	16	−7	10		1	15	−7	9			770083.771(0.052)	10.5940	556.656	
1	20	4	16	+	1	21	3	19	+		770103.411(0.877)	1.6128	646.802	
1	16	11	5	−	1	15	11	4	−		770192.325(0.198)	6.9579	899.441	
1	16	11	6	+	1	15	11	5	+		770192.325(0.198)	6.9579	899.441	
1	16	−11	6		1	15	−11	5			770254.787(0.140)	6.8379	813.391	
1	16	10	6		1	15	10	5			770264.661(0.152)	8.2181	827.740	
1	16	7	9		1	15	7	8			770349.180(0.121)	9.8936	596.800	
1	16	−9	8		1	15	−9	7			770379.061(0.125)	10.0511	745.863	
1	16	10	6	+	1	15	10	5	+		770429.755(0.076)	7.8734	752.782	
1	16	10	7	−	1	15	10	6	−		770429.755(0.076)	7.8734	752.782	
1	16	−2	14		1	15	−2	13			770548.329(0.042)	12.7596	446.373	
1	16	9	7		1	15	9	6			770567.637(0.056)	8.8187	702.648	
1	16	−6	11		1	15	−6	10			770621.615(0.060)	10.7728	535.884	
1	16	−8	9		1	15	−8	8			770689.396(0.051)	9.6813	662.326	
0	25	9	16	−	0	26	8	19	−		770706.285(0.784)	5.5294	788.260	
0	25	9	17	+	0	26	8	18	+		770706.286(0.784)	5.5294	788.260	
0	21	10	11	+	0	22	9	14	+		770764.745(0.368)	3.3582	698.179	
0	21	10	12	−	0	22	9	13	−		770764.745(0.368)	3.3582	698.179	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	16	5	11	−	1	15	5	10	−		770770.250(0.047)	11.4779	485.255	
1	16	5	12	+	1	15	5	11	+		770770.250(0.047)	11.4779	485.255	
1	16	7	9	−	1	15	7	8	−		770791.351(0.055)	10.4890	630.714	
1	16	7	10	+	1	15	7	9	+		770791.351(0.055)	10.4890	630.714	
1	16	4	13		1	15	4	12			770804.461(0.037)	12.0113	445.535	
1	16	2	14	+	1	15	2	13	+		770845.239(0.037)	12.6987	400.578	
1	16	−3	13		1	15	−3	12			770870.778(0.035)	12.4135	417.225	
1	16	0	16		1	15	0	15			770881.209(0.038)	12.9419	401.910	
0	16	−1	16		0	15	−1	15			770885.716(0.014)	12.8825	197.135	
1	16	1	16		1	15	1	15			770913.486(0.038)	12.8738	395.585	
1	16	2	15	−	1	15	2	14	−		770965.829(0.036)	12.6987	400.592	
1	16	9	7	−	1	15	9	6	−		770994.649(0.058)	15.4927	668.245	
1	16	9	8	+	1	15	9	7	+		770994.649(0.058)	15.4927	668.245	
0	16	14	2	+	0	15	14	1	+		771283.080(0.264)	2.8937	871.698	
0	16	14	3	−	0	15	14	2	−		771283.080(0.264)	2.8937	871.698	
1	16	3	14	+	1	15	3	13	+		771338.971(0.037)	12.4709	468.354	
1	16	3	13	−	1	15	3	12	−		771341.386(0.038)	12.4709	468.354	
1	16	2	15		1	15	2	14			771347.616(0.041)	12.7637	470.990	
0	21	2	19	+	0	20	3	18	+		771380.384(0.101)	8.3136	373.197	
1	16	−1	15		1	15	−1	14			771392.049(0.050)	12.8674	480.377	
1	13	−9	5		1	12	−10	3			771434.201(1.543)	0.4880	673.543	
1	16	0	16	+	1	15	0	15	+		771479.647(0.069)	12.9300	487.539	
0	16	13	4		0	15	13	3			771496.530(0.175)	4.2334	777.018	
1	16	−4	12		1	15	−4	11			771524.439(0.046)	12.1169	474.824	
1	16	1	15	−	1	15	1	14	−		771550.127(0.053)	12.9034	419.243	
0	16	0	16	+	0	15	0	15	+		771575.557(0.014)	12.9316	193.344	
0	16	−13	3		0	15	−13	2			771588.863(0.128)	4.3053	777.728	
1	16	−5	12		1	15	−5	11			771660.564(0.059)	11.6109	572.655	
1	16	8	8		1	15	8	7			771662.005(0.049)	10.1917	606.704	
0	16	13	3	−	0	15	13	2	−		771714.428(0.167)	4.2855	786.746	
0	16	13	4	+	0	15	13	3	+		771714.428(0.167)	4.2855	786.746	
0	16	−12	4		0	15	−12	3			771720.458(0.109)	5.4969	689.689	
0	16	12	4	+	0	15	12	3	+		771868.436(0.079)	5.5710	694.161	
0	16	12	5	−	0	15	12	4	−		771868.436(0.079)	5.5710	694.161	
0	16	12	5		0	15	12	4			771911.930(0.124)	5.5199	700.266	
0	16	11	5	−	0	15	11	4	−		771953.686(0.064)	6.6758	609.910	
0	16	11	6	+	0	15	11	5	+		771953.686(0.064)	6.6758	609.910	
0	16	−11	5		0	15	−11	4			772078.914(0.088)	6.6601	619.657	
0	16	11	6		0	15	11	5			772115.156(0.050)	6.7422	617.622	
0	16	10	7		0	15	10	6			772188.512(0.040)	7.7623	537.787	
0	16	10	6	+	0	15	10	5	+		772226.852(0.062)	7.7115	545.270	
0	16	10	7	−	0	15	10	6	−		772226.852(0.062)	7.7115	545.270	
0	16	−10	6		0	15	−10	5			772330.641(0.036)	7.8146	547.736	
0	16	9	8		0	15	9	7			772368.438(0.043)	8.6777	477.529	
0	16	−9	7		0	15	−9	6			772414.985(0.030)	8.7511	473.339	
0	16	2	15	−	0	15	2	14	−		772440.764(0.016)	12.7986	219.666	
0	5	3	2		0	4	2	2		772453.803(0.050)	772453.884(0.019)	5.5467	31.596	HER84
1	16	4	13	−	1	15	4	12	−		772481.220(0.085)	12.1300	527.520	
1	16	4	12	+	1	15	4	11	+		772481.248(0.085)	12.1300	527.520	
0	16	9	7	−	0	15	9	6	−		772510.255(0.029)	8.7851	484.090	
0	16	9	8	+	0	15	9	7	+		772510.255(0.029)	8.7851	484.090	
0	16	−8	8		0	15	−8	7			772514.708(0.031)	9.5577	416.832	
0	16	8	8	+	0	15	8	7	+		772624.556(0.026)	9.6389	416.491	
0	16	8	9	−	0	15	8	8	−		772624.556(0.026)	9.6389	416.491	
1	16	5	11		1	15	5	10			772648.729(0.090)	11.6985	491.431	
0	16	8	9		0	15	8	8			772653.974(0.026)	9.6509	426.334	
0	16	7	9	−	0	15	7	8	−		772675.703(0.025)	10.3465	363.496	
0	16	7	10	+	0	15	7	9	+		772675.703(0.025)	10.3465	363.496	
0	16	−7	9		0	15	−7	8			772760.962(0.023)	10.4117	374.306	
0	16	7	10		0	15	7	9			772810.872(0.023)	10.4242	367.074	
0	16	6	10	+	0	15	6	9	+		772843.663(0.020)	11.0693	328.108	
0	16	6	11	−	0	15	6	10	−		772843.663(0.020)	11.0693	328.108	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	16	6	11		0	15	6	10			772863.417(0.021)	11.0376	317.741	
0	16	5	12		0	15	5	11			772923.950(0.018)	11.6265	288.063	
0	16	−6	10		0	15	−6	9			772968.314(0.021)	11.1060	324.816	
0	16	−4	13		0	15	−4	12			773043.139(0.016)	12.0851	254.603	
0	16	5	12	+	0	15	5	11	+		773089.939(0.018)	11.6839	289.349	
0	16	5	11	−	0	15	5	10	−		773089.961(0.018)	11.6839	289.349	
0	16	−5	11		0	15	−5	10			773096.893(0.018)	11.6257	279.692	
0	11	−6	5		0	12	−5	7			773103.881(0.043)	1.7176	211.986	
0	16	4	12		0	15	4	11			773167.086(0.016)	12.1577	260.249	
0	16	−3	14		0	15	−3	13			773195.606(0.015)	12.5282	237.125	
0	16	3	14	+	0	15	3	13	+		773259.158(0.014)	12.4433	228.152	
1	23	2	22		1	22	3	20			773272.684(1.076)	1.0466	695.953	
0	16	4	13	−	0	15	4	12	−		773413.766(0.016)	12.1072	249.385	
0	16	3	13	−	0	15	3	12	−		773415.743(0.014)	12.4431	228.164	
0	16	4	12	+	0	15	4	11	+		773418.925(0.016)	12.1072	249.385	
1	20	1	20		1	19	0	19			773472.712(0.100)	10.3477	514.375	
0	16	1	15		0	15	1	14			773602.290(0.016)	13.0541	208.226	
1	16	13	3	−	1	15	13	2	−		773810.840(5.023)	4.6176	968.153	
1	16	13	4	+	1	15	13	3	+		773810.840(5.023)	4.6176	968.153	
0	19	−1	19		0	18	0	18			773892.541(0.041)	18.2867	283.731	
0	16	3	13		0	15	3	12			773940.776(0.015)	12.4805	226.775	
0	16	2	14	+	0	15	2	13	+		773950.168(0.016)	12.8007	219.844	
0	16	2	14		0	15	2	13			774333.424(0.015)	12.6103	209.190	
1	4	−1	3		1	5	−2	3			774963.356(0.498)	1.0357	277.556	
0	16	−2	15		0	15	−2	14			775595.585(0.014)	12.7314	211.800	
0	7	6	1	+	0	8	5	4	+		776106.337(0.061)	0.3404	153.915	
0	7	6	2	−	0	8	5	3	−		776106.337(0.061)	0.3404	153.915	
0	18	−9	9		0	19	−8	11			776840.847(0.132)	2.9332	529.540	
0	17	−9	8		1	16	−4	12			776947.229(0.241)	$0.1E-6$	500.559	
0	20	3	17		0	20	0	20			776986.854(0.090)	0.6342	346.073	
1	22	2	21		1	21	−1	20			778272.761(0.507)	0.0480	658.830	
0	12	2	10		0	11	0	11			778398.360(0.026)	0.0024	115.409	
0	23	11	12	−	0	24	10	15	−		778590.143(0.382)	4.0199	834.828	
0	23	11	13	+	0	24	10	14	+		778590.143(0.382)	4.0199	834.828	
0	16	1	15	−	0	15	1	14	−		779008.709(0.016)	12.8956	205.219	
0	13	0	13		0	12	−1	12			779030.673(0.022)	8.9057	129.577	
1	18	11	7		1	17	10	7			779140.338(5.249)	17.5159	880.728	
0	6	2	4	+	0	5	1	5	+	779380.507(0.050)	779380.486(0.018)	4.1330	34.098	HER84
0	24	−1	24		0	23	1	22			781617.384(0.224)	0.0252	459.690	
0	14	−2	13		0	13	1	12			782589.227(0.023)	0.1895	161.449	
0	11	3	9	+	0	10	2	8	+		783001.615(0.017)	7.6234	114.960	
1	17	8	9	+	1	16	9	8	+		783261.592(0.078)	3.9482	693.962	
1	17	8	10	−	1	16	9	7	−		783261.592(0.078)	3.9482	693.962	
0	11	3	8	−	0	10	2	9	−		784177.312(0.017)	7.5849	114.923	
0	9	2	7		0	8	−1	8			784263.429(0.019)	0.0140	61.930	
0	21	0	21	+	0	20	1	20	+		784692.979(0.091)	24.3982	345.521	
1	15	8	7		1	14	6	8			786301.993(0.505)	0.0048	580.476	
0	21	3	18		0	21	0	21			787342.065(0.121)	0.7172	379.611	
0	25	0	25		0	24	−2	23			787453.811(0.402)	0.0017	503.261	
0	17	9	8	−	1	16	5	11	−		787507.143(0.186)	0.0003	510.965	
0	17	9	9	+	1	16	5	12	+		787507.144(0.186)	0.0003	510.965	
0	21	0	21		0	20	1	19			787568.767(0.139)	8.6287	353.341	
1	6	3	4		1	7	4	4			788212.204(0.201)	7.3568	297.615	
0	18	2	16		0	17	−2	16			789345.087(0.052)	0.0310	265.169	
1	25	3	22	−	1	26	2	25	−		789806.367(0.831)	8.4707	771.490	
1	26	0	26		1	25	−3	22			790054.414(0.551)	0.0084	746.364	
1	13	13	0	−	1	14	12	3	−		791274.134(2.160)	0.0256	895.072	
1	13	13	1	+	1	14	12	2	+		791274.134(2.160)	0.0256	895.072	
0	4	−3	2		0	5	0	5			791552.068(0.028)	0.0002	33.316	
0	17	1	16		0	16	2	14			792232.467(0.036)	6.1207	235.019	
1	22	−1	21		1	23	−3	20			792354.724(0.713)	0.0008	667.754	
0	25	−1	25		0	24	2	22			792567.273(0.289)	1.8826	499.307	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	9	−8	1		0	10	−7	3			792685.169(0.107)	0.2891	269.551	
0	20	10	11		0	21	9	13			792754.685(0.215)	3.2447	656.181	
0	7	3	4		0	6	−2	5			792870.666(0.014)	0.0001	51.889	
1	11	5	6		1	12	4	9			792995.120(0.180)	1.4557	378.024	
1	25	3	23	+	1	26	2	24	+		793302.353(0.806)	8.4385	771.370	
1	16	2	15		1	17	−3	14			793380.856(0.148)	0.2E−5	470.255	
1	23	3	21		1	24	−3	21			793502.185(1.141)	0.2E−6	706.262	
1	23	7	16		1	22	8	14			794207.865(1.979)	1.1974	820.667	
1	5	1	5	+	1	4	2	2	+		794400.753(0.028)	1.0991	223.682	
0	22	0	22		0	21	2	19			794430.871(0.187)	0.0218	388.227	
0	24	1	23	−	0	23	2	22	−		794683.806(0.203)	13.9526	470.600	
1	15	9	6		0	14	12	3			795194.204(0.630)	0.1E−5	676.124	
0	22	2	21	−	0	21	3	18	−		795493.210(0.132)	7.9951	407.108	
1	5	1	4	−	1	4	2	3	−		795841.104(0.029)	1.0962	223.682	
0	10	−3	8		0	9	3	6			795913.525(0.020)	0.3E−8	105.765	
0	25	−2	24		0	24	3	21			796896.925(0.172)	1.7883	517.205	
1	7	−3	4		1	6	0	6			797035.006(0.092)	0.2E−4	242.705	
0	5	3	2		0	4	1	3			797387.363(0.025)	0.0026	30.764	
1	18	6	12		1	17	8	9			797390.712(0.901)	0.0055	659.794	
1	9	3	7		1	8	2	7			798266.623(0.054)	1.1954	335.870	
0	22	3	19		0	22	0	22			798785.389(0.162)	0.7954	414.727	
0	18	12	7		1	17	9	8			799444.163(0.623)	0.0001	755.659	
1	14	−2	12		1	15	1	15			800038.503(0.106)	0.9E−5	395.585	
0	13	1	12		0	12	0	12			802241.090(0.026)	6.1964	134.689	
0	13	7	7		0	14	6	9			802638.592(0.053)	1.9818	293.570	
0	16	2	14		0	15	1	14			803239.211(0.034)	7.5406	208.226	
1	10	−2	8		1	11	0	11			803556.786(0.085)	0.3E−4	315.093	
0	19	1	18		0	18	−2	17			803679.167(0.062)	0.4485	294.293	
0	11	−2	10		0	10	0	10			804024.818(0.020)	0.0019	97.724	
1	16	9	7	−	1	15	8	8	−		804083.554(0.070)	14.9255	667.141	
1	16	9	8	+	1	15	8	7	+		804083.555(0.070)	14.9255	667.141	
0	15	−2	14		0	14	2	12			804306.195(0.026)	0.0133	184.972	
0	7	−3	5		0	8	−1	8			804351.330(0.025)	0.2E−4	61.930	
1	16	5	11	−	0	15	9	6	−		805678.872(0.192)	2.8E−5	484.090	
1	16	5	12	+	0	15	9	7	+		805678.872(0.192)	2.8E−5	484.090	
0	13	−7	6		0	14	−6	8			807508.059(0.059)	1.8386	300.641	
1	15	10	5		1	14	11	3			807597.486(4.336)	0.6169	800.802	
0	10	1	9		0	9	−1	9			807614.925(0.020)	0.0008	76.433	
0	11	1	11	+	0	10	0	10	+		807865.839(0.024)	12.3821	88.686	
0	19	8	12		0	20	7	14			810291.686(0.113)	3.6500	512.036	
0	14	9	6		0	15	8	8			810564.651(0.098)	1.3353	426.334	
1	12	6	6		1	11	7	4			811246.194(0.612)	1.2566	510.045	
0	23	3	20		0	23	0	23			811337.400(0.213)	0.8663	451.418	
0	8	−2	7		0	7	−1	7		811445.210(0.050)*	811444.522(0.015)	5.1498	49.035	HER84
0	23	3	20		0	22	−3	20			811583.243(0.121)	0.4E−4	451.410	
1	11	−1	10		1	10	2	9			811737.353(0.412)	0.0013	366.439	
0	7	5	3	+	0	8	4	4	+		812333.337(0.042)	0.7284	113.915	
0	7	5	2	−	0	8	4	5	−		812333.388(0.042)	0.7284	113.915	
0	7	2	6	−	0	6	1	5	−		812550.357(0.018)	4.7211	44.278	
0	17	1	17	+	0	16	1	16	+		813541.803(0.024)	13.7012	227.443	
0	26	0	26		0	25	−2	24			814136.845(0.513)	0.0014	543.787	
1	18	−4	14		1	19	−3	16			814227.031(0.259)	4.8236	529.691	
0	6	−4	3		0	5	−3	3			815070.511(0.022)	6.8273	67.787	
1	19	4	16	−	1	20	3	17	−		815964.842(0.730)	1.5112	613.051	
1	19	4	15	+	1	20	3	18	+		815993.267(0.732)	1.5108	613.050	
0	17	0	17		0	16	0	16			816010.934(0.020)	13.7026	227.711	
1	16	−4	12		0	15	−9	6			816045.883(0.237)	0.1E−7	473.339	
0	15	8	7	+	0	16	7	10	+		816055.026(0.075)	2.2507	389.270	
0	15	8	8	−	0	16	7	9	−		816055.026(0.075)	2.2507	389.270	
1	13	0	13		1	12	1	12			816319.599(0.025)	5.6204	328.063	
1	17	3	15		1	16	3	14			817064.815(0.087)	13.2544	508.593	
1	17	6	12	−	1	16	6	11	−		817130.972(0.079)	12.0673	543.888	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	17	6	11	+	1	16	6	10	+		817130.973(0.079)	12.0673	543.888	
1	17	−13	5		1	16	−13	4			817370.508(0.756)	4.9190	1048.700	
1	17	12	5	+	1	16	12	4	+		817615.494(0.525)	6.0031	944.815	
1	17	12	6	−	1	16	12	5	−		817615.494(0.525)	6.0031	944.815	
1	17	12	5		1	16	12	4			817636.869(0.282)	6.9447	910.656	
1	17	8	9	+	1	16	8	8	+		817679.388(0.069)	4.5156	692.814	
1	17	8	9	+	1	16	8	8	+		817679.388(0.069)	4.5156	692.814	
1	17	13	4		1	16	13	3			817750.426(0.390)	5.6655	1053.320	
1	17	6	11		1	16	6	10			817762.025(0.126)	11.5370	630.241	
1	17	11	6		1	16	11	5			817823.934(0.313)	7.1178	850.558	
1	17	10	8		1	16	−10	7			817954.002(0.199)	7.5482	766.661	
1	17	−12	6		1	16	−12	5			817982.213(0.296)	6.8841	987.327	
1	17	−7	11		1	16	−7	10			818001.681(0.063)	11.5576	582.344	
1	17	1	17	+	1	16	1	16	+		818006.665(0.048)	13.7163	444.547	
1	17	11	6	−	1	16	11	5	−		818214.028(0.217)	8.1498	925.132	
1	17	11	7	+	1	16	11	6	+		818214.028(0.217)	8.1498	925.132	
1	17	10	7		1	16	10	6			818262.855(0.174)	9.3418	853.433	
1	17	−11	7		1	16	−11	6			818317.361(0.160)	8.0091	839.084	
1	17	7	10		1	16	7	9			818358.623(0.133)	10.7967	622.497	
1	17	−9	9		1	16	−9	8			818376.196(0.142)	11.2160	771.560	
1	17	10	7	+	1	16	10	6	+		818496.138(0.088)	8.9786	778.480	
1	17	10	8	−	1	16	10	7	−		818496.138(0.088)	8.9786	778.480	
1	17	−2	15		1	16	−2	14			818519.009(0.052)	13.5806	472.076	
1	17	9	8		1	16	9	7			818635.552(0.067)	9.8654	728.352	
1	17	−6	12		1	16	−6	11			818652.635(0.071)	11.6619	561.589	
0	17	−1	17		0	16	−1	16			818668.758(0.018)	13.6929	222.849	
1	17	−8	10		1	16	−8	9			818759.922(0.065)	10.6780	688.034	
1	17	5	13	+	1	16	5	12	+		818814.812(0.056)	12.3469	510.965	
1	17	5	12	−	1	16	5	11	−		818814.813(0.056)	12.3469	510.965	
1	17	4	14		1	16	4	13			818842.742(0.045)	12.8597	471.247	
1	17	7	10	−	1	16	7	9	−		818862.313(0.068)	11.4456	656.425	
1	17	7	11	+	1	16	7	10	+		818862.313(0.068)	11.4456	656.425	
1	17	2	15	+	1	16	2	14	+		818875.868(0.047)	13.5169	426.290	
1	17	−3	14		1	16	−3	13			818913.119(0.044)	13.2445	442.939	
1	17	0	17		1	16	0	16			818913.166(0.048)	13.7506	427.624	
1	17	1	17		1	16	1	16			818953.398(0.048)	13.6846	421.300	
1	17	9	8	−	1	16	9	7	−		818999.756(0.068)	16.9180	693.962	
1	17	9	9	+	1	16	9	8	+		818999.756(0.068)	16.9180	693.962	
1	17	2	16	−	1	16	2	15	−		819020.389(0.046)	13.5169	426.308	
0	24	9	15	−	0	25	8	18	−		819148.523(0.535)	5.1624	746.450	
0	24	9	16	+	0	25	8	17	+		819148.523(0.535)	5.1624	746.450	
0	20	10	10	+	0	21	9	13	+		819256.834(0.307)	2.9736	662.784	
0	20	10	11	−	0	21	9	12	−		819256.834(0.307)	2.9736	662.784	
0	17	14	3	+	0	16	14	2	+		819340.865(0.289)	4.2221	897.425	
0	17	14	4	−	0	16	14	3	−		819340.865(0.289)	4.2221	897.425	
1	17	3	15	+	1	16	3	14	+		819471.820(0.047)	13.3054	494.083	
1	17	3	14	−	1	16	3	13	−		819475.079(0.048)	13.3054	494.084	
1	17	2	16		1	16	2	15			819476.373(0.051)	13.5864	496.719	
0	17	0	17	+	0	16	0	16	+		819478.826(0.018)	13.7390	219.081	
1	17	−1	16		1	16	−1	15			819517.197(0.060)	13.6777	506.108	
0	17	13	5		0	16	13	4			819569.739(0.195)	5.4962	802.753	
1	17	0	17	+	1	16	0	16	+		819609.188(0.080)	13.7381	513.273	
1	17	1	16	−	1	16	1	15	−		819611.200(0.066)	13.7156	444.980	
0	17	−13	4		0	16	−13	3			819688.924(0.129)	5.5889	803.465	
1	17	−4	13		1	16	−4	12			819703.162(0.057)	12.9724	500.559	
0	17	−12	5		0	16	−12	4			819813.637(0.122)	6.6982	715.431	
0	17	13	4	−	0	16	13	3	−		819824.379(0.174)	5.5637	812.487	
0	17	13	5	+	0	16	13	4	+		819824.379(0.174)	5.5637	812.487	
1	17	−5	13		1	16	−5	12			819867.873(0.070)	12.4898	598.395	
1	14	−9	6		1	13	−10	4			819907.738(1.715)	0.7646	694.418	
1	17	8	9		1	16	8	8			819916.199(0.059)	11.2247	632.444	
0	17	12	5	+	0	16	12	4	+		819994.527(0.078)	6.7881	719.908	

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v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	17	12	6	−	0	16	12	5	−		819994.527(0.078)	6.7881	719.908	
0	17	12	6		0	16	12	5			820031.030(0.134)	6.7264	726.014	
0	17	11	6	−	0	16	11	5	−		820070.070(0.071)	7.8190	635.659	
0	17	11	7	+	0	16	11	6	+		820070.070(0.071)	7.8190	635.659	
0	17	−11	6		0	16	−11	5			820205.848(0.096)	7.8012	645.411	
0	17	11	7		0	16	11	6			820259.283(0.051)	7.8967	643.377	
0	17	10	8		0	16	10	7			820328.968(0.044)	8.8511	563.545	
0	17	10	7	+	0	16	10	6	+		820361.486(0.069)	8.7939	571.028	
0	17	10	8	−	0	16	10	7	−		820361.486(0.069)	8.7939	571.028	
0	17	−10	7		0	16	−10	6			820487.941(0.040)	8.9108	573.498	
0	17	2	16	−	0	16	2	15			820498.985(0.019)	13.6217	245.432	
0	17	9	9		0	16	9	8			820512.304(0.049)	9.7080	503.292	
0	17	−9	8		0	16	−9	7			820578.127(0.036)	9.7893	499.104	
0	17	−8	9		0	16	−8	8			820670.873(0.037)	10.5421	442.600	
0	17	9	8	−	0	16	9	7	−		820675.760(0.035)	9.8277	509.859	
0	17	9	9	+	0	16	9	8	+		820675.760(0.035)	9.8277	509.859	
0	6	3	3		0	5	2	3		820762.501(0.050)	820762.426(0.019)	5.9125	39.665	HER84
0	17	8	9	+	0	16	8	8	+		820807.495(0.032)	10.6311	442.263	
0	17	8	10	−	0	16	8	9	−		820807.495(0.032)	10.6311	442.263	
0	17	8	10		0	16	8	9			820825.789(0.031)	10.6447	452.107	
1	17	4	14	−	1	16	4	13	−		820845.484(0.102)	12.9863	553.287	
1	17	4	13	+	1	16	4	12	+		820845.526(0.102)	12.9863	553.287	
0	17	7	10	−	0	16	7	9	−		820848.761(0.030)	11.2905	389.270	
0	17	7	11	+	0	16	7	10	+		820848.761(0.030)	11.2905	389.270	
0	17	−7	10		0	16	−7	9			820935.794(0.028)	11.3619	400.083	
0	17	7	11		0	16	7	10			821009.882(0.029)	11.3750	392.852	
0	17	6	11	+	0	16	6	10	+		821021.150(0.025)	11.9814	353.887	
0	17	6	12	−	0	16	6	11	−		821021.150(0.025)	11.9814	353.887	
1	17	5	12		1	16	5	11			821045.591(0.106)	12.5867	517.203	
0	17	6	12		0	16	6	11			821060.111(0.026)	11.9467	343.521	
0	17	5	13		0	16	5	12			821107.355(0.022)	12.5065	313.845	
0	22	2	20	+	0	21	3	19	+		821136.059(0.123)	8.9039	407.026	
0	17	−6	11		0	16	−6	10			821179.089(0.025)	12.0205	350.599	
0	17	−4	14		0	16	−4	13			821243.109(0.019)	12.9391	280.389	
0	17	5	13	+	0	16	5	12	+		821307.450(0.022)	12.5674	315.137	
0	17	5	12	−	0	16	5	11	−		821307.489(0.022)	12.5674	315.137	
0	17	−5	12		0	16	−5	11			821327.580(0.022)	12.5049	305.480	
0	17	4	13		0	16	4	12			821385.475(0.019)	13.0158	286.039	
0	17	−3	15		0	16	3	14			821409.412(0.018)	13.3662	262.916	
0	25	−1	25		0	24	1	23			821441.400(0.287)	0.0286	498.344	
0	10	−6	4		0	11	−5	6			821457.348(0.046)	1.3400	192.639	
1	21	1	21		1	20	0	20			821471.173(0.122)	10.9532	546.492	
0	17	3	15	+	0	16	3	14	+		821485.845(0.017)	13.2773	253.946	
0	17	4	14	−	0	16	4	13	−		821695.140(0.019)	12.9618	275.183	
0	17	3	14	−	0	16	3	13	−		821697.900(0.017)	13.2771	253.962	
0	17	4	13	+	0	16	4	12	+		821703.054(0.019)	12.9618	275.183	
0	17	1	16		0	16	1	15			821869.387(0.019)	13.8601	234.031	
0	17	2	15	+	0	16	2	14	+		822300.898(0.019)	13.6247	245.660	
0	17	3	14		0	16	3	13			822316.190(0.018)	13.3157	252.591	
0	17	2	15		0	16	2	14			822540.481(0.019)	13.4278	235.019	
1	17	13	4	−	1	16	13	3	−		822894.388(5.852)	5.9868	993.965	
1	17	13	5	+	1	16	13	4	+		822894.388(5.852)	5.9868	993.965	
1	3	−1	2		1	4	−2	2			823154.752(0.502)	0.9258	269.510	
0	17	−2	16		0	16	−2	15			824342.727(0.018)	13.5487	237.672	
0	6	6	0	+	0	7	5	3	+		824484.014(0.065)	0.1295	141.012	
0	6	6	1	−	0	7	5	2	−		824484.014(0.065)	0.1295	141.012	
0	20	−1	20		0	19	0	19			824719.642(0.049)	20.0263	314.112	
0	24	3	21		0	24	0	24			825015.381(0.277)	0.9279	489.686	
0	17	−9	8		0	18	−8	10			825033.139(0.114)	2.5319	498.955	
0	14	0	14		0	13	−1	13			825276.149(0.024)	10.1266	150.497	
0	22	0	22		0	21	1	20			825640.556(0.183)	8.6515	387.186	
0	18	−9	9		1	17	−4	13			825964.809(0.281)	0.2E−6	527.901	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	23	2	22		1	22	−1	21			826293.576(0.542)	0.0603	694.184	
1	24	2	23		1	23	3	21			826622.439(1.276)	1.0567	732.730	
1	19	11	8		1	18	10	8			826649.987(5.563)	17.8612	909.622	
0	22	11	11	−	0	23	10	14	−		826937.255(0.330)	3.5816	796.249	
0	22	11	12	+	0	23	10	13	+		826937.255(0.330)	3.5816	796.249	
0	17	1	16	−	0	16	1	15	−		827453.972(0.020)	13.7069	231.204	
0	26	5	22		0	26	4	22			828613.176(0.257)	22.4668	632.284	
0	25	5	21		0	25	4	21			829387.450(0.210)	21.6204	590.443	
0	13	2	11		0	12	0	12			829713.591(0.030)	0.0031	134.689	
0	4	4	1	−	0	3	3	0	−		829891.440(0.025)	6.9761	44.293	
0	4	4	0	+	0	3	3	1	+		829891.458(0.025)	6.9761	44.293	
1	18	8	10	+	1	17	9	9	+		829932.850(0.096)	4.6083	721.281	
1	18	8	11	−	1	17	9	8	−		829932.850(0.096)	4.6083	721.281	
0	24	5	20		0	24	4	20			830088.526(0.169)	20.7661	550.204	
0	7	2	5	+	0	6	1	6	+	830349.412(0.050)	830349.523(0.018)	4.5159	43.694	PIC81
0	23	5	19		0	23	4	19			830721.258(0.134)	19.9037	511.566	
0	12	3	10	+	0	11	2	9	+		831044.980(0.019)	8.0580	132.710	
0	22	5	18		0	22	4	18			831290.369(0.105)	19.0330	474.532	
1	25	2	24		1	26	0	26			831726.266(0.896)	0.0026	772.717	
0	21	5	17		0	21	4	17			831800.446(0.082)	18.1537	439.102	
0	22	−3	20		0	22	2	20			831863.065(0.115)	2.5906	423.662	
0	21	−3	19		0	21	2	19			832019.459(0.094)	2.0474	388.227	
0	23	−3	21		0	23	2	21			832046.621(0.141)	3.1710	460.689	
0	23	0	23		0	22	2	20			832108.908(0.243)	0.0253	423.662	
0	20	5	16		0	20	4	16			832255.926(0.064)	17.2656	405.277	
0	15	−2	14		0	14	1	13			832475.632(0.025)	0.2272	184.032	
0	20	−3	18		0	20	2	18			832481.076(0.076)	1.5596	354.387	
0	24	−3	22		0	24	2	22			832594.590(0.171)	3.7686	499.307	
0	19	5	15		0	19	4	15			832661.085(0.050)	16.3683	373.057	
0	12	3	9	−	0	11	2	10	−		832753.711(0.018)	7.9991	132.657	
0	18	5	14		0	18	4	14			833020.030(0.040)	15.4612	342.444	
0	26	−1	26		0	25	2	23			833076.274(0.360)	1.9877	539.515	
0	19	−3	17		0	19	2	17			833201.720(0.063)	1.1414	322.143	
0	17	5	13		0	17	4	13			833336.690(0.033)	14.5438	313.437	
0	10	2	8		0	9	−1	9			833493.164(0.021)	0.0272	76.433	
0	25	−3	23		0	25	2	23			833523.582(0.207)	4.3644	539.515	
0	16	5	12		0	16	4	12			833614.810(0.030)	13.6152	286.039	
1	25	0	25	+	1	26	1	26	+		833824.812(1.683)	14.7645	789.237	
0	15	5	11		0	15	4	11			833857.945(0.027)	12.6743	260.249	
0	14	5	10		0	14	4	10			834069.458(0.026)	11.7197	236.068	
0	18	−3	16		0	18	2	16			834124.506(0.052)	0.8002	291.498	
0	13	5	9		0	13	4	9			834252.507(0.025)	10.7493	213.496	
0	12	5	8		0	12	4	8			834410.054(0.025)	9.7606	192.535	
0	11	5	7		0	11	4	7			834544.850(0.025)	8.7499	173.184	
0	10	5	6		0	10	4	6			834659.443(0.026)	7.7120	155.444	
0	9	5	5		0	9	4	5			834756.169(0.028)	6.6394	139.316	
0	8	5	4		0	8	4	4			834837.154(0.031)	5.5210	124.799	
0	26	−3	24		0	26	2	24			834845.136(0.249)	4.9412	581.310	
0	7	5	3		0	7	4	3			834904.315(0.034)	4.3395	111.894	
0	19	2	17		0	18	−2	17			834905.876(0.067)	0.0363	294.293	
0	6	5	2		0	6	4	2			834959.354(0.037)	3.0666	100.602	
0	5	5	1		0	5	4	1			835003.761(0.040)	1.6522	90.923	
0	17	−3	15		0	17	2	15			835184.966(0.044)	0.5362	262.456	
1	16	8	8		1	15	6	9			835946.361(0.589)	0.0042	604.560	
1	24	3	21	−	1	25	2	24	−		836110.663(0.683)	8.1696	729.785	
0	16	−3	14		0	16	2	14			836316.035(0.039)	0.3426	235.019	
1	5	3	3		1	6	4	3			836438.773(0.205)	6.9798	286.354	
0	15	−3	13		0	15	2	13			837453.852(0.035)	0.2083	209.190	
0	18	9	9	−	1	17	5	12	−		837511.987(0.215)	0.0005	538.278	
0	18	9	10	+	1	17	5	13	+		837511.988(0.215)	0.0005	538.278	
0	14	−3	12		0	14	2	12			838543.039(0.031)	0.1202	184.972	
1	24	7	17		1	23	8	15			838790.878(2.230)	1.1926	857.662	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	22	0	22	+	0	21	1	21	+		838901.618(0.109)	26.0177	379.008	
1	21	−1	20		1	22	−3	19			839065.838(0.626)	0.0007	630.842	
1	24	3	22	+	1	25	2	23	+		839118.772(0.664)	8.1430	729.682	
0	13	−3	11		0	13	2	11			839540.432(0.029)	0.0656	162.366	
0	3	−3	1		0	4	0	4			839763.272(0.029)	0.3E−4	25.254	
0	18	1	17		0	17	2	15			839805.344(0.044)	6.6889	262.456	
0	25	3	22		0	25	0	25			839833.927(0.355)	0.9786	529.528	
0	12	−3	10		0	12	2	10			840416.826(0.027)	0.0336	141.374	
0	23	2	22	−	0	22	3	19	−		840421.959(0.162)	8.3685	442.566	
1	10	5	5		1	11	4	8			840571.131(0.170)	1.2520	358.729	
1	15	2	14		1	16	−3	13			840946.359(0.140)	0.1E−5	442.939	
0	19	10	10		0	20	9	12			840980.743(0.184)	2.8334	622.397	
0	8	3	5		0	7	−2	6			841101.539(0.014)	0.0003	63.188	
0	8	−8	0		0	9	−7	2			841108.804(0.118)	0.1069	253.429	
0	11	−3	9		0	11	2	9			841156.798(0.025)	0.0161	121.997	
0	10	−3	8		0	10	2	8			841757.099(0.024)	0.0071	104.236	
0	16	9	7		0	15	12	4			841990.511(0.605)	0.2E−5	700.266	
0	9	−3	7		0	9	2	7			842224.167(0.023)	0.0029	88.091	
1	6	1	6	+	1	5	2	3	+		842341.987(0.028)	1.5347	231.727	
0	8	−3	6		0	8	2	6			842571.329(0.023)	0.0010	73.561	
1	19	6	13		1	18	8	10			842606.240(1.032)	0.0057	688.752	
0	7	−3	5		0	7	2	5			842816.098(0.023)	0.0003	60.647	
0	6	−3	4		0	6	2	4			842977.830(0.024)	0.0001	49.349	
0	5	−3	3		0	5	2	3			843075.873(0.025)	0.2E−4	39.665	
0	4	−3	2		0	4	2	2			843128.217(0.026)	0.2E−5	31.596	
0	3	−3	1		0	3	2	1			843150.587(0.027)	0.1E−6	25.141	
0	11	−3	9		0	10	3	7			844082.762(0.021)	0.1E−7	121.899	
1	6	1	5	−	1	5	2	4	−		844355.204(0.030)	1.5290	231.727	
1	8	−3	5		1	7	0	7			845202.394(0.089)	0.4E−4	253.968	
1	22	3	20		1	23	−3	20			845375.616(0.971)	0.1E−6	667.754	
0	6	3	3		0	5	1	4			845721.511(0.024)	0.0044	38.833	
1	10	3	8		1	9	2	8			845985.073(0.068)	1.2631	350.351	
0	20	1	19		0	19	−2	18			848221.544(0.080)	0.4643	325.047	
1	13	−2	11		1	14	1	14			848374.777(0.097)	0.6E−5	371.473	
0	19	12	8		1	18	9	9			848956.806(0.710)	0.0002	784.568	
0	12	7	6		0	13	6	8			850940.938(0.054)	1.6023	271.007	
0	26	−2	25		0	25	3	22			851252.756(0.211)	2.1012	557.541	
0	12	1	12	+	0	11	0	11	+		851414.968(0.027)	13.5373	106.409	
1	9	−2	7		1	10	0	10			851810.239(0.085)	0.3E−4	297.401	
0	25	1	24	−	0	24	2	23	−		851948.278(0.245)	15.0505	509.150	
1	17	5	13	+	0	16	9	8	+		851983.429(0.214)	6.2E−5	509.859	
1	17	5	12	−	0	16	9	7	−		851983.430(0.214)	6.2E−5	509.859	
0	17	2	15		0	16	1	15			852177.402(0.039)	7.9935	234.031	
0	6	−3	4		0	7	−1	7			852378.659(0.026)	0.1E−4	49.035	
1	17	9	8	−	1	16	8	9	−		853417.552(0.077)	15.0298	692.814	
1	17	9	9	+	1	16	8	8	+		853417.552(0.077)	15.0298	692.814	
0	14	1	13		0	13	0	13			853504.466(0.030)	6.5924	155.562	
0	16	−2	15		0	15	2	13			853849.714(0.031)	0.0183	209.190	
0	12	−2	11		0	11	0	11			854932.365(0.023)	0.0023	115.409	
0	26	3	23		0	26	0	26			855805.275(0.449)	1.0171	570.943	
0	12	−7	5		0	13	−6	7			855888.998(0.061)	1.4836	278.076	
1	16	10	6		1	15	11	4			856046.704(4.543)	0.8795	824.879	
0	11	1	10		0	10	−1	10			856687.556(0.021)	0.0012	92.543	
0	8	2	7	−	0	7	1	6	−		857959.181(0.019)	5.1915	55.667	
0	18	8	11		0	19	7	13			858680.041(0.094)	3.2498	479.830	
0	13	9	5		0	14	8	7			859010.697(0.108)	1.0194	402.169	
1	13	6	7		1	12	7	5			859282.857(0.735)	1.7621	529.328	
1	12	−1	11		1	11	2	10			859975.392(0.409)	0.0020	384.135	
0	9	−2	8		0	8	−1	8			860459.265(0.016)	5.4518	61.930	
0	26	−1	26		0	25	1	24			860546.881(0.362)	0.0324	538.598	
0	6	5	2	+	0	7	4	3	+		860706.823(0.045)	0.4165	101.011	
0	6	5	1	−	0	7	4	4	−		860706.840(0.045)	0.4165	101.011	

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v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	18	1	18	+	0	17	1	17	+		861186.074(0.029)	14.5114	254.580	
1	17	−4	13		1	18	−3	15			861275.058(0.211)	4.5319	499.172	
1	18	4	15	−	1	19	3	16	−		862164.881(0.608)	1.4072	580.903	
1	18	4	14	+	1	19	3	17	+		862185.975(0.609)	1.4070	580.902	
0	24	3	21		0	23	−3	21			862250.015(0.151)	0.0001	488.444	
0	23	0	23		0	22	1	21			862860.992(0.238)	8.6096	422.636	
1	17	−4	13		0	16	−9	7			863334.060(0.270)	0.2E−7	499.104	
0	7	−4	4		0	6	−3	4			863364.871(0.021)	7.1464	77.468	
0	18	0	18		0	17	0	17			863431.158(0.025)	14.5084	254.930	
0	14	8	6	+	0	15	7	9	+		864307.281(0.071)	1.8681	363.496	
0	14	8	7	−	0	15	7	8	−		864307.281(0.071)	1.8681	363.496	
1	14	0	14		1	13	1	13			864408.542(0.030)	6.1356	348.966	
1	18	3	16		1	17	3	15			864761.843(0.103)	14.0765	535.847	
1	26	−2	24		1	26	−3	23			864778.302(0.825)	16.5501	788.060	
1	18	6	13	−	1	17	6	12	−		864853.933(0.095)	12.9724	571.144	
1	18	6	12	+	1	17	6	11	+		864853.935(0.095)	12.9724	571.144	
1	18	−13	6		1	17	−13	5			865317.400(0.797)	6.0060	1075.970	
1	18	12	6		1	17	12	5			865559.579(0.340)	8.1390	937.929	
1	18	12	6	+	1	17	12	5	+		865578.377(0.561)	7.0418	972.088	
1	18	12	7	−	1	17	12	6	−		865578.377(0.561)	7.0418	972.088	
1	18	6	12		1	17	6	11			865583.988(0.138)	12.4215	657.519	
1	18	8	10	+	1	17	8	9	+		865671.014(0.086)	5.1844	720.089	
1	18	8	11	−	1	17	8	10	−		865671.014(0.086)	5.1844	720.089	
1	18	13	5		1	17	13	4			865741.079(0.409)	6.9116	1080.600	
0	3	3	0		0	2	0	2			865768.967(0.026)	0.4E−4	13.963	
1	18	11	7		1	17	11	6			865795.965(0.335)	8.1452	877.837	
1	18	−7	12		1	17	−7	11			865882.425(0.076)	12.5043	609.629	
1	18	−10	9		1	17	−10	8			865931.041(0.216)	8.4691	793.945	
1	18	1	18	+	1	17	1	17	+		865948.796(0.059)	14.5282	471.833	
1	18	−12	7		1	17	−12	6			865981.529(0.318)	8.0711	1014.610	
1	18	11	7	−	1	17	11	6	−		866214.768(0.239)	9.3011	952.425	
1	18	11	8	+	1	17	11	7	+		866214.768(0.239)	9.3011	952.425	
1	18	10	8		1	17	10	7			866235.163(0.203)	10.4231	880.728	
1	25	−2	23		1	25	−3	22			866249.070(0.695)	16.4067	746.364	
1	18	7	11		1	17	7	10			866343.160(0.149)	11.6845	649.794	
1	18	−9	10		1	17	−9	9			866346.012(0.167)	12.3437	798.858	
1	18	−11	8		1	17	−11	7			866365.654(0.189)	9.1402	866.380	
0	18	−1	18		0	17	−1	17			866388.309(0.022)	14.5030	250.157	
1	18	−2	16		1	17	−2	15			866455.923(0.064)	14.4000	499.379	
1	18	10	8	+	1	17	10	7	+		866546.981(0.108)	10.0511	805.782	
1	18	10	9	−	1	17	10	8	−		866546.981(0.108)	10.0511	805.782	
1	18	−6	13		1	17	−6	12			866659.542(0.086)	12.5398	588.896	
1	18	9	9		1	17	9	8			866686.633(0.084)	10.8855	755.659	
1	18	−8	11		1	17	−8	10			866812.667(0.082)	11.6536	715.345	
1	18	5	14	+	1	17	5	13	+		866836.476(0.068)	13.2077	538.278	
1	18	5	13	−	1	17	5	12	−		866836.477(0.068)	13.2077	538.278	
1	18	4	15		1	17	4	14			866856.228(0.056)	13.7030	498.560	
1	18	2	16	+	1	17	2	15	+		866879.834(0.059)	14.3339	453.605	
1	18	7	11	−	1	17	7	10	−		866914.418(0.085)	12.3858	683.739	
1	18	7	12	+	1	17	7	11	+		866914.418(0.085)	12.3858	683.739	
1	18	0	18		1	17	0	17			866918.303(0.060)	14.5593	454.940	
1	18	−3	15		1	17	−3	14			866930.617(0.055)	14.0726	470.255	
1	18	1	18		1	17	1	17			866967.536(0.060)	14.4950	448.617	
1	18	9	9	−	1	17	9	8	−		866977.488(0.086)	18.2458	721.281	
1	18	9	10	+	1	17	9	9	+		866977.488(0.086)	18.2458	721.281	
1	18	2	17	−	1	17	2	16	−		867051.211(0.058)	14.3339	453.628	
0	18	0	18	+	0	17	0	17	+		867326.685(0.022)	14.5464	246.416	
0	18	14	4	+	0	17	14	3	+		867371.720(0.333)	5.4891	924.756	
0	18	14	5	−	0	17	14	4	−		867371.720(0.333)	5.4891	924.756	
0	23	9	14	−	0	24	8	17	−		867522.998(0.386)	4.7621	706.239	
0	23	9	15	+	0	24	8	16	+		867522.998(0.386)	4.7621	706.239	
1	24	−2	22		1	24	−3	21			867560.122(0.581)	16.2145	706.262	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	18	2	17		1	17	2	16			867590.330(0.063)	14.4079	524.054	
1	18	3	16	+	1	17	3	15	+		867590.667(0.059)	14.1368	521.418	
1	18	3	15	−	1	17	3	14	−		867594.987(0.059)	14.1368	521.418	
0	18	13	6		0	17	13	5			867616.413(0.229)	6.7056	830.091	
1	18	−1	17		1	17	−1	16			867626.434(0.072)	14.4877	533.444	
1	18	1	17	−	1	17	1	16	−		867643.174(0.081)	14.5273	472.319	
1	18	0	18	+	1	17	0	17	+		867722.647(0.093)	14.5463	540.612	
0	19	10	9	+	0	20	9	12	+		867742.853(0.256)	2.5973	628.990	
0	19	10	10	−	0	20	9	11	−		867742.853(0.256)	2.5973	628.990	
0	18	−13	5		0	17	−13	4			867766.357(0.135)	6.8177	830.807	
1	18	−4	14		1	17	−4	13			867873.809(0.069)	13.8228	527.901	
0	18	−12	6		0	17	−12	5			867881.394(0.143)	7.8534	742.777	
0	18	13	5	−	0	17	13	4	−		867912.095(0.187)	6.7876	839.834	
0	18	13	6	+	0	17	13	5	+		867912.095(0.187)	6.7876	839.834	
1	18	−5	14		1	17	−5	13			868069.873(0.083)	13.3607	625.743	
0	18	12	6	+	0	17	12	5	+		868099.569(0.081)	7.9584	747.260	
0	18	12	7	−	0	17	12	6	−		868099.569(0.081)	7.9584	747.260	
0	18	12	7		0	17	12	6			868127.267(0.151)	7.8867	753.368	
1	18	8	10		1	17	8	9			868159.814(0.073)	12.2296	659.794	
0	18	11	7	−	0	17	11	6	−		868162.630(0.083)	8.9232	663.014	
0	18	11	8	+	0	17	11	7	+		868162.630(0.083)	8.9232	663.014	
0	18	−11	7		0	17	−11	6			868309.483(0.109)	8.9035	672.770	
1	15	−9	7		1	14	−10	5			868369.850(1.906)	1.0840	716.897	
0	18	11	8		0	17	11	7			868382.844(0.058)	9.0117	670.738	
0	18	10	9		0	17	10	8			868447.333(0.054)	9.9073	590.908	
0	18	10	8	+	0	17	10	7	+		868472.539(0.081)	9.8441	598.393	
0	18	10	9	−	0	17	10	8	−		868472.539(0.081)	9.8441	598.393	
0	18	2	17	−	0	17	2	16	−		868517.913(0.024)	14.4431	272.800	
0	18	−10	8		0	17	−10	7			868624.626(0.049)	9.9743	600.867	
0	18	9	10		0	17	9	9			868632.650(0.059)	10.7122	530.661	
0	18	−9	9		0	17	−9	8			868720.742(0.045)	10.8011	526.475	
1	23	−2	21		1	23	−3	20			868721.490(0.482)	15.9733	667.754	
0	18	−8	10		0	17	−8	9			868804.100(0.045)	11.5057	469.975	
0	18	9	9	−	0	17	9	8	−		868819.657(0.044)	10.8438	537.233	
0	18	9	10	+	0	17	9	9	+		868819.657(0.044)	10.8438	537.233	
0	18	8	10	+	0	17	8	9	+		868971.123(0.040)	11.6023	469.642	
0	18	8	11	−	0	17	8	10	−		868971.123(0.040)	11.6023	469.642	
0	18	8	11		0	17	8	10			868975.918(0.039)	11.6175	479.487	
0	18	7	11	−	0	17	7	10	−		869000.128(0.037)	12.2187	416.651	
0	18	7	12	+	0	17	7	11	+		869000.128(0.037)	12.2187	416.651	
0	7	3	4		0	6	2	4		869037.809(0.050)	869037.911(0.019)	6.2955	49.349	HER84
0	18	−7	11		0	17	−7	10			869088.282(0.035)	12.2960	427.466	
0	18	6	12	+	0	17	6	11	+		869175.842(0.030)	12.8819	381.273	
0	18	6	13	−	0	17	6	12	−		869175.842(0.030)	12.8819	381.273	
0	18	7	12		0	17	7	11			869190.378(0.035)	12.3096	420.238	
1	18	4	15	−	1	17	4	14	−		869215.978(0.121)	13.8374	580.667	
1	18	4	14	+	1	17	4	13	+		869216.041(0.121)	13.8374	580.667	
0	18	6	13		0	17	6	12			869237.280(0.032)	12.8440	370.909	
0	18	5	14		0	17	5	13			869268.141(0.027)	13.3785	341.235	
0	24	0	24		0	23	2	21			869281.255(0.309)	0.0293	460.689	
0	18	−6	12		0	17	−6	11			869371.686(0.030)	12.9231	377.991	
0	18	−4	15		0	17	−4	14			869422.172(0.023)	13.7880	307.783	
1	18	5	13		1	17	5	12			869450.060(0.123)	13.4671	544.591	
1	22	1	22		1	21	0	21			869450.355(0.148)	11.5750	580.207	
0	18	5	14	+	0	17	5	13	+		869506.609(0.026)	13.4427	342.533	
0	18	5	13	−	0	17	5	12	−		869506.675(0.026)	13.4427	342.533	
0	18	−5	13		0	17	−5	12			869542.249(0.027)	13.3760	332.876	
0	18	4	14		0	17	4	13			869584.801(0.024)	13.8685	313.437	
0	18	−3	16		0	17	−3	15			869603.163(0.022)	14.2012	290.315	
0	18	3	16	+	0	17	3	15	+		869691.331(0.021)	14.1086	281.347	
1	22	−2	20		1	22	−3	19			869743.318(0.397)	15.6830	630.842	
0	9	−6	3		0	10	−5	5			869811.514(0.049)	0.9837	174.902	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	18	4	15	−	0	17	4	14	−		869965.620(0.023)	13.8112	302.592	
0	18	3	15	−	0	17	3	14	−		869973.375(0.021)	14.1083	281.371	
0	18	4	14	+	0	17	4	13	+		869977.451(0.023)	13.8112	302.592	
0	18	1	17		0	17	1	16			870113.359(0.024)	14.6670	261.445	
1	21	−2	19		1	21	−3	18			870635.774(0.324)	15.3438	595.527	
0	18	2	16	+	0	17	2	15	+		870644.819(0.024)	14.4472	273.089	
0	18	2	16		0	17	2	15			870663.622(0.023)	14.2464	262.456	
0	18	3	15		0	17	3	14			870691.391(0.022)	14.1480	280.020	
0	23	2	21	+	0	22	3	20	+		871071.288(0.149)	9.5140	442.459	
0	15	0	15		0	14	−1	14			871152.310(0.027)	11.4426	173.017	
1	2	−1	1		1	3	−2	1			871366.686(0.505)	0.8236	263.074	
1	20	−2	18		1	20	−3	17			871408.991(0.264)	14.9567	561.809	
1	18	13	5	−	1	17	13	4	−		871769.626(6.351)	7.2939	1021.410	
1	18	13	6	+	1	17	13	5	+		871769.626(6.351)	7.2939	1021.410	
1	19	−2	17		1	19	−3	16			872072.964(0.214)	14.5220	529.691	
1	18	−2	16		1	18	−3	15			872637.512(0.174)	14.0407	499.172	
1	17	−2	15		1	17	−3	14			873112.206(0.143)	13.5140	470.255	
0	18	−2	17		0	17	−2	16			873137.741(0.022)	14.3648	265.169	
0	16	−9	7		0	17	−8	9			873259.112(0.100)	2.1436	469.975	
1	16	−2	14		1	16	−3	13			873506.316(0.119)	12.9430	442.939	
1	15	−2	13		1	15	−3	12			873828.765(0.102)	12.3291	417.225	
1	14	−2	12		1	14	−3	11			874088.087(0.089)	11.6737	393.115	
1	20	11	9		1	19	10	9			874139.077(5.919)	18.2323	940.116	
1	13	−2	11		1	13	−3	10			874292.393(0.081)	10.9781	370.609	
1	24	2	23		1	23	−1	22			874305.045(0.587)	0.0753	731.140	
1	12	−2	10		1	12	−3	9			874449.337(0.075)	10.2435	349.707	
1	11	−2	9		1	11	−3	8			874566.094(0.071)	9.4710	330.411	
1	10	−2	8		1	10	−3	7			874649.336(0.069)	8.6612	312.721	
1	9	−2	7		1	9	−3	6			874705.219(0.069)	7.8142	296.638	
1	8	−2	6		1	8	−3	5			874739.364(0.069)	6.9289	282.161	
1	3	−2	1		1	3	−3	0			874742.385(0.081)	1.6030	233.896	
1	4	−2	2		1	4	−3	1			874751.846(0.078)	2.8742	240.332	
1	7	−2	5		1	7	−3	4			874756.850(0.071)	6.0026	269.292	
1	5	−2	3		1	5	−3	2			874759.401(0.076)	3.9951	248.377	
1	6	−2	4		1	6	−3	3			874762.205(0.073)	5.0289	258.030	
0	19	−9	10		1	18	−4	14			874932.615(0.341)	0.3E−6	556.851	
0	21	11	10	−	0	22	10	13	−		875296.253(0.286)	3.1564	759.269	
0	21	11	11	+	0	22	10	12	+		875296.253(0.286)	3.1564	759.269	
0	21	−1	21		0	20	0	20			875734.655(0.059)	21.8409	346.073	
0	18	1	17	−	0	17	1	16	−		875851.600(0.025)	14.5177	258.805	
1	19	8	11	+	1	18	9	10	+		876594.339(0.124)	5.2801	750.200	
1	19	8	12	−	1	18	9	9	−		876594.339(0.124)	5.2801	750.200	
1	24	2	23		1	25	0	25			877643.277(0.733)	0.0023	731.028	
1	24	0	24	+	1	25	1	25	+		878121.018(1.501)	14.3074	747.599	
0	5	4	2	−	0	4	3	1	−		878226.417(0.024)	7.1631	50.746	
0	5	4	1	+	0	4	3	2	+		878226.547(0.024)	7.1631	50.746	
0	13	3	11	+	0	12	2	10	+		879012.897(0.022)	8.4980	152.074	
0	20	2	18		0	19	−2	18			879579.893(0.086)	0.0403	325.047	
1	25	2	24		1	24	3	22			880517.783(1.498)	1.0602	771.090	
0	13	3	10	−	0	12	2	11	−		881420.497(0.021)	8.4109	151.999	
0	14	2	12		0	13	0	13			881673.903(0.035)	0.0040	155.562	
0	8	2	6	+	0	7	1	7	+		881782.230(0.020)	4.8911	54.888	
1	23	3	20	−	1	24	2	23	−		882621.787(0.555)	7.8562	689.675	
0	16	−2	15		0	15	1	14			882755.500(0.029)	0.2617	208.226	
0	11	2	9		0	10	−1	10			883000.649(0.024)	0.0495	92.543	
1	25	7	18		1	24	8	16			883051.188(2.512)	1.1854	896.260	
1	4	3	2		1	5	4	2			884646.995(0.209)	6.6785	276.702	
0	24	2	23	−	0	23	3	20	−		884837.583(0.197)	8.7177	479.635	
1	23	3	21	+	1	24	2	22	+		885193.694(0.541)	7.8344	689.587	
1	20	−1	19		1	21	−3	18			885940.639(0.564)	0.0006	595.527	
1	17	8	9		1	16	6	10			885955.301(0.686)	0.0034	630.241	
1	20	6	14		1	19	8	11			887356.233(1.178)	0.0055	719.320	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	19	1	18		0	18	2	16			887471.821(0.054)	7.3294	291.498	
0	19	9	10	−	1	18	5	13	−		887615.857(0.266)	0.0009	567.192	
0	19	9	11	+	1	18	5	14	+		887615.858(0.266)	0.0009	567.192	
1	9	5	4		1	10	4	7			888320.059(0.171)	1.0293	341.040	
1	14	2	13		1	15	−3	12			888612.160(0.137)	0.7E−6	417.225	
1	17	9	8		0	16	12	5			888714.134(0.600)	0.5E−5	726.014	
0	18	10	9		0	19	9	11			889235.648(0.157)	2.4355	590.215	
0	9	3	6		0	8	−2	7			889272.941(0.014)	0.0009	76.102	
0	19	6	14		0	19	5	15			889572.831(0.046)	17.6732	400.832	
0	18	6	13		0	18	5	14			889584.039(0.037)	16.6066	370.230	
0	20	6	15		0	20	5	16			889584.723(0.059)	18.7319	433.038	
0	17	6	12		0	17	5	13			889614.900(0.031)	15.5307	341.235	
0	21	6	16		0	21	5	17			889623.332(0.077)	19.7839	466.848	
0	16	6	11		0	16	5	12			889662.144(0.028)	14.4439	313.845	
0	22	6	17		0	22	5	18			889692.447(0.100)	20.8300	502.261	
0	15	6	10		0	15	5	11			889722.678(0.027)	13.3438	288.063	
0	14	6	9		0	14	5	10			889793.585(0.027)	12.2278	263.889	
0	23	6	18		0	23	5	19			889796.025(0.128)	21.8712	539.276	
0	13	6	8		0	13	5	9			889872.129(0.028)	11.0923	241.324	
0	24	6	19		0	24	5	20			889938.186(0.161)	22.9080	577.892	
0	12	6	7		0	12	5	8			889955.755(0.029)	9.9326	220.368	
0	11	6	6		0	11	5	7			890042.089(0.030)	8.7422	201.021	
0	25	6	20		0	25	5	21			890123.210(0.200)	23.9411	618.108	
0	10	6	5		0	10	5	6			890128.937(0.032)	7.5123	183.285	
0	9	6	4		0	9	5	5			890214.289(0.034)	6.2303	167.160	
1	7	1	7	+	1	6	2	4	+		890225.434(0.029)	1.9851	241.381	
0	8	6	3		0	8	5	4			890296.316(0.037)	4.8776	152.646	
0	26	6	21		0	26	5	22			890355.533(0.246)	24.9710	659.923	
0	7	6	2		0	7	5	3			890373.373(0.040)	3.4253	139.744	
0	6	6	1		0	6	5	2			890443.998(0.043)	1.8268	128.453	
0	21	1	20		0	20	−2	19			892050.297(0.102)	0.4662	357.431	
0	12	−3	10		0	11	3	8			892176.334(0.021)	0.3E−7	139.647	
1	7	1	6	−	1	6	2	5	−		892904.345(0.031)	1.9752	241.381	
0	23	0	23	+	0	22	1	22	+		893148.476(0.130)	27.6828	414.080	
1	9	−3	6		1	8	0	8			893355.663(0.087)	0.0001	266.838	
1	11	3	9		1	10	2	9			893524.899(0.086)	1.3290	366.439	
0	7	3	4		0	6	1	5			894056.033(0.023)	0.0067	48.514	
0	13	1	13	+	0	12	0	12	+		894614.074(0.031)	14.7241	125.737	
1	12	−2	10		1	13	1	13			896684.938(0.091)	0.4E−5	348.966	
1	21	3	19		1	22	−3	19			896885.779(0.818)	0.8E−7	630.842	
1	18	5	14	+	0	17	9	9	+		898144.145(0.256)	0.0001	537.233	
1	18	5	13	−	0	17	9	8	−		898144.146(0.256)	0.0001	537.233	
0	20	12	9		1	19	9	10			898482.601(0.855)	0.0002	815.080	
0	25	−11	14		0	26	−10	16			899065.113(1.189)	4.3576	919.343	
0	24	0	24		0	23	1	22			899254.098(0.304)	8.5077	459.690	
0	11	7	5		0	12	−6	7			899257.043(0.057)	1.2410	250.053	
1	8	−2	6		1	9	0	9			900057.491(0.086)	0.2E−4	281.316	
0	5	−3	3		0	6	−1	6			900513.568(0.027)	0.5E−5	37.749	
0	18	2	16		0	17	1	16			900971.637(0.045)	8.5124	261.445	
1	18	9	9	−	1	17	8	10	−		902715.652(0.092)	15.1933	720.089	
1	18	9	10	+	1	17	8	9	+		902715.652(0.092)	15.1933	720.089	
0	9	2	8	−	0	8	1	7	−		902934.870(0.021)	5.6766	68.680	
0	17	−2	16		0	16	2	14			903859.017(0.038)	0.0239	235.019	
0	11	−7	4		0	12	−6	6			904262.110(0.065)	1.1470	257.120	
1	17	10	7		1	16	11	5			904479.561(4.777)	1.1751	850.558	
0	15	1	14		0	14	0	14			905404.204(0.034)	6.9573	178.025	
0	25	0	25		0	24	2	22			905975.944(0.387)	0.0338	499.307	
0	12	1	11		0	11	−1	11			905976.920(0.023)	0.0018	110.258	
0	13	−2	12		0	12	0	12			906577.727(0.026)	0.0028	134.689	
0	17	8	10		0	18	7	12			907055.384(0.081)	2.8575	449.231	
1	14	6	8		1	13	7	6			907188.493(0.885)	2.3566	550.216	
0	12	9	4		0	13	8	6			907451.494(0.123)	0.7301	379.612	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	13	−1	12		1	12	2	11			908203.408(0.406)	0.0030	403.438	
1	16	−4	12		1	17	−3	14			908502.513(0.174)	4.2259	470.255	
1	17	4	14	−	1	18	3	15	−		908649.150(0.507)	1.3019	550.358	
1	17	4	13	+	1	18	3	16	+		908664.548(0.508)	1.3017	550.358	
0	19	1	19	+	0	18	1	18	+		908797.254(0.036)	15.3212	283.306	
0	5	5	1	+	0	6	4	2	+		909074.377(0.047)	0.1621	89.720	
0	5	5	0	−	0	6	4	3	−		909074.382(0.047)	0.1621	89.720	
0	26	1	25	−	0	25	2	24	−		909389.205(0.291)	16.2167	549.290	
0	10	−2	9		0	9	−1	9			909737.626(0.017)	5.7107	76.433	
1	18	−4	14		0	17	−9	8			910629.742(0.319)	$0.4E-7$	526.475	
0	19	0	19		0	18	0	18			910807.844(0.032)	15.3148	283.731	
0	8	−4	5		0	7	−3	5			911642.045(0.020)	7.4984	88.761	
0	3	−3	1		0	2	−2	1			912108.703(0.025)	4.6403	22.841	
1	19	3	17		1	18	3	16			912410.608(0.120)	14.8955	564.692	
1	15	0	15		1	14	1	14			912470.192(0.038)	6.6617	371.473	
1	19	6	14	−	1	18	6	13	−		912529.179(0.113)	13.8672	599.993	
1	19	6	13	+	1	18	6	12	+		912529.183(0.113)	13.8672	599.993	
0	13	8	5	+	0	14	7	8	+		912584.204(0.069)	1.5018	339.330	
0	13	8	6	−	0	14	7	7	−		912584.204(0.069)	1.5018	339.330	
0	25	3	22		0	24	−3	22			913215.282(0.185)	0.0001	527.080	
1	19	−13	7		1	18	−13	6			913241.465(0.843)	7.0546	1104.830	
1	19	6	13		1	18	6	12			913375.342(0.152)	13.3021	686.392	
1	19	12	7		1	18	12	6			913454.027(0.415)	9.2920	966.801	
1	19	12	7	+	1	18	12	6	+		913518.754(0.603)	8.0469	1000.960	
1	19	12	8	−	1	18	12	7	−		913518.754(0.603)	8.0469	1000.960	
1	19	8	11	+	1	18	8	10	+		913638.977(0.110)	5.8755	748.965	
1	19	8	12	−	1	18	8	11	−		913638.977(0.110)	5.8755	748.965	
1	19	13	6		1	18	13	5			913712.455(0.432)	8.1110	1109.480	
1	19	−7	13		1	18	−7	12			913724.368(0.093)	13.4365	638.512	
1	19	11	8		1	18	11	7			913744.812(0.364)	9.1487	906.717	
1	19	1	19	+	1	18	1	18	+		913861.034(0.073)	15.3398	500.717	
1	19	−10	10		1	18	−10	9			913884.413(0.238)	9.3717	822.830	
1	19	−12	8		1	18	−12	7			913960.701(0.344)	9.2181	1043.500	
0	19	−1	19		0	18	−1	18			914043.729(0.028)	15.3126	279.056	
0	4	3	1		0	3	0	3			914149.625(0.025)	0.0002	18.803	
1	19	10	9		1	18	10	8			914180.107(0.241)	11.4675	909.622	
1	19	11	8	−	1	18	11	7	−		914193.310(0.264)	10.4181	981.318	
1	19	11	9	+	1	18	11	8	+		914193.310(0.264)	10.4181	981.318	
1	19	−9	11		1	18	−9	10			914286.971(0.201)	13.4389	827.756	
1	19	7	12		1	18	7	11			914301.350(0.168)	12.5594	678.692	
1	19	−2	17		1	18	−2	16			914357.289(0.077)	15.2182	528.280	
1	19	−11	9		1	18	−11	8			914398.807(0.227)	10.2376	895.279	
1	19	10	9	+	1	18	10	8	+		914581.366(0.134)	10.0961	834.687	
1	19	10	10	−	1	18	10	9	−		914581.366(0.134)	10.0961	834.687	
1	19	−6	14		1	18	−6	13			914640.930(0.104)	13.4085	617.805	
1	19	9	10		1	18	9	9			914719.889(0.105)	11.8833	784.568	
1	19	5	15	+	1	18	5	14	+		914834.233(0.082)	14.0617	567.192	
1	19	5	14	−	1	18	5	13	−		914834.234(0.082)	14.0617	567.192	
1	19	4	16		1	18	4	15			914843.498(0.068)	14.5419	527.476	
1	19	−8	12		1	18	−8	11			914846.570(0.102)	12.6114	744.258	
1	19	2	17	+	1	18	2	16	+		914855.600(0.072)	15.1498	482.521	
1	19	0	19		1	18	0	18			914895.080(0.073)	15.3680	483.857	
1	19	−3	16		1	18	−3	15			914921.837(0.067)	14.8983	499.172	
1	19	9	10	−	1	18	9	9	−		914926.657(0.110)	19.4928	750.200	
1	19	9	11	+	1	18	9	10	+		914926.657(0.110)	19.4928	750.200	
1	19	7	12	−	1	18	7	11	−		914946.540(0.104)	13.3123	712.656	
1	19	7	13	+	1	18	7	12	+		914946.541(0.104)	13.3123	712.656	
1	19	1	19		1	18	1	18			914954.410(0.074)	15.3052	477.536	
1	19	2	18	−	1	18	2	17	−		915056.913(0.071)	15.1498	482.550	
0	19	0	19	+	0	18	0	18	+		915116.960(0.028)	15.3537	275.347	
0	19	14	5	+	0	18	14	4	+		915374.025(0.398)	6.7047	953.688	
0	19	14	6	−	0	18	14	5	−		915374.025(0.398)	6.7047	953.688	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	19	13	7		0	18	13	6			915634.960(0.278)	7.8700	859.031	
1	19	1	18	−	1	18	1	17	−		915644.390(0.097)	15.3388	501.260	
1	19	2	18		1	18	2	17			915688.561(0.077)	15.2284	552.994	
1	19	3	17	+	1	18	3	16	+		915694.614(0.072)	14.9657	550.358	
1	19	3	16	−	1	18	3	15	−		915700.247(0.073)	14.9657	550.358	
1	19	−1	18		1	18	−1	17			915718.777(0.086)	15.2975	562.385	
1	19	0	19	+	1	18	0	18	+		915819.045(0.108)	15.3545	569.556	
0	19	−13	6		0	18	−13	5			915819.823(0.151)	8.0005	859.753	
0	22	9	13	−	0	23	8	16	−		915860.953(0.290)	4.3537	667.630	
0	22	9	14	+	0	23	8	15	+		915860.953(0.290)	4.3537	667.630	
0	19	−12	7		0	18	−12	6			915922.210(0.175)	8.9699	771.726	
0	19	13	6	−	0	18	13	5	−		915976.265(0.206)	7.9659	868.784	
0	19	13	7	+	0	18	13	6	+		915976.265(0.206)	7.9659	868.784	
1	19	−4	15		1	18	−4	14			916035.702(0.084)	14.6687	556.851	
0	19	12	7	+	0	18	12	6	+		916182.319(0.091)	9.0892	776.217	
0	19	12	8	−	0	18	12	7	−		916182.319(0.091)	9.0892	776.217	
0	19	12	8		0	18	12	7			916199.276(0.175)	9.0081	782.325	
0	18	10	8	+	0	19	9	11	+		916220.229(0.216)	2.2323	596.800	
0	18	10	9	−	0	19	9	10	−		916220.229(0.216)	2.2323	596.800	
0	19	11	8	−	0	18	11	7	−		916229.950(0.102)	9.9944	691.973	
0	19	11	9	+	0	18	11	8	+		916229.950(0.102)	9.9944	691.973	
1	19	−5	15		1	18	−5	14			916265.713(0.098)	14.2247	654.698	
1	19	8	11		1	18	8	10			916388.142(0.090)	13.2097	688.752	
0	19	−11	8		0	18	−11	7			916388.438(0.128)	9.9732	701.734	
0	19	11	9		0	18	11	8			916484.627(0.071)	10.0935	699.704	
0	19	2	18	−	0	18	2	17	−		916495.475(0.029)	15.2630	301.771	
0	19	10	10		0	18	10	9			916542.299(0.068)	10.9361	619.876	
0	19	10	9	+	0	18	10	8	+		916558.617(0.096)	10.8674	627.362	
0	19	10	10	−	0	18	10	9	−		916558.617(0.096)	10.8674	627.362	
0	16	0	16		0	15	−1	15			916651.879(0.032)	12.8532	197.135	
0	19	9	11		0	18	9	10			916728.083(0.072)	11.6945	559.636	
0	19	−10	9		0	18	−10	8			916739.483(0.062)	11.0102	629.841	
1	16	−9	8		1	15	−10	6			916814.723(2.119)	1.4412	740.978	
0	19	−9	10		0	18	−9	9			916841.616(0.057)	11.7905	555.453	
0	19	−8	11		0	18	−8	10			916913.034(0.056)	12.4519	498.955	
0	19	9	10	−	0	18	9	9	−		916940.346(0.057)	11.8377	566.214	
0	19	9	11	+	0	18	9	10	+		916940.346(0.057)	11.8377	566.214	
0	19	8	12		0	18	8	11			917103.073(0.050)	12.5726	508.473	
0	19	8	11	+	0	18	8	10	+		917114.300(0.051)	12.5556	498.628	
0	19	8	12	−	0	18	8	11	−		917114.300(0.051)	12.5556	498.628	
0	19	7	12	−	0	18	7	11	−		917128.524(0.046)	13.1333	445.637	
0	19	7	13	+	0	18	7	12	+		917128.524(0.046)	13.1333	445.637	
0	19	−7	12		0	18	−7	11			917217.100(0.043)	13.2168	456.456	
0	8	3	5		0	7	2	5			917270.003(0.019)	6.6830	60.647	
0	19	6	14	−	0	18	6	13	−		917306.390(0.037)	13.7725	410.266	
0	19	6	13	+	0	18	6	12	+		917306.391(0.037)	13.7725	410.266	
0	19	7	13		0	18	7	12			917351.261(0.044)	13.2307	449.231	
0	19	6	14		0	18	6	13			917393.773(0.038)	13.7314	399.904	
0	19	5	15		0	18	5	14			917404.981(0.032)	14.2438	370.230	
1	23	1	23		1	22	0	22			917410.013(0.177)	12.2140	615.519	
0	19	−6	13		0	18	−6	12			917545.021(0.037)	13.8157	406.990	
0	19	−4	16		0	18	−4	15			917579.126(0.028)	14.6326	336.784	
1	19	4	16	−	1	18	4	15	−		917589.944(0.141)	14.6842	609.661	
1	19	4	15	+	1	18	4	14	+		917590.036(0.141)	14.6842	609.661	
0	19	5	15	+	0	18	5	14	+		917686.313(0.032)	14.3110	371.536	
0	19	5	14	−	0	18	5	13	−		917686.421(0.032)	14.3110	371.536	
0	19	−5	14		0	18	−5	13			917739.947(0.032)	14.2401	361.881	
0	19	4	15		0	18	4	14			917763.926(0.028)	14.7167	342.444	
0	19	−3	17		0	18	−3	16			917775.744(0.027)	15.0336	319.322	
1	19	5	14		1	18	5	13			917858.643(0.142)	14.3410	573.592	
0	19	3	17	+	0	18	3	16	+		917873.697(0.026)	14.9377	310.357	
0	8	−6	2		0	9	−5	4			918166.704(0.052)	0.6564	158.776	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	19	4	16	−	0	18	4	15	−		918224.342(0.028)	14.6561	331.611	
0	19	4	15	+	0	18	4	14	+		918241.627(0.028)	14.6561	331.612	
0	19	3	16	−	0	18	3	15	−		918242.835(0.026)	14.9372	310.390	
0	19	1	18		0	18	1	17			918330.099(0.029)	15.4759	290.469	
0	19	2	17		0	18	2	16			918698.530(0.029)	15.0673	291.498	
0	19	2	17	+	0	18	2	16	+		918980.369(0.029)	15.2684	302.131	
0	19	3	16		0	18	3	15			919065.921(0.026)	14.9778	309.063	
1	1	−1	0		1	2	−2	0			919593.764(0.507)	0.7414	258.246	
1	19	13	6	−	1	18	13	5	−		920478.218(6.698)	8.5494	1050.490	
1	19	13	7	+	1	18	13	6	+		920478.218(6.698)	8.5494	1050.490	
0	24	2	22	+	0	23	3	21	+		921196.615(0.180)	10.1461	479.496	
0	15	−9	6		0	16	−8	8			921515.000(0.090)	1.7705	442.600	
1	21	11	10		1	20	10	10			921610.712(6.326)	18.6280	972.208	
0	19	−2	18		0	18	−2	17			921972.695(0.027)	15.1805	294.293	
1	25	2	24		1	24	−1	23			922307.831(0.643)	0.0935	769.696	
1	23	0	23	+	1	24	1	24	+		922730.352(1.358)	13.8383	707.550	
1	20	8	12	+	1	19	9	11	+		923249.344(0.164)	5.9614	780.719	
1	20	8	13	−	1	19	9	10	−		923249.344(0.164)	5.9614	780.719	
0	21	2	19		0	20	−2	19			923259.982(0.110)	0.0427	357.431	
0	20	11	9	−	0	21	10	12	−		923666.108(0.248)	2.7455	723.889	
0	20	11	10	+	0	21	10	11	+		923666.108(0.248)	2.7455	723.889	
1	23	2	22		1	24	0	24			923807.935(0.593)	0.0021	690.931	
0	20	−9	11		1	19	−4	15			923836.450(0.425)	$0.6E-6$	587.406	
0	19	1	18	−	0	18	1	17	−		924197.756(0.031)	15.3281	288.020	
0	4	3	2	+	0	3	4	−1	+		925646.509(0.024)	$0.5E-5$	19.870	
0	6	4	3	−	0	5	3	2	−		926554.657(0.023)	7.4458	58.813	
0	6	4	2	+	0	5	3	3	+		926555.179(0.023)	7.4458	58.813	
0	14	3	12	+	0	13	2	11	+		926893.316(0.025)	8.9437	173.051	
0	22	−1	22		0	21	0	21			926906.595(0.071)	23.7240	379.611	
1	26	7	19		1	25	8	17			926987.774(2.830)	1.1771	936.462	
0	25	2	24	−	0	24	3	21	−		928688.307(0.237)	9.0388	518.313	
1	25	−11	15		1	26	−10	17			929005.606(3.481)	3.3506	1111.410	
1	22	3	19	−	1	23	2	22	−		929325.261(0.446)	7.5309	651.159	
0	14	3	11	−	0	13	2	12	−		930198.176(0.024)	8.8186	172.948	
1	22	3	20	+	1	23	2	21	+		931509.140(0.436)	7.5132	651.085	
1	21	6	15		1	20	8	12			931633.650(1.340)	0.0051	751.495	
0	12	2	10		0	11	−1	11			932824.125(0.027)	0.0856	110.258	
1	3	3	1		1	4	4	1			932848.416(0.212)	6.4902	268.657	
1	19	−1	18		1	20	−3	17			932967.148(0.521)	0.0005	561.809	
0	17	−2	16		0	16	1	15			933495.937(0.035)	0.2903	234.031	
0	9	2	7	+	0	8	1	8	+		933692.989(0.021)	5.2554	67.679	
0	15	2	13		0	14	0	14			934309.991(0.040)	0.0051	178.025	
0	25	0	25		0	24	1	23			934850.071(0.384)	8.3515	498.344	
1	26	2	25		1	25	3	23			934970.746(1.744)	1.0567	811.031	
0	22	1	21		0	21	−2	20			935113.497(0.129)	0.4553	391.444	
0	20	1	19		0	19	2	17			935288.363(0.068)	8.0507	322.143	
1	18	9	9		0	17	12	6			935369.738(0.624)	$0.8E-5$	753.368	
1	8	5	3		1	9	4	6			936211.132(0.177)	0.7944	324.958	
1	18	8	10		1	17	6	11			936353.090(0.796)	0.0023	657.519	
1	13	2	12		1	14	−3	11			936367.834(0.137)	$0.4E-6$	393.115	
0	10	3	7		0	9	−2	8			937367.628(0.014)	0.0023	90.632	
0	14	1	14	+	0	13	0	13	+		937478.333(0.035)	15.9449	146.670	
0	17	10	8		0	18	9	10			937516.397(0.134)	2.0527	559.636	
0	20	9	11	−	1	19	5	14	−		937817.615(0.343)	0.0016	597.708	
0	20	9	12	+	1	19	5	15	+		937817.617(0.343)	0.0016	597.708	
1	8	1	8	+	1	7	2	5	+		938048.758(0.032)	2.4482	252.643	
0	13	−3	11		0	12	3	9			940179.302(0.023)	$0.6E-7$	159.009	
1	12	3	10		1	11	2	10			940852.380(0.109)	1.3921	384.135	
1	8	1	7	−	1	7	2	6	−		941484.857(0.032)	2.4326	252.644	
1	10	−3	7		1	9	0	9			941494.303(0.084)	0.0001	281.316	
0	26	0	26		0	25	2	23			942213.840(0.477)	0.0392	539.515	
0	8	3	5		0	7	1	6			942394.867(0.023)	0.0095	59.809	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	19	5	15	+	0	18	9	10	+		944158.721(0.318)	0.0003	566.214	
1	19	5	14	−	0	18	9	9	−		944158.724(0.318)	0.0003	566.214	
1	11	−2	9		1	12	1	12			944973.945(0.088)	0.3E−5	328.063	
0	24	0	24	+	0	23	1	23	+		947406.517(0.153)	29.3926	450.735	
0	10	2	9	−	0	9	1	8	−		947475.661(0.023)	6.1773	83.319	
0	10	7	4		0	11	6	6			947585.034(0.060)	0.9033	230.710	
0	24	−11	13		0	25	−10	15			947629.167(0.994)	3.9565	877.553	
0	21	12	10		1	20	9	11			948013.387(1.068)	0.0003	847.193	
1	20	3	18		1	21	−3	18			948039.181(0.684)	0.4E−7	595.527	
1	7	−2	5		1	8	0	8			948300.968(0.087)	0.1E−4	266.838	
0	4	−3	2		0	5	−1	5			948731.030(0.029)	0.2E−5	28.073	
0	19	2	17		0	18	1	17			949556.808(0.056)	9.1058	290.469	
1	19	9	10	−	1	18	8	11	−		951971.296(0.120)	15.4095	748.965	
1	19	9	11	+	1	18	8	10	+		951971.296(0.120)	15.4095	748.965	
0	10	−7	3		0	11	−6	5			952629.272(0.070)	0.8335	237.774	
1	18	10	8		1	17	11	6			952890.790(5.043)	1.5012	877.837	
1	26	6	21	−	1	26	5	22	+		953992.245(1.760)	7.1752	856.083	
1	26	6	20	+	1	26	5	21	−		953992.515(1.760)	7.1752	856.083	
0	18	−2	17		0	17	2	15			954456.276(0.048)	0.0294	262.456	
1	15	6	9		1	14	7	7			954944.766(1.055)	3.0388	572.707	
1	16	4	13	−	1	17	3	14	−		955398.653(0.426)	1.1955	521.418	
1	16	4	12	+	1	17	3	15	+		955409.689(0.427)	1.1954	521.418	
0	16	8	9		0	17	7	11			955419.973(0.072)	2.4745	420.238	
0	13	1	12		0	12	−1	12			955522.298(0.026)	0.0026	129.577	
0	11	9	3		0	12	8	5			955887.167(0.140)	0.4735	358.663	
1	15	−4	11		1	16	−3	13			955891.193(0.146)	3.9068	442.939	
0	20	1	20	+	0	19	1	19	+		956374.238(0.044)	16.1306	313.620	
1	14	−1	13		1	13	2	12			956419.633(0.403)	0.0044	424.349	
1	19	−4	15		0	18	−9	9			957944.703(0.389)	0.8E−7	555.453	
0	16	1	15		0	15	0	15			957995.777(0.041)	7.2835	202.075	
0	20	0	20		0	19	0	19			958147.407(0.040)	16.1218	314.112	
0	14	−2	13		0	13	0	13			959080.851(0.029)	0.0032	155.562	
1	25	6	20	−	1	25	5	21	+		959226.817(1.430)	7.7402	814.379	
1	25	6	19	+	1	25	5	20	−		959226.993(1.430)	7.7402	814.379	
0	11	−2	10		0	10	−1	10			959345.652(0.018)	5.9191	92.543	
0	9	−4	6		0	8	−3	6			959900.488(0.019)	7.8724	101.666	
1	20	3	18		1	19	3	17			960012.710(0.138)	15.7121	595.127	
1	20	6	15	−	1	19	6	14	−		960157.495(0.133)	14.7531	630.432	
1	20	6	14	+	1	19	6	13	+		960157.503(0.133)	14.7531	630.432	
0	4	−3	2		0	3	−2	2			960471.276(0.024)	4.8655	27.682	
1	16	0	16		1	15	1	15			960502.103(0.047)	7.1996	395.585	
0	12	8	4	+	0	13	7	7	+		960882.556(0.071)	1.1557	316.772	
0	12	8	5	−	0	13	7	6	−		960882.556(0.071)	1.1557	316.772	
1	20	6	14		1	19	6	13			961138.135(0.168)	14.1804	716.859	
1	20	−13	8		1	19	−13	7			961141.463(0.895)	8.0710	1135.290	
1	20	12	8		1	19	12	7			961319.280(0.504)	10.4096	997.271	
1	20	12	9	−	1	19	12	8	−		961435.415(0.652)	9.0238	1031.430	
1	20	12	8	+	1	19	12	7	+		961435.416(0.652)	9.0238	1031.430	
1	20	−7	14		1	19	−7	13			961526.004(0.112)	14.3564	668.991	
1	20	8	12	+	1	19	8	11	+		961581.662(0.139)	6.5867	779.440	
1	20	8	13	−	1	19	8	12	−		961581.662(0.139)	6.5867	779.440	
0	20	−1	20		0	19	−1	19			961634.945(0.034)	16.1220	309.545	
1	20	13	7		1	19	13	6			961663.476(0.460)	9.2709	1139.960	
1	20	11	9		1	19	11	8			961669.197(0.401)	10.1328	937.196	
1	20	1	20	+	1	19	1	19	+		961741.803(0.088)	16.1510	531.201	
0	17	0	17		0	16	−1	16			961777.097(0.038)	14.3565	222.849	
1	20	−10	11		1	19	−10	10			961812.809(0.266)	10.2593	853.313	
1	20	−12	9		1	19	−12	8			961918.599(0.374)	10.3311	1073.980	
1	20	10	10		1	19	10	9			962096.213(0.286)	12.4794	940.116	
1	20	11	9	−	1	19	11	8	−		962148.421(0.292)	11.5061	1011.810	
1	20	11	10	+	1	19	11	9	+		962148.421(0.292)	11.5061	1011.810	
1	20	−9	12		1	19	−9	11			962197.544(0.245)	14.5055	858.253	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	20	−2	18		1	19	−2	17			962221.377(0.093)	16.0351	558.780	
1	20	7	13		1	19	7	12			962231.758(0.192)	13.4233	709.190	
1	20	−11	10		1	19	−11	9			962415.954(0.273)	11.3063	925.780	
0	5	3	2		0	4	0	4			962577.903(0.025)	0.0007	25.254	
1	20	−6	15		1	19	−6	14			962595.391(0.125)	14.2693	648.314	
1	20	10	10	+	1	19	10	9	+		962598.372(0.167)	12.1179	865.195	
1	20	10	11	−	1	19	10	10	−		962598.372(0.167)	12.1179	865.195	
1	20	9	11		1	19	9	10			962734.327(0.132)	12.8621	815.080	
1	20	2	18	+	1	19	2	17	+		962801.639(0.087)	15.9648	513.037	
1	20	4	17		1	19	4	16			962803.143(0.081)	15.3772	557.991	
1	20	5	16	+	1	19	5	15	+		962807.315(0.097)	14.9096	597.708	
1	20	5	15	−	1	19	5	14	−		962807.316(0.097)	14.9096	597.708	
1	20	0	20		1	19	0	19			962841.963(0.089)	16.1767	514.375	
1	20	9	11	−	1	19	9	10	−		962846.044(0.141)	20.6718	780.719	
1	20	9	12	+	1	19	9	11	+		962846.044(0.141)	20.6718	780.719	
0	20	0	20	+	0	19	0	19	+		962847.742(0.034)	16.1609	305.872	
1	20	−8	13		1	19	−8	12			962860.568(0.126)	13.5542	774.774	
1	20	−3	17		1	19	−3	16			962885.350(0.081)	15.7220	529.691	
1	20	1	20		1	19	1	19			962912.533(0.090)	16.1151	508.056	
1	20	7	13	−	1	19	7	12	−		962957.550(0.126)	14.2271	743.175	
1	20	7	14	+	1	19	7	13	+		962957.550(0.126)	14.2271	743.175	
1	20	2	19	−	1	19	2	18	−		963036.117(0.087)	15.9648	513.073	
0	20	14	6	+	0	19	14	5	+		963346.153(0.485)	7.8764	984.222	
0	20	14	7	−	0	19	14	6	−		963346.153(0.485)	7.8764	984.222	
1	20	1	19	−	1	19	1	18	−		963613.203(0.116)	16.1498	531.803	
0	20	13	8		0	19	13	7			963623.783(0.341)	8.9962	889.573	
1	20	2	19		1	19	2	18			963770.123(0.092)	16.0481	583.538	
1	20	3	18	+	1	19	3	17	+		963782.744(0.087)	15.7925	580.902	
1	20	3	17	−	1	19	3	16	−		963789.983(0.088)	15.7925	580.903	
1	20	−1	19		1	19	−1	18			963793.230(0.103)	16.1070	592.930	
0	20	−13	7		0	19	−13	6			963847.985(0.177)	9.1440	890.301	
1	20	0	20	+	1	19	0	19	+		963897.401(0.126)	16.1627	600.105	
1	24	6	19	−	1	24	5	20	+		963926.003(1.188)	8.1525	774.273	
1	24	6	18	+	1	24	5	19	−		963926.115(1.188)	8.1525	774.273	
0	20	−12	8		0	19	−12	7			963934.561(0.216)	10.0534	802.278	
0	20	13	7	−	0	19	13	6	−		964015.573(0.233)	9.1054	899.338	
0	20	13	8	+	0	19	13	7	+		964015.573(0.233)	9.1054	899.338	
0	21	9	12	−	0	22	8	15	−		964178.195(0.226)	3.9463	630.622	
0	21	9	13	+	0	22	8	14	+		964178.195(0.226)	3.9463	630.622	
1	20	−4	16		1	19	−4	15			964188.108(0.101)	15.5110	587.406	
0	20	12	9	−	0	19	12	8	−		964241.533(0.108)	10.1865	806.777	
0	20	12	8	+	0	19	12	7	+		964241.534(0.108)	10.1865	806.777	
0	20	12	9		0	19	12	8			964245.684(0.207)	10.0965	812.886	
0	20	11	9	−	0	19	11	8	−		964270.612(0.128)	11.0377	722.535	
0	20	11	10	+	0	19	11	9	+		964270.612(0.128)	11.0377	722.535	
0	20	2	19	−	0	19	2	18	−		964429.660(0.035)	16.0815	332.342	
0	20	−11	9		0	19	−11	8			964441.335(0.153)	11.0151	732.301	
1	20	−5	16		1	19	−5	15			964454.413(0.115)	15.0831	685.262	
0	26	3	23		0	25	−3	23			964495.533(0.225)	0.0002	567.318	
0	20	11	10		0	19	11	9			964563.420(0.089)	11.1470	730.275	
1	20	8	12		1	19	8	11			964596.631(0.110)	14.1675	719.320	
0	20	10	11		0	19	10	10			964612.558(0.086)	11.9416	650.449	
0	20	10	10	+	0	19	10	9	+		964618.326(0.116)	11.8678	657.935	
0	20	10	11	−	0	19	10	10	−		964618.326(0.116)	11.8678	657.935	
0	17	10	7	+	0	18	9	10	+		964688.035(0.186)	1.8809	566.214	
0	17	10	8	−	0	18	9	9	−		964688.035(0.186)	1.8809	566.214	
0	20	9	12		0	19	9	11			964797.204(0.088)	12.6581	590.215	
0	20	−10	10		0	19	−10	9			964831.301(0.080)	12.0227	660.420	
0	20	−9	11		0	19	−9	10			964939.536(0.071)	12.7610	586.035	
0	20	−8	12		0	19	−8	11			964996.319(0.068)	13.3833	529.540	
0	20	9	11	−	0	19	9	10	−		965035.993(0.074)	12.8125	596.800	
0	20	9	12	+	0	19	9	11	+		965035.993(0.074)	12.8125	596.800	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	20	8	13		0	19	8	12			965205.959(0.062)	13.5128	539.064	
0	20	7	13	−	0	19	7	12	−		965232.669(0.056)	14.0367	476.229	
0	20	7	14	+	0	19	7	13	+		965232.669(0.056)	14.0367	476.229	
0	20	8	12	+	0	19	8	11	+		965235.881(0.063)	13.4939	529.219	
0	20	8	13	−	0	19	8	12	−		965235.881(0.063)	13.4939	529.219	
1	17	−9	9		1	16	−10	7			965236.307(2.355)	1.8326	766.661	
0	20	−7	13		0	19	−7	12			965320.922(0.053)	14.1260	487.051	
1	24	1	24		1	23	0	23			965349.947(0.209)	12.8709	652.428	
0	20	6	15	−	0	19	6	14	−		965411.447(0.045)	14.6548	440.864	
0	20	6	14	+	0	19	6	13	+		965411.449(0.045)	14.6548	440.864	
0	9	3	6		0	8	2	6			965448.259(0.019)	7.0670	73.561	
0	20	7	14		0	19	7	13			965491.429(0.054)	14.1402	479.830	
0	20	5	16		0	19	5	15			965516.547(0.039)	15.1033	400.832	
0	20	6	15		0	19	6	14			965528.439(0.046)	14.6104	430.505	
0	20	−6	14		0	19	−6	13			965698.003(0.045)	14.6998	437.596	
0	20	−4	17		0	19	−4	16			965712.782(0.034)	15.4737	367.391	
0	20	5	16	+	0	19	5	15	+		965845.454(0.038)	15.1733	402.147	
0	20	5	15	−	0	19	5	14	−		965845.627(0.038)	15.1733	402.147	
0	22	2	20		0	21	−2	20			965865.581(0.139)	0.0433	391.444	
0	20	−5	15		0	19	−5	14			965919.716(0.038)	15.0984	392.494	
0	20	4	16		0	19	4	15			965921.706(0.034)	15.5610	373.057	
0	20	−3	18		0	19	−3	17			965926.068(0.033)	15.8637	349.935	
1	20	4	17	−	1	19	4	16	−		965964.137(0.164)	15.5273	640.269	
1	20	4	16	+	1	19	4	15	+		965964.268(0.164)	15.5273	640.269	
0	20	3	18	+	0	19	3	17	+		966030.952(0.031)	15.7650	340.974	
1	20	5	15		1	19	5	14			966267.321(0.162)	15.2094	604.209	
0	20	4	17	−	0	19	4	16	−		966470.383(0.033)	15.4973	362.239	
0	20	4	16	+	0	19	4	15	+		966495.119(0.033)	15.4973	362.241	
0	20	3	17	−	0	19	3	16	−		966507.109(0.031)	15.7643	341.020	
0	20	1	19		0	19	1	18			966515.072(0.035)	16.2875	321.101	
0	7	−6	1		0	8	−5	3			966523.123(0.056)	0.3695	144.263	
0	20	2	18		0	19	2	17			966646.712(0.035)	15.8915	322.143	
0	20	2	18	+	0	19	2	17	+		967305.698(0.035)	16.0886	332.785	
0	20	3	17		0	19	3	16			967439.177(0.032)	15.8055	339.720	
1	22	0	22	+	1	23	1	23	+		967635.412(1.250)	13.3581	669.093	
1	23	6	18	−	1	23	5	19	+		968160.370(0.986)	8.4853	735.764	
1	23	6	17	+	1	23	5	18	−		968160.439(0.986)	8.4853	735.764	
1	20	13	7	−	1	19	13	6	−		969062.115(6.990)	9.7614	1081.200	
1	20	13	8	+	1	19	13	7	+		969062.115(6.990)	9.7614	1081.200	
1	22	11	11		1	21	10	11			969068.199(6.793)	19.0475	1005.900	
0	26	0	26		0	25	1	24			969684.447(0.478)	8.1472	538.598	
0	14	−9	5		0	15	−8	7			969797.180(0.084)	1.4157	416.832	
1	21	8	13	+	1	20	9	12	+		969900.789(0.216)	6.6511	812.836	
1	21	8	14	−	1	20	9	11	−		969900.789(0.216)	6.6511	812.836	
1	22	2	21		1	23	0	23			970202.996(0.473)	0.0018	652.428	
1	26	2	25		1	25	−1	24			970303.007(0.711)	0.1160	809.852	
0	20	−2	19		0	19	−2	18			970834.614(0.033)	15.9964	325.047	
0	25	2	23	+	0	24	3	22	+		971521.251(0.215)	10.8024	518.135	
0	26	2	25	−	0	25	3	22	−		971919.481(0.284)	9.3279	558.600	
1	22	6	17	−	1	22	5	18	+		971965.888(0.809)	8.7589	698.853	
1	22	6	16	+	1	22	5	17	−		971965.930(0.809)	8.7589	698.853	
0	19	11	8	−	0	20	10	11	−		972045.765(0.216)	2.3503	690.111	
0	19	11	9	+	0	20	10	10	+		972045.765(0.216)	2.3503	690.111	
0	20	1	19	−	0	19	1	18	−		972488.438(0.037)	16.1379	318.848	
0	21	−9	12		1	20	−4	16			972661.630(0.536)	$0.9E-6$	619.568	
0	15	3	13	+	0	14	2	12	+		974673.161(0.030)	9.3956	195.641	
0	7	4	4	−	0	6	3	3	−		974876.737(0.022)	7.7808	68.493	
0	7	4	3	+	0	6	3	4	+		974878.305(0.022)	7.7808	68.493	
1	21	6	16	−	1	21	5	17	+		975366.303(0.652)	8.9757	663.539	
1	21	6	15	+	1	21	5	16	−		975366.327(0.652)	8.9757	663.539	
1	22	6	16		1	21	8	13			975436.784(1.519)	0.0045	785.278	
1	24	−11	14		1	25	−10	16			975560.761(3.037)	3.0900	1069.760	

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ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	21	3	18	−	1	22	2	21	−		976206.969(0.354)	7.1943	614.241	
0	25	−10	15		0	26	−9	17			976287.442(0.408)	5.0747	844.987	
0	23	1	22		0	22	−2	21			977372.636(0.161)	0.4340	427.088	
1	21	3	19	+	1	22	2	20	+		978047.564(0.348)	7.1801	614.178	
0	23	−1	23		0	22	0	22			978201.764(0.084)	25.6686	414.727	
1	20	6	15	−	1	20	5	16	+		978381.596(0.515)	9.1316	629.824	
1	20	6	14	+	1	20	5	15	−		978381.610(0.515)	9.1316	629.824	
0	15	3	12	−	0	14	2	13	−		979109.569(0.028)	9.2202	195.504	
0	15	1	15	+	0	14	0	14	+		980024.493(0.042)	17.2019	169.206	
1	18	−1	17		1	19	−3	16			980133.721(0.494)	0.0005	529.691	
1	19	6	14	−	1	19	5	15	+		981031.416(0.396)	9.2203	597.708	
1	19	6	13	+	1	19	5	14	−		981031.423(0.396)	9.2203	597.708	
1	19	9	10		0	18	12	7			981962.359(0.693)	0.1E−4	782.325	
0	13	2	11		0	12	−1	12			982994.799(0.030)	0.1408	129.577	
0	26	4	22		0	26	3	23			983132.600(0.250)	25.3159	599.490	
0	21	1	20		0	20	2	18			983305.019(0.086)	8.8580	354.387	
1	18	6	13	−	1	18	5	14	+		983336.470(0.296)	9.2346	567.192	
1	18	6	12	+	1	18	5	13	−		983336.474(0.296)	9.2346	567.192	
1	12	2	11		1	13	−3	10			984203.498(0.138)	0.2E−6	370.609	
1	7	5	2		1	8	4	5			984215.981(0.187)	0.5564	310.483	
0	18	−2	17		0	17	1	16			984764.291(0.044)	0.3109	261.445	
1	17	6	12	−	1	17	5	13	+		985319.014(0.216)	9.1679	538.278	
1	17	6	11	+	1	17	5	12	−		985319.016(0.216)	9.1679	538.278	
0	11	3	8		0	10	−2	9			985365.012(0.015)	0.0054	106.779	
1	9	1	9	+	1	8	2	6	+		985809.527(0.034)	2.9232	265.513	
0	16	10	7		0	17	9	9			985820.079(0.116)	1.6874	530.661	
0	10	2	8	+	0	9	1	9	+		986097.969(0.024)	5.6060	82.068	
0	25	4	21		0	25	3	22			986366.173(0.205)	24.3316	557.541	
1	16	6	11	−	1	16	5	12	+		987002.854(0.160)	9.0141	510.965	
1	16	6	10	+	1	16	5	11	−		987002.855(0.160)	9.0141	510.965	
1	19	8	11		1	18	6	12			987157.244(0.921)	0.0013	686.392	
0	16	2	14		0	15	0	15			987632.697(0.046)	0.0064	202.075	
1	13	3	11		1	12	2	11			987932.015(0.140)	1.4518	403.438	
0	14	−3	12		0	13	3	10			988075.566(0.024)	0.1E−6	179.984	
0	21	9	12	−	1	20	5	15	−		988114.644(0.449)	0.0030	629.824	
0	21	9	13	+	1	20	5	16	+		988114.648(0.449)	0.0030	629.824	
0	3	−3	1		0	2	2	0			988276.777(0.028)	0.2E−7	20.300	
1	15	6	10	−	1	15	5	11	+		988413.109(0.131)	8.7682	485.255	
1	15	6	9	+	1	15	5	10	−		988413.110(0.131)	8.7682	485.255	
0	24	4	20		0	24	3	21			989265.828(0.166)	23.3406	517.205	
1	14	6	8	+	1	14	5	9	−		989575.815(0.131)	8.4259	461.148	
1	14	6	9	−	1	14	5	10	+		989575.815(0.131)	8.4259	461.148	
1	11	−3	8		1	10	0	10			989617.923(0.082)	0.0002	297.401	
1	20	5	16	+	0	19	9	11	+		990025.690(0.403)	0.0006	596.800	
1	20	5	15	−	0	19	9	10	−		990025.694(0.403)	0.0006	596.800	
1	9	1	8	−	1	8	2	7	−		990092.749(0.035)	2.9001	265.514	
1	13	6	7	+	1	13	5	8	−		990517.469(0.149)	7.9836	438.645	
1	13	6	8	−	1	13	5	9	+		990517.469(0.149)	7.9836	438.645	
0	9	3	6		0	8	1	7			990742.660(0.023)	0.0130	72.717	
1	12	6	6	+	1	12	5	7	−		991264.547(0.174)	7.4380	417.747	
1	12	6	7	−	1	12	5	8	+		991264.547(0.174)	7.4380	417.747	
0	11	2	10	−	0	10	1	9	−		991580.131(0.025)	6.6946	99.581	
1	11	6	5	+	1	11	5	6	−		991843.048(0.199)	6.7858	398.454	
1	11	6	6	−	1	11	5	7	+		991843.048(0.199)	6.7858	398.454	
0	23	4	19		0	23	3	20			991849.444(0.133)	22.3436	478.482	
1	10	6	4	+	1	10	5	5	−		992278.063(0.223)	6.0223	380.767	
1	10	6	5	−	1	10	5	6	+		992278.063(0.223)	6.0223	380.767	
1	9	6	3	+	1	9	5	4	−		992593.414(0.245)	5.1404	364.686	
1	9	6	4	−	1	9	5	5	+		992593.414(0.245)	5.1404	364.686	
1	8	6	2	+	1	8	5	3	−		992811.347(0.266)	4.1278	350.212	
1	8	6	3	−	1	8	5	4	+		992811.347(0.266)	4.1278	350.212	
1	7	6	1	+	1	7	5	2	−		992952.286(0.284)	2.9639	337.345	

Table 4. Microwave transitions of CH_3OH in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit. A double asterisk after a measured frequency indicates that the transition was overlooked in the previous global analyses (see the text Refs. 7 and 9)—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	7	6	2	−	1	7	5	3	+		992952.286(0.284)	2.9639	337.345	
1	6	6	0	+	1	6	5	1	−		993034.649(0.301)	1.6112	326.086	
1	6	6	1	−	1	6	5	2	+		993034.649(0.301)	1.6112	326.086	
1	10	−2	8		1	11	1	11			993246.308(0.086)	0.2E−5	308.765	
0	22	4	18		0	22	3	19			994136.178(0.105)	21.3413	441.371	
0	5	−5	0		0	4	−4	1			994217.252(0.032)	8.9147	77.230	
0	9	7	3		0	10	6	5			995923.101(0.065)	0.5966	212.977	
0	21	4	17		0	21	3	18			996146.014(0.082)	20.3344	405.874	
0	23	−11	12		0	24	−10	14			996166.909(0.828)	3.5640	837.362	
1	6	−2	4		1	7	0	7			996542.663(0.088)	0.8E−5	253.968	
0	3	−3	1		0	4	−1	4			997009.313(0.030)	0.6E−6	20.009	
0	22	12	11		1	21	9	12			997540.608(1.357)	0.0003	880.908	
0	20	2	18		0	19	1	18			997873.421(0.070)	9.7793	321.101	
0	20	4	16		0	20	3	17			997899.386(0.064)	19.3234	371.990	
1	19	3	17		1	20	−3	17			998846.209(0.566)	0.2E−7	561.809	
0	19	4	15		0	19	3	16			999416.857(0.049)	18.3087	339.720	

[a] The uncertainties of these lines are less than 10 kHz in the references cited, but a value of 50 kHz is used in the present analysis.

TABLE 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit.

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	3	1	2	−	1	3	1	3	+		551.523(0.018)	0.4673	235.555	
0	17	3	14	−	0	17	3	15	+		605.764(0.039)	1.0053	275.567	
1	17	2	16	−	1	17	2	15	+		626.102(0.363)	0.4372	447.884	
0	9	2	7	+	0	9	2	8	−		676.963(0.022)	0.6372	97.112	
1	3	0	3		1	4	1	4			683.161(0.023)	2.2317	218.372	
1	18	2	17	−	1	18	2	16	+		781.921(0.453)	0.421	476.083	
0	1	1	0	−	0	1	1	1	+		794.706(0.001)	1.2131	11.678	
0	18	3	15	−	0	18	3	16	+		846.730(0.056)	0.9697	303.877	
1	4	1	3	−	1	4	1	4	+		918.973(0.028)	0.3580	241.831	
0	18	6	13		0	19	5	15			926.690(0.062)	4.7678	393.929	
1	19	2	18	−	1	19	2	17	+		964.965(0.559)	0.4068	505.864	
0	10	2	8	+	0	10	2	9	−		1014.616(0.034)	0.5662	112.848	
0	19	3	16	−	0	19	3	17	+		1162.173(0.077)	0.9384	333.756	
1	20	2	19	−	1	20	2	18	+		1178.173(0.682)	0.3943	537.207	
1	5	1	4	−	1	5	1	5	+		1378.025(0.037)	0.2891	249.675	
1	21	2	20	−	1	21	2	19	+		1424.617(0.825)	0.3834	570.109	
0	11	2	9	+	0	11	2	10	−		1464.095(0.048)	0.5068	130.154	
0	20	3	17	−	0	20	3	18	+		1569.176(0.106)	0.9108	365.202	
1	22	2	21	−	1	22	2	20	+		1707.499(0.988)	0.3736	604.571	
1	6	1	5	−	1	6	1	6	+		1928.501(0.045)	0.2415	259.087	
0	8	−2	7		0	9	−1	9			1989.506(0.024)	2.7966	74.705	
1	23	2	22	−	1	23	2	21	+		2030.146(1.176)	0.3650	640.590	
0	12	2	10	+	0	12	2	11	−		2047.261(0.067)	0.4561	149.030	
0	21	3	18	−	0	21	3	19	+		2087.467(0.143)	0.8863	398.215	
0	2	1	1	−	0	2	1	2	+		2384.051(0.003)	0.6724	14.801	
1	24	2	23	−	1	24	2	22	+		2396.003(1.388)	0.3573	678.166	
1	7	1	6	−	1	7	1	7	+		2570.186(0.051)	0.2065	270.067	
0	22	3	19	−	0	22	3	20	+		2739.608(0.191)	0.8642	432.794	
0	13	2	11	+	0	13	2	12	−		2787.689(0.091)	0.4122	169.475	
1	25	2	24	−	1	25	2	23	+		2808.632(1.629)	0.3504	717.298	
0	15	−5	10		0	16	−4	13			3094.831(0.054)	4.0527	275.408	
1	26	2	25	−	1	26	2	24	+		3271.701(1.900)	0.3443	757.984	
1	8	1	7	−	1	8	1	8	+		3302.827(0.052)	0.1795	282.614	
0	23	3	20	−	0	23	3	21	+		3551.174(0.252)	0.8443	468.938	
0	14	2	12	+	0	14	2	13	−		3710.547(0.120)	0.3737	191.489	
0	3	2	1		0	4	0	4			3901.802(0.022)	$0.4E-4$	24.855	
1	9	1	8	−	1	9	1	9	+		4126.131(0.054)	0.1580	296.729	
0	24	3	21	−	0	24	3	22	+		4550.895(0.328)	0.8261	506.645	
0	3	1	2	−	0	3	1	3	+		4767.882(0.006)	0.4691	19.485	
0	15	2	13	+	0	15	2	14	−		4842.459(0.157)	0.3396	215.069	
1	10	1	9	−	1	10	1	10	+		5039.762(0.066)	0.1405	312.410	
0	25	3	22	−	0	25	3	23	+		5770.765(0.422)	0.8094	545.916	
0	12	1	11		0	11	3	8			5963.332(0.033)	0.0132	137.249	
0	15	−3	13		0	16	−2	15			6007.804(0.042)	5.1030	232.416	
1	11	1	10	−	1	11	1	11	+		6043.339(0.101)	0.1258	329.657	
0	16	2	14	+	0	16	2	15	−		6211.336(0.201)	0.3092	240.216	
0	16	0	16		0	15	3	12			6345.866(0.140)	0.0754	222.269	
1	12	1	11		1	12	1	12	+		7136.438(0.164)	0.1134	348.470	
0	11	1	11	+	0	10	2	8	+		7211.886(0.029)	3.5450	112.881	
0	26	3	23	−	0	26	3	24	+		7246.088(0.538)	0.7938	586.748	
0	17	2	15	+	0	17	2	16	−		7846.174(0.253)	0.2817	266.927	
0	7	−1	7		0	6	1	5			7878.694(0.021)	0.0001	47.703	
0	4	1	3	−	0	4	1	4	+		7945.932(0.010)	0.3603	25.730	
1	8	2	7		1	7	3	5			8171.286(0.055)	0.2996	334.303	
1	13	1	12	−	1	13	1	13	+		8318.586(0.257)	0.1027	368.847	
0	10	1	9	−	0	9	2	8	−	9153.500(0.050)	9153.485(0.030)	3.5279	97.112	KUR86
1	14	1	13	−	1	14	1	14	+		9589.261(0.383)	0.0934	390.789	
0	18	4	14		0	17	5	13		9651.480(0.050)	9651.486(0.038)	4.7244	335.768	KUR86
0	18	2	16	+	0	18	2	17	−		9776.822(0.315)	0.2569	295.202	
1	12	2	11	−	1	11	1	10	−	9786.400(0.050)	9786.407(0.050)	7.0139	329.859	KUR86
0	10	−4	7		0	11	−3	9		9999.400(0.050)	9999.373(0.033)	2.3888	147.647	KUR86

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	15	1	14	−	1	15	1	15	+		10947.887(0.547)	0.0853	414.294	
0	24	0	24		0	23	−3	21			11330.382(1.136)	0.4405	477.876	
0	20	4	16		0	21	3	18		11359.230(0.050)*	11359.169(0.125)	6.7641	397.029	KUR86
0	18	2	16		0	17	−3	15			11443.391(0.164)	0.2488	284.524	
0	5	1	4	−	0	5	1	5	+	11917.740(0.050)	11917.773(0.014)	0.2919	33.536	AND87
0	19	2	17	+	0	19	2	18	−		12033.722(0.389)	0.2343	325.039	
0	25	5	21	+	0	24	6	18	+	12346.720(0.050)*	12347.739(1.356)	7.0921	606.951	KUR86
0	25	5	20	−	0	24	6	19	−	12349.840(0.050)*	12350.793(1.357)	7.0921	606.951	KUR86
1	16	1	15	−	1	16	1	16	+		12393.837(0.754)	0.0781	439.362	
0	10	3	7		0	11	2	9		12918.070(0.050)	12918.089(0.026)	3.0767	119.499	KUR86
1	17	1	16	−	1	17	1	17	+		13926.424(1.010)	0.0716	465.991	
0	6	0	6		0	5	−2	4			14012.798(0.026)	0.0002	41.694	
0	5	1	5	+	0	6	0	6	+	14300.350(0.050)	14300.308(0.021)	5.0700	33.059	KUR86
0	20	2	18	+	0	20	2	19	−		14647.609(0.475)	0.2136	356.437	
0	2	0	2		0	3	−1	3		14782.270(0.050)	14782.212(0.019)	1.9834	13.342	KUR86
0	23	6	18	−	0	22	7	15	−		15193.626(1.162)	5.9441	568.762	
0	23	6	17	+	0	22	7	16	+		15193.643(1.162)	5.9441	568.762	
1	18	1	17	−	1	18	1	18	+		15544.905(1.322)	0.0659	494.182	
0	10	−2	9		0	9	3	6			15606.434(0.027)	0.0015	104.185	
1	12	2	10	+	1	11	1	11	+	15667.550(0.050)	15667.472(0.073)	7.0924	329.657	KUR86
0	6	1	5	−	0	6	1	6	+	16682.760(0.050)	16682.748(0.018)	0.2448	42.902	KUR86
1	19	1	18	−	1	19	1	19	+		17248.475(1.696)	0.0607	523.932	
0	21	2	19	+	0	21	2	20	−		17649.189(0.574)	0.1946	389.394	
1	20	1	19	−	1	20	1	20	+		19036.267(2.141)	0.0561	555.284	
0	4	3	2	+	0	5	2	3	+	19123.400(0.050)	19123.354(0.019)	0.5679	49.893	KUR86
0	4	3	1	−	0	5	2	4	−	19195.450(0.050)	19195.402(0.019)	0.5677	49.891	KUR86
0	6	2	4		0	7	−1	7			19244.051(0.022)	0.0012	47.966	
0	24	5	20	+	0	25	4	21	+	19291.450(0.050)*	19291.115(0.932)	7.8866	567.452	KUR86
0	24	5	19	−	0	25	4	22	−	19638.130(0.050)*	19637.688(0.942)	7.8884	567.441	KUR86
0	14	3	12	+	0	13	4	9	+	19977.850(0.050)	19977.787(0.028)	3.7859	199.389	KUR86
0	14	3	11	−	0	13	4	10	−	20173.980(0.050)	20173.948(0.029)	3.7873	199.389	KUR86
1	21	1	20	−	1	21	1	21	+		20907.349(2.663)	0.0518	588.108	
0	22	2	20	+	0	22	2	21	−		21068.789(0.690)	0.1771	423.910	
0	7	1	6	−	0	7	1	7	+	22239.920(0.050)	22239.901(0.022)	0.2102	53.828	KUR86
1	22	1	21	−	1	22	1	22	+		22860.723(3.272)	0.0480	622.532	
0	4	0	4		0	3	1	2		23145.440(0.050)	23145.463(0.014)	1.3992	24.083	KUR86
1	19	−3	16		1	18	−2	16			23391.720(7.197)	12.4398	521.793	
1	17	−2	15		1	18	−3	15			23865.468(7.207)	11.7876	492.790	
0	2	1	1		0	3	0	3		23980.250(0.050)	23980.222(0.014)	0.9226	18.558	KUR86
1	23	1	22	−	1	23	1	23	+		24895.323(3.975)	0.0445	658.512	
0	23	2	21	+	0	23	2	22	−		24935.974(0.823)	0.1610	459.982	
0	22	−3	20		0	23	0	23			25271.196(0.921)	0.3885	440.893	
0	12	4	9	−	0	13	3	10	−	26979.070(0.050)	26979.096(0.026)	3.3535	178.030	KUR86
1	24	1	23	−	1	24	1	24	+		27010.017(4.783)	0.0414	696.046	
0	3	2	1		0	3	1	2		27047.280(0.050)	27047.265(0.022)	2.8030	24.083	KUR86
0	4	2	2		0	4	1	3		27050.540(0.050)	27050.524(0.020)	3.9202	30.381	KUR86
0	2	2	0		0	2	1	1		27053.030(0.050)	27052.994(0.024)	1.5930	19.358	KUR86
0	5	2	3		0	5	1	4		27071.930(0.050)	27071.962(0.018)	5.0129	38.255	KUR86
0	12	4	8	+	0	13	3	11	+	27105.870(0.050)	27105.905(0.025)	3.3527	178.026	KUR86
0	6	2	4		0	6	1	5		27122.720(0.050)	27122.745(0.018)	6.1078	47.703	KUR86
0	7	2	5		0	7	1	6		27215.570(0.050)	27215.590(0.019)	7.2181	58.725	KUR86
0	8	2	6		0	8	1	7		27364.090(0.050)	27364.077(0.021)	8.3501	71.322	KUR86
0	8	−1	8		0	7	2	5			27500.189(0.024)	0.0029	59.633	
0	9	2	7		0	9	1	8		27581.630(0.050)	27581.616(0.023)	9.5048	85.493	KUR86
0	10	2	8		0	10	1	9		27880.030(0.050)	27880.029(0.025)	10.6776	101.237	KUR86
0	6	2	5	−	0	5	3	2	−	27992.990(0.050)	27992.980(0.018)	0.9478	58.403	KUR86
0	6	2	4	+	0	5	3	3	+	28137.250(0.050)	28137.251(0.018)	0.9484	58.403	KUR86
0	11	2	9		0	11	1	10		28267.770(0.050)	28267.745(0.027)	11.8574	118.556	KUR86
0	26	4	23	−	0	25	5	20	−	28399.480(0.050)*	28400.221(0.953)	8.3148	607.363	KUR86
0	8	1	7	−	0	8	1	8	+	28587.890(0.050)	28587.877(0.025)	0.1837	66.314	KUR86
0	26	2	24		0	26	1	25		28621.020(0.050)*	28621.330(0.380)	11.4384	566.821	KUR86
0	12	2	10		0	12	1	11		28747.750(0.050)	28747.709(0.028)	13.0254	137.447	KUR86

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	26	4	22	+	0	25	5	21	+	28869.720(0.050)*	28870.258(0.949)	8.3123	607.363	KUR86
1	25	1	24	−	1	25	1	25	+		29203.603(5.705)	0.0385	735.133	
0	24	2	22	+	0	24	2	23	−		29279.166(0.976)	0.1462	497.610	
0	13	2	11		0	13	1	12		29315.200(0.050)	29315.174(0.030)	14.1538	157.912	HUG51
0	25	−3	23		0	26	−1	26			29519.639(1.536)	0.0004	553.865	
0	14	2	12		0	14	1	13		29955.700(0.050)	29955.690(0.031)	15.2054	179.950	KUR86
0	25	2	23		0	25	1	24		30127.850(0.050)*	30128.063(0.294)	12.6555	525.975	KUR86
0	15	2	13		0	15	1	14		30643.720(0.050)	30643.713(0.032)	16.1351	203.560	KUR86
0	16	2	14		0	16	1	15		31342.280(0.050)	31342.303(0.034)	16.8927	228.742	KUR86
0	24	2	22		0	24	1	23		31350.280(0.050)*	31350.415(0.225)	13.8484	486.688	KUR86
1	26	1	25	−	1	26	1	26	+		31474.813(6.752)	0.0359	775.773	
1	10	1	10	+	1	11	2	9	+	31817.070(0.050)	31817.103(0.048)	6.5869	311.349	KUR86
0	21	7	15	+	0	22	6	16	+		31857.275(1.134)	5.4704	533.150	
0	21	7	14	−	0	22	6	17	−		31857.285(1.133)	5.4704	533.150	
0	8	3	5		0	9	−2	8			31933.204(0.026)	0.0006	88.950	
0	17	2	15		0	17	1	16		32004.340(0.050)	32004.350(0.036)	17.4283	255.495	KUR86
0	23	2	21		0	23	1	22		32271.050(0.050)*	32271.132(0.170)	14.9713	448.963	KUR86
0	4	−1	4		0	3	0	3		32398.480(0.050)	32398.556(0.019)	2.5147	18.558	KUR86
0	18	2	16		0	18	1	17		32575.520(0.050)	32575.538(0.041)	17.7004	283.819	KUR86
0	22	2	20		0	22	1	21		32883.330(0.050)*	32883.371(0.127)	15.9702	412.802	KUR86
0	4	−2	3		0	5	0	5			32891.155(0.026)	0.0001	32.723	
0	19	2	17		0	19	1	18		32998.850(0.050)	32998.873(0.051)	17.6831	313.713	KUR86
0	21	2	19		0	21	1	20		33192.990(0.050)*	33193.006(0.093)	16.7882	378.205	KUR86
0	20	2	18		0	20	1	19		33220.080(0.050)	33220.108(0.069)	17.3724	345.175	KUR86
0	25	2	23	+	0	25	2	24	−		34125.236(1.151)	0.1325	536.790	
0	12	2	10		0	11	3	8		34711.060(0.050)	34711.041(0.029)	3.4792	137.249	KUR86
0	7	0	7	+	0	6	1	6	+	35161.580(0.050)	35161.610(0.021)	6.1275	42.902	AND90a
0	9	2	7	+	0	10	1	10	+	35171.780(0.050)	35171.706(0.026)	3.1526	95.961	KUR86
0	23	6	18	−	0	24	5	19	−	35177.730(0.050)*	35176.943(1.214)	6.6350	568.096	KUR86
0	23	6	17	+	0	24	5	20	+	35179.660(0.050)*	35178.982(1.213)	6.6350	568.096	KUR86
0	9	1	8	−	0	9	1	9	+	35724.850(0.050)	35724.816(0.027)	0.1627	80.358	KUR86
0	14	3	11		0	15	0	15			35953.499(0.101)	0.0588	197.453	
0	16	−3	14		0	17	2	15			36652.612(0.116)	0.1619	256.563	
1	10	1	9	−	1	11	2	10	−	36740.880(0.050)	36740.891(0.039)	6.5258	311.352	KUR86
0	12	−3	10		0	11	−4	8		37224.070(0.050)	37224.099(0.039)	2.8232	165.291	KUR86
0	22	3	19		0	21	4	17		37397.940(0.050)*	37398.107(0.194)	7.1874	430.417	KUR86
0	16	5	12		0	17	4	13		37645.890(0.050)	37645.914(0.037)	4.2763	307.784	KUR86
0	3	1	2		0	2	−2	1			38544.886(0.031)	0.0001	22.797	
1	6	3	4		1	7	2	6			39023.607(0.051)	0.2299	322.014	
0	5	1	4		0	6	−1	6			39071.728(0.021)	0.0001	36.952	
0	26	2	24	+	0	26	2	25	−		39499.105(1.351)	0.1198	577.522	
0	10	3	7		0	11	1	10			41185.834(0.032)	0.0101	118.556	
0	8	2	7	−	0	9	1	8	−	41904.330(0.050)	41904.332(0.025)	3.0128	81.550	KUR86
0	5	0	5		0	4	2	2			43139.663(0.021)	0.0001	31.284	
0	10	1	9	−	0	10	1	10	+	43648.180(0.050)	43648.228(0.028)	0.1456	95.961	KUR86
0	17	−2	16		0	16	−3	14		43658.700(0.050)	43658.785(0.054)	5.4629	257.785	KUR86
0	17	−4	14		0	16	−5	11		43907.320(0.050)	43907.300(0.050)	4.4996	300.677	KUR86
0	10	−1	10		0	9	−2	8		44294.420(0.050)	44294.365(0.028)	3.1444	88.950	KUR86
0	20	5	16		0	19	6	14		46055.700(0.050)	46055.849(0.088)	5.2294	423.823	KUR86
1	5	1	5		1	4	0	4		46382.690(0.050)	46382.765(0.024)	2.6836	224.677	KUR86
1	1	0	1		1	0	0	0		47083.600(0.050)	47083.647(0.004)	0.8089	208.972	KUR86
1	1	0	1	+	1	0	0	0	+	47093.850(0.050)	47093.853(0.008)	0.8081	294.458	KUR86
0	25	0	25		0	24	−3	22			47125.519(1.383)	0.4931	515.582	
0	1	0	1	+	0	0	0	0	+	47205.210(0.050)	47205.206(0.002)	0.8087	0.000	KUR86
0	1	0	1		0	0	0	0		47209.550(0.050)	47209.627(0.002)	0.8084	9.111	KUR86
1	2	0	2		1	3	1	3		47755.350(0.050)	47755.298(0.022)	1.7826	212.091	KUR86
0	17	0	17		0	16	3	13			47808.844(0.193)	0.0935	247.460	
0	17	6	12		0	18	5	14		47950.070(0.050)	47950.107(0.061)	4.3110	364.065	KUR86
0	7	−2	6		0	8	−1	8		48529.770(0.050)	48529.728(0.021)	2.4178	60.550	KUR86
0	12	1	12	+	0	11	2	9	+	49070.910(0.050)	49070.884(0.032)	3.9246	130.203	KUR86
0	14	−5	9		0	15	−4	12		50138.570(0.050)	50138.637(0.061)	3.6084	250.244	KUR86
0	2	2	0		0	3	0	3			51033.216(0.023)	$0.1E-4$	18.558	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	11	1	10	−	0	11	1	11	+	52354.780(0.050)	52354.856(0.029)	0.1314	113.122	KUR86
0	13	1	12		0	12	3	9			53073.905(0.036)	0.0165	156.142	
0	8	−1	8		0	7	1	6			54715.778(0.022)	0.0002	58.725	
0	14	−3	12		0	15	−2	14		55215.230(0.050)	55215.263(0.038)	4.7183	207.176	KUR86
1	9	2	8		1	8	3	6			55435.342(0.060)	0.3699	346.857	
1	13	2	12	−	1	12	1	11	−	56268.860(0.050)	56268.848(0.076)	7.5116	348.708	KUR86
0	19	4	15		0	18	5	14		56964.830(0.050)	56964.813(0.050)	5.1786	364.065	KUR86
0	9	−4	6		0	10	−3	8		57225.680(0.050)	57225.640(0.028)	1.9655	130.334	KUR86
0	25	−8	17		0	26	−7	19			57673.595(5.555)	6.6041	733.416	
0	19	2	17		0	18	−3	16			59418.473(0.228)	0.3651	312.831	
0	19	4	15		0	20	3	17		59907.710(0.050)	59907.740(0.100)	6.3364	363.967	KUR86
0	26	5	22	+	0	25	6	19	+	59921.310(0.050)*	59922.585(1.534)	7.5530	646.195	KUR86
0	26	5	21	−	0	25	6	20	−	59925.820(0.050)*	59927.084(1.535)	7.5531	646.195	KUR86
0	9	3	6		0	10	2	8		60484.920(0.050)	60484.896(0.024)	2.6628	102.167	KUR86
0	11	1	10	−	0	10	2	9	−	60581.340(0.050)	60581.357(0.036)	4.0611	112.848	KUR86
0	7	0	7		0	6	−2	5			60720.884(0.026)	0.0003	51.144	
0	12	1	11	−	0	12	1	12	+	61840.560(0.050)	61840.523(0.030)	0.1194	131.840	KUR86
0	1	0	1		0	2	−1	2		61968.550(0.050)	61968.452(0.020)	1.4738	8.619	KUR86
0	24	6	19	−	0	23	7	16	−		62213.427(1.210)	6.4238	604.876	
0	24	6	18	+	0	23	7	17	+		62213.455(1.209)	6.4238	604.876	
0	21	−3	19		0	22	0	22			62681.515(0.737)	0.3379	405.069	
1	13	2	11	+	1	12	1	12	+	63184.380(0.050)*	63184.135(0.116)	7.6105	348.470	KUR86
0	11	−2	10		0	10	3	7			63255.362(0.029)	0.0035	119.929	
0	4	1	4	+	0	5	0	5	+	63405.230(0.050)*	63405.091(0.021)	4.0305	23.615	KUR86
0	3	2	1		0	2	−2	1			65592.151(0.030)	$0.1E-6$	22.797	
0	5	2	3		0	6	−1	6			66143.690(0.021)	0.0005	36.952	
0	3	3	1	+	0	4	2	2	+	66370.170(0.050)*	66370.016(0.020)	0.2361	42.019	KUR86
0	3	3	0	−	0	4	2	3	−	66400.790(0.050)	66400.870(0.020)	0.2361	42.018	KUR86
0	15	3	13	+	0	14	4	10	+	67019.790(0.050)	67019.781(0.033)	4.2171	221.420	KUR86
0	15	3	12	−	0	14	4	11	−	67314.410(0.050)	67314.310(0.036)	4.2195	221.420	KUR86
0	23	5	19	+	0	24	4	20	+	67328.600(0.100)**	67328.413(0.974)	7.4576	528.146	KUR86
0	23	5	18	−	0	24	4	21	−	67580.820(0.050)*	67580.602(0.985)	7.4588	528.138	KUR86
0	24	−3	22		0	25	−1	25			68616.143(1.270)	0.0004	513.293	
0	5	0	5		0	4	1	3		70190.200(0.050)	70190.187(0.014)	1.8877	30.381	KUR86
1	20	−3	17		1	19	−2	17			70702.896(7.206)	13.1155	551.560	
1	16	−2	14		1	17	−3	14			71075.695(7.225)	11.1581	464.569	
0	1	1	0		0	2	0	2		71155.210(0.050)	71155.232(0.014)	0.4568	13.835	KUR86
0	13	1	12	−	0	13	1	13	+	72100.000(0.050)	72099.969(0.036)	0.1091	152.113	KUR86
0	9	−1	9		0	8	2	6			74045.714(0.026)	0.0061	72.235	
0	11	4	8	−	0	12	3	9	−	74144.710(0.050)	74144.709(0.024)	2.9196	157.571	KUR86
0	11	4	7	+	0	12	3	10	+	74223.870(0.050)	74223.896(0.024)	2.9192	157.569	KUR86
0	7	2	6	−	0	6	3	3	−	75155.150(0.050)	75155.127(0.018)	1.3563	67.849	KUR86
0	7	2	5	+	0	6	3	4	+	75415.300(0.050)	75415.236(0.018)	1.3578	67.849	KUR86
0	6	−2	5		0	6	2	4			76029.274(0.027)	0.0001	48.608	
0	7	−2	6		0	7	2	5			76029.916(0.027)	0.0003	59.633	
0	5	−2	4		0	5	2	3			76030.028(0.027)	$0.3E-4$	39.158	
0	4	−2	3		0	4	2	2			76030.818(0.028)	$0.7E-5$	31.284	
0	3	−2	2		0	3	2	1			76031.262(0.030)	$0.1E-5$	24.985	
0	2	−2	1		0	2	2	0			76031.397(0.031)	$0.6E-7$	20.261	
0	8	−2	7		0	8	2	6			76035.220(0.028)	0.0008	72.235	
0	9	−2	8		0	9	2	7			76051.755(0.030)	0.0017	86.413	
0	10	−2	9		0	10	2	8			76091.330(0.032)	0.0035	102.167	
0	11	−2	10		0	11	2	9			76173.452(0.034)	0.0066	119.499	
0	12	−2	11		0	12	2	10			76328.207(0.036)	0.0117	138.406	
0	13	−2	12		0	13	2	11			76599.275(0.039)	0.0198	158.890	
0	14	−2	13		0	14	2	12			77046.608(0.045)	0.0319	180.949	
0	15	−2	14		0	15	2	13			77748.094(0.058)	0.0490	204.582	
0	8	2	6	+	0	9	1	9	+	78060.240(0.050)	78060.228(0.024)	2.7495	80.358	KUR86
0	16	−2	15		0	16	2	14			78799.423(0.080)	0.0721	229.788	
0	20	7	14	+	0	21	6	15	+		78936.744(1.118)	5.0032	498.593	
0	20	7	13	−	0	21	6	16	−		78936.750(1.118)	5.0032	498.593	
0	13	3	10		0	14	0	14			79031.656(0.073)	0.0442	173.974	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	9	1	9	+	1	10	2	8	+	79269.130(0.050)	79269.131(0.039)	6.0934	294.085	KUR86
0	7	3	4		0	8	−2	7			79385.207(0.025)	0.0002	74.771	
0	5	−1	5		0	4	0	4		79581.770(0.050)	79581.804(0.019)	3.0755	24.855	KUR86
0	3	−2	2		0	4	0	4			79933.064(0.027)	0.3E−4	24.855	
0	17	−2	16		0	17	2	15			80311.397(0.114)	0.1018	256.563	
0	26	0	26		0	25	−3	23			82117.682(1.666)	0.5458	554.850	
0	13	2	11		0	12	3	9		82389.070(0.050)	82389.079(0.033)	3.8665	156.142	KUR86
0	18	−2	17		0	18	2	16			82404.312(0.161)	0.1382	284.906	
0	22	6	17	−	0	23	5	18	−	82661.140(0.050)*	82660.578(1.104)	6.1823	530.392	KUR86
0	22	6	16	+	0	23	5	19	+	82662.520(0.050)*	82661.916(1.104)	6.1823	530.392	KUR86
0	14	1	13	−	0	14	1	14	+	83126.670(0.050)	83126.667(0.049)	0.1003	173.942	KUR86
1	9	1	8	−	1	10	2	9	−	83314.950(0.050)	83314.934(0.037)	6.0469	294.087	KUR86
0	13	−3	11		0	12	−4	9		84444.140(0.050)	84444.114(0.047)	3.2670	184.172	KUR86
0	15	−3	13		0	16	2	14			84807.227(0.084)	0.1004	229.788	
0	15	5	11		0	16	4	12		84929.520(0.050)	84929.527(0.044)	3.8346	281.046	KUR86
0	8	0	8	+	0	7	1	7	+	84970.220(0.050)	84970.232(0.023)	7.2059	53.828	KUR86
0	19	−2	18		0	19	2	17			85199.741(0.220)	0.1809	314.813	
0	4	1	3		0	3	−2	2			85757.927(0.029)	0.0005	27.521	
0	4	1	3		0	5	−1	5			86109.187(0.022)	0.5E−4	27.509	
1	5	3	3		1	6	2	5			86168.150(0.049)	0.1619	311.022	
0	23	3	20		0	22	4	18		86381.640(0.050)*	86381.927(0.294)	7.6055	464.993	KUR86
0	9	3	6		0	10	1	9			88364.924(0.030)	0.0075	101.237	
0	18	0	18		0	17	3	14			88384.721(0.264)	0.1123	274.225	
0	20	−2	19		0	20	2	18			88810.949(0.292)	0.2287	346.283	
0	6	0	6		0	5	2	3			90042.825(0.021)	0.0002	39.158	
0	11	−1	11		0	10	−2	9		90262.310(0.050)	90262.253(0.035)	3.4550	104.705	KUR86
0	13	1	13	+	0	12	2	10	+	90384.310(0.050)	90384.357(0.037)	4.2893	149.098	KUR86
0	18	−4	15		0	17	−5	12		90862.420(0.050)	90862.423(0.051)	4.9482	327.412	KUR86
0	7	2	6	−	0	8	1	7	−	92588.704(0.050)	92588.759(0.022)	2.5147	67.267	TSU95
0	21	5	17		0	20	6	15		92992.830(0.050)*	92993.157(0.132)	5.6954	455.253	KUR86
0	21	−2	20		0	21	2	19			93333.888(0.376)	0.2804	379.312	
1	6	1	6		1	5	0	5		93441.190(0.050)	93441.263(0.024)	3.1391	232.528	KUR86
0	2	1	2	+	0	1	1	1	+	93619.460(0.050)	93619.431(0.004)	1.2144	11.678	KUR86
0	18	−2	17		0	17	−3	15		93847.580(0.050)	93847.703(0.077)	5.7924	284.524	KUR86
1	2	1	2	+	1	1	1	1	+	94072.780(0.050)	94072.784(0.007)	1.2145	227.711	KUR86
1	2	1	2		1	1	1	1		94164.208(0.050)	94164.325(0.007)	1.2118	204.238	AND87
1	2	0	2		1	1	0	1		94165.820(0.050)	94165.782(0.007)	1.6178	210.543	KUR86
1	2	−1	1		1	1	−1	0		94174.990(0.050)	94174.879(0.014)	1.2113	288.916	KUR86
1	2	0	2	+	1	1	0	1	+	94186.731(0.050)	94186.791(0.015)	1.6163	296.029	AND90a
1	2	1	1	−	1	1	1	0	−	94256.510(0.050)*	94256.648(0.008)	1.2145	227.714	KUR86
0	2	−1	2		0	1	−1	1		94405.163(0.050)	94405.223(0.004)	1.2136	5.470	AND90a
0	2	0	2	+	0	1	0	1	+	94407.280(0.050)*	94407.129(0.004)	1.6174	1.575	KUR86
0	2	0	2		0	1	0	1		94411.016(0.050)	94410.895(0.004)	1.6167	10.686	AND90a
0	2	1	1		0	1	1	0		94420.449(0.050)	94420.439(0.004)	1.2457	16.209	AND90a
1	1	0	1		1	2	1	2		94832.360(0.050)	94832.372(0.022)	1.3356	207.379	KUR86
0	15	1	14	−	0	15	1	15	+	94912.690(0.050)	94912.642(0.072)	0.0925	197.326	KUR86
0	16	6	11		0	17	5	13		95010.130(0.050)	95010.206(0.077)	3.8599	335.768	KUR86
0	2	1	1	−	0	1	1	0	−	95208.660(0.050)	95208.776(0.004)	1.2144	11.705	KUR86
0	6	−2	5		0	7	−1	7		95273.440(0.050)	95273.325(0.020)	2.0145	47.966	KUR86
0	13	−5	8		0	14	−4	11			97219.021(0.067)	3.1681	226.650	
0	22	−2	21		0	22	2	20			98840.751(0.472)	0.3349	413.899	
0	14	1	13		0	13	3	10			100135.635(0.041)	0.0200	176.610	
0	20	−3	18		0	21	0	21			100900.829(0.581)	0.2893	370.784	
0	9	−1	9		0	8	1	7			101409.790(0.025)	0.0004	71.322	
1	14	2	13	−	1	13	1	12	−		102708.602(0.121)	8.0194	369.125	
1	10	2	9		1	9	3	7			102790.012(0.072)	0.4398	360.978	
0	3	−2	2		0	3	1	2			103078.527(0.030)	0.0007	24.083	
0	4	−2	3		0	4	1	3			103081.342(0.029)	0.0027	30.381	
0	2	−2	1		0	2	1	1			103084.391(0.032)	0.0001	19.358	
0	5	−2	4		0	5	1	4			103101.990(0.027)	0.0078	38.255	
0	6	−2	5		0	6	1	5			103152.019(0.027)	0.0191	47.703	
0	7	−2	6		0	7	1	6			103245.506(0.027)	0.0413	58.725	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	8	−2	7		0	8	1	7			103399.296(0.029)	0.0812	71.322	
0	9	−2	8		0	9	1	8			103633.372(0.030)	0.1490	85.493	
0	10	−2	9		0	10	1	9			103971.359(0.031)	0.2587	101.237	
0	13	−3	11		0	14	−2	13		104026.552(0.050)	104026.609(0.038)	4.3144	183.519	TSU95
0	20	4	16		0	19	5	15		104296.379(0.050)	104296.379(0.075)	5.6384	393.929	TSU95
0	11	−2	10		0	11	1	10			104441.196(0.032)	0.4293	118.556	
0	8	−4	5		0	9	−3	7		104454.029(0.050)	104453.994(0.026)	1.5559	114.593	TSU95
0	24	−8	16		0	25	−7	18			104875.215(5.412)	6.1251	692.615	
0	12	−2	11		0	12	1	11			105075.916(0.033)	0.6855	137.447	
0	23	−2	22		0	23	2	21			105377.332(0.581)	0.3915	450.040	
0	13	−2	12		0	13	1	12		105914.401(0.050)	105914.449(0.036)	1.0583	157.912	TSU95
0	14	−2	13		0	14	1	13			107002.298(0.044)	1.5850	179.950	
0	8	0	8		0	7	−2	6			107166.013(0.026)	0.0004	62.169	
0	20	2	18		0	19	−3	17			107210.123(0.309)	0.5132	342.707	
0	16	1	15	−	0	16	1	16	+		107448.262(0.104)	0.0857	222.263	
0	8	3	5		0	9	2	7		107984.970(0.050)	107984.959(0.021)	2.2415	86.413	TSU95
0	18	4	14		0	19	3	16			108265.418(0.118)	5.9048	332.479	
0	15	−2	14		0	15	1	14		108391.751(0.050)	108391.807(0.059)	2.3075	203.560	TSU95
0	23	−3	21		0	24	−1	24			108453.491(1.040)	0.0004	474.259	
0	0	0	0		0	1	−1	1		109164.120(0.050)	109164.048(0.020)	0.9784	5.470	TSU95
0	25	6	20	−	0	24	7	17	−		109199.495(1.279)	6.9092	642.552	
0	25	6	19	+	0	24	7	18	+		109199.541(1.280)	6.9092	642.552	
0	16	−2	15		0	16	1	15			110141.726(0.083)	3.2691	228.742	
1	14	2	12	+	1	13	1	13	+		110732.514(0.179)	8.1419	368.847	
0	12	−2	11		0	11	3	8			111039.248(0.031)	0.0077	137.249	
0	26	0	26		0	26	−1	26			111637.321(0.671)	3.3899	553.865	
0	3	1	3	+	0	4	0	4	+		112143.546(0.021)	3.0065	15.744	
0	17	−2	16		0	17	1	16			112315.747(0.116)	4.5092	255.495	
0	12	1	11	−	0	11	2	10	−		112375.502(0.044)	4.6140	130.154	
0	4	2	2		0	3	−2	2			112808.452(0.029)	0.1E−5	27.521	
0	24	−2	23		0	24	2	22			112964.194(0.703)	0.4505	487.734	
0	4	2	2		0	5	−1	5			113159.711(0.020)	0.0002	27.509	
0	16	3	14	+	0	15	4	11	+		114011.706(0.043)	4.6450	245.024	
0	16	3	13	−	0	15	4	12	−		114442.607(0.049)	4.6489	245.023	
0	3	1	2		0	2	2	0			114576.283(0.023)	0.3159	20.261	
0	18	−2	17		0	18	1	17			114979.850(0.160)	6.0565	283.819	
0	22	5	18	+	0	23	4	19	+		115253.401(1.046)	7.0256	490.409	
0	22	5	17	−	0	23	4	20	−		115434.318(1.056)	7.0265	490.403	
0	25	0	25		0	25	−1	25			115741.662(0.587)	3.7398	513.293	
0	6	0	6		0	5	1	4		117114.783(0.050)	117114.788(0.015)	2.3887	38.255	TSU95
1	21	−3	18		1	20	−2	18			118075.388(7.247)	13.8157	582.886	
0	19	−2	18		0	19	1	18			118198.614(0.214)	7.9211	313.713	
1	15	−2	13		1	16	−3	13			118245.658(7.247)	10.5502	437.911	
0	24	0	24		0	24	−1	24			119783.873(0.507)	4.1126	474.259	
0	10	−1	10		0	9	2	7			120346.120(0.031)	0.0121	86.413	
0	17	1	16	−	0	17	1	17	+		120722.038(0.146)	0.0796	248.753	
0	10	4	7	−	0	11	3	8	−		121322.202(0.022)	2.4877	138.685	
0	10	4	6	+	0	11	3	9	+		121369.677(0.022)	2.4875	138.683	
0	7	2	5	+	0	8	1	8	+		121435.421(0.022)	2.3383	66.314	
0	2	2	0		0	1	1	0			121473.433(0.025)	2.8291	16.209	
0	25	−2	24		0	25	2	23			121600.620(0.838)	0.5133	526.980	
0	20	−2	19		0	20	1	19			122031.057(0.279)	10.0898	345.175	
0	8	2	7	−	0	7	3	4	−		122280.419(0.020)	1.7829	78.869	
0	8	2	6	+	0	7	3	5	+		122714.808(0.019)	1.7862	78.869	
0	12	3	9		0	13	0	13			122824.720(0.055)	0.0319	152.045	
0	23	0	23		0	23	−1	23			123732.079(0.432)	4.5057	436.765	
0	19	7	13	+	0	20	6	14	+		126042.268(1.111)	4.5428	465.601	
0	19	7	12	−	0	20	6	15	−		126042.272(1.112)	4.5428	465.601	
0	21	−2	20		0	21	1	20			126526.894(0.356)	12.5247	378.205	
1	8	1	8	+	1	9	2	7	+		126688.064(0.037)	5.6113	278.388	
0	6	3	3		0	7	−2	6			126767.815(0.025)	0.0001	62.169	
0	6	−1	6		0	5	0	5		126779.471(0.050)	126779.501(0.018)	3.6737	32.723	TSU95

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	2	−2	1		0	3	0	3			127064.613(0.028)	0.9E−5	18.558	
0	22	0	22		0	22	−1	22			127553.041(0.363)	4.9154	400.814	
0	19	0	19		0	18	3	15			128029.725(0.354)	0.1312	302.565	
1	8	1	7	−	1	9	2	8	−	129937.297(0.050)	129937.315(0.036)	5.5769	278.390	TSU95
0	14	2	12		0	13	3	10		130091.375(0.050)	130091.325(0.039)	4.2343	176.610	TSU95
0	21	6	16	−	0	22	5	17	−		130104.370(1.022)	5.7338	494.254	
0	21	6	15	+	0	22	5	18	+		130105.231(1.022)	5.7338	494.254	
0	14	1	14	+	0	13	2	11	+	131130.340(0.050)	131130.259(0.046)	4.6372	169.568	TSU95
0	21	0	21		0	21	−1	21			131213.119(0.300)	5.3362	366.408	
0	26	−2	25		0	26	2	24			131269.877(0.989)	0.5824	567.776	
0	14	−3	12		0	13	−4	10			131660.060(0.056)	3.7188	204.626	
0	22	−2	21		0	22	1	21			131724.122(0.446)	15.1676	412.802	
0	14	5	10		0	15	4	11		132201.313(0.050)	132201.319(0.051)	3.4001	255.878	TSU95
0	25	−6	19		0	26	−5	21			132433.436(5.241)	7.7163	638.581	
0	5	1	4		0	4	−2	3			132960.074(0.028)	0.0016	33.820	
0	14	−3	12		0	15	2	13			132963.357(0.066)	0.0592	204.582	
0	3	1	2		0	4	−1	4			133210.942(0.023)	0.2E−4	19.639	
1	4	3	2		1	5	2	4			133278.432(0.052)	0.0977	301.600	
0	20	0	20		0	20	−1	20			134679.461(0.244)	5.7610	333.547	
0	18	1	17	−	0	18	1	18	+		134720.411(0.200)	0.0742	276.794	
0	9	0	9	+	0	8	1	8	+	135113.796(0.050)	135113.873(0.025)	8.3077	66.314	TSU95
0	8	3	5		0	9	1	8			135566.576(0.028)	0.0052	85.493	
0	24	3	21		0	23	4	19		135608.004(0.050)*	135609.905(0.418)	8.0177	501.135	TSU95
0	12	−1	12		0	11	−2	10			135847.546(0.044)	3.7221	122.039	
0	7	0	7		0	6	2	4			136750.159(0.020)	0.0004	48.608	
0	23	−2	22		0	23	1	22			137648.465(0.551)	17.9473	448.963	
0	19	−4	16		0	18	−5	13		137764.849(0.050)	137764.977(0.065)	5.3977	355.717	TSU95
0	19	0	19		0	19	−1	19			137921.390(0.195)	6.1803	302.235	
0	22	5	18		0	21	6	16			139880.731(0.196)	6.1651	488.249	
0	19	−3	17		0	20	0	20			139926.335(0.450)	0.2435	338.040	
0	3	1	3	+	0	2	1	2	+	140423.830(0.050)	140423.850(0.006)	2.1589	14.801	HAQ74
1	7	1	7		1	6	0	6		140491.061(0.050)	140491.179(0.025)	3.5989	241.950	AND90a
0	18	0	18		0	18	−1	18			140911.896(0.153)	6.5832	272.473	
1	3	1	3	+	1	2	1	2	+	141105.169(0.050)	141105.178(0.010)	2.1591	230.849	KUR86
1	3	2	1	+	1	2	2	0	+	141237.353(0.050)*	141236.878(0.010)	1.3443	212.446	AND87
1	3	2	2	−	1	2	2	1	−	141237.353(0.050)*	141237.528(0.010)	1.3443	212.446	AND87
1	3	−2	1		1	2	−2	0			141237.941(0.013)	1.3507	258.260	
1	3	1	3		1	2	1	2		141242.862(0.050)*	141242.857(0.010)	2.1544	207.379	AND90a
1	3	2	2		1	2	2	1		141242.862(0.050)*	141242.903(0.013)	1.3511	282.755	AND90a
1	3	0	3		1	2	0	2		141244.819(0.050)	141244.896(0.010)	2.4267	213.684	AND90a
1	3	−1	2		1	2	−1	1		141260.052(0.050)	141260.058(0.020)	2.1534	292.058	AND90a
1	3	0	3	+	1	2	0	2	+	141277.783(0.050)	141277.899(0.021)	2.4244	299.171	KUR86
1	3	1	2	−	1	2	1	1	−	141380.810(0.050)	141380.888(0.011)	2.1591	230.858	AND87
0	3	0	3		0	2	0	2		141595.477(0.050)	141595.449(0.005)	2.4249	13.835	HAQ74
0	3	−1	3		0	2	−1	2		141597.059(0.050)	141597.135(0.005)	2.1575	8.619	HAQ74
0	3	0	3	+	0	2	0	2	+	141602.528(0.050)	141602.486(0.006)	2.4260	4.724	HAQ74
0	3	2	2	−	0	2	2	1	−	141622.715(0.050)	141622.742(0.005)	1.3562	30.996	HAQ74
0	3	−2	2		0	2	−2	1		141623.491(0.050)*	141623.413(0.005)	1.3492	22.797	HAQ74
0	3	2	1		0	2	2	0		141623.491(0.050)*	141623.548(0.005)	1.3313	20.261	HAQ74
0	3	1	2		0	2	1	1		141629.262(0.050)	141629.277(0.006)	2.2143	19.358	HAQ74
0	3	2	1	+	0	2	2	0	+	141630.908(0.050)	141630.967(0.005)	1.3562	30.996	HAQ74
1	0	0	0		1	1	1	1		141913.089(0.050)	141913.051(0.022)	0.8900	204.238	AND90a
0	15	6	10		0	16	5	12			142102.946(0.095)	3.4155	309.039	
0	5	−2	4		0	6	−1	6		142173.744(0.050)	142173.718(0.020)	1.5936	36.952	AND87
0	3	1	2	−	0	2	1	1	−	142807.657(0.050)	142807.681(0.006)	2.1590	14.880	HAQ74
0	6	2	5	−	0	7	1	6	−	142896.800(0.050)	142896.813(0.020)	2.0327	54.570	AND87
0	17	0	17		0	17	−1	17			143629.115(0.118)	6.9567	244.264	
0	24	−2	23		0	24	1	23			144314.609(0.670)	20.7888	486.688	
0	12	−5	7		0	13	−4	10			144331.132(0.072)	2.7334	204.626	
0	19	−2	18		0	18	−3	16			144618.214(0.112)	6.0874	312.831	
0	16	0	16		0	16	−1	16			146057.653(0.090)	7.2869	217.609	
0	15	1	14		0	14	3	11			147136.372(0.053)	0.0235	198.652	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	10	−1	10		0	9	1	8			147927.736(0.029)	0.0006	85.493	
0	15	0	15		0	15	−1	15			148189.570(0.068)	7.5588	192.510	
0	22	−3	20		0	23	−1	23			149003.275(0.842)	0.0004	436.765	
1	15	2	14	−	1	14	1	13	−		149108.125(0.185)	8.5379	391.109	
0	19	1	18	−	0	19	1	19	+		149427.528(0.267)	0.0694	306.386	
0	14	0	14		0	14	−1	14		150024.809(0.050)	150024.903(0.051)	7.7580	168.969	TSU95
1	11	2	10		1	10	3	8			150259.248(0.109)	0.5088	376.664	
0	13	0	13		0	13	−1	13		151571.517(0.050)	151571.626(0.039)	7.8712	146.989	TSU95
0	21	4	17		0	20	5	16			151648.666(0.111)	6.1037	425.359	
0	7	−4	4		0	8	−3	6		151683.739(0.050)	151683.678(0.028)	1.1641	100.426	AND90a
0	25	−2	24		0	25	1	24			151728.683(0.808)	23.6209	525.975	
0	23	−8	15		0	24	−7	17			152085.062(5.306)	5.6532	653.375	
0	12	−3	10		0	13	−2	12		152501.490(0.050)	152501.596(0.039)	3.8968	161.445	TSU95
0	12	0	12		0	12	−1	12		152844.998(0.050)	152845.024(0.032)	7.8872	126.571	TSU95
0	9	0	9		0	8	−2	7			153272.497(0.028)	0.0006	74.771	
0	11	0	11		0	11	−1	11		153866.588(0.050)	153866.582(0.026)	7.7974	107.716	TSU95
0	10	0	10		0	10	−1	10		154662.531(0.050)	154662.494(0.023)	7.5966	90.427	AND90a
0	21	2	19		0	20	−3	18			154760.521(0.408)	0.6924	374.150	
0	9	0	9		0	9	−1	9		155262.012(0.050)	155262.003(0.020)	7.2832	74.705	AND87
0	7	3	4		0	8	2	6		155420.497(0.050)	155420.426(0.020)	1.8171	72.235	AND90a
0	8	0	8		0	8	−1	8		155695.809(0.050)	155695.740(0.018)	6.8587	60.550	AND87
0	7	0	7		0	7	−1	7		155994.273(0.050)	155994.210(0.017)	6.3281	47.966	AND87
0	26	6	21	−	0	25	7	18	−		156149.145(1.376)	7.4002	681.790	
0	26	6	20	+	0	25	7	19	+		156149.219(1.377)	7.4002	681.790	
0	6	0	6		0	6	−1	6		156186.559(0.050)	156186.515(0.017)	5.6987	36.952	AND87
0	5	0	5		0	5	−1	5		156299.396(0.050)	156299.374(0.017)	4.9803	27.509	AND87
0	4	0	4		0	4	−1	4		156356.390(0.050)	156356.405(0.017)	4.1842	19.639	AND87
0	1	0	1		0	1	−1	1		156373.659(0.050)	156373.675(0.020)	1.4614	5.470	AND87
0	3	0	3		0	3	−1	3		156377.726(0.050)	156377.661(0.018)	3.3232	13.342	AND87
0	2	0	2		0	2	−1	2		156379.367(0.050)	156379.347(0.019)	2.4108	8.619	AND87
0	17	4	13		0	18	3	15			156449.776(0.149)	5.4703	302.565	
1	15	2	13	+	1	14	1	14	+		158312.317(0.265)	8.6875	390.789	
0	13	−2	12		0	12	3	9			158988.354(0.035)	0.0157	156.142	
0	26	−2	25		0	26	1	25			159891.206(0.966)	26.3809	566.821	
0	5	2	3		0	4	−2	3			160032.036(0.028)	$0.7E-5$	33.820	
0	3	2	1		0	4	−1	4			160258.207(0.020)	$0.4E-4$	19.639	
0	2	1	2	+	0	3	0	3	+	160507.778(0.050)	160507.694(0.022)	1.9953	9.447	AND87
0	17	3	15	+	0	16	4	12	+	160944.147(0.050)	160944.133(0.059)	5.0683	270.199	TSU95
0	17	3	14	−	0	16	4	13	−		161560.336(0.070)	5.0744	270.198	
0	4	1	3		0	3	2	1		161789.215(0.050)	161789.190(0.022)	0.7074	24.985	AND87
0	21	5	17	+	0	22	4	18	+		163077.074(1.128)	6.5913	454.241	
0	21	5	16	−	0	22	4	19	−		163204.875(1.136)	6.5918	454.236	
0	7	0	7		0	6	1	5		163872.900(0.050)	163872.904(0.016)	2.9023	47.703	AND87
0	13	1	12	−	0	12	2	11	−		164531.587(0.053)	5.1884	149.030	
0	20	1	19	−	0	20	1	20	+		164825.036(0.348)	0.0651	337.527	
0	6	2	4	+	0	7	1	7	+	165280.537(0.050)	165280.544(0.020)	1.9215	53.828	AND87
1	14	−2	12		1	15	−3	12			165381.680(7.269)	9.9631	412.817	
1	22	−3	19		1	21	−2	19			165516.776(7.340)	14.5411	615.768	
0	1	1	0		0	1	0	1		165566.098(0.050)	165566.127(0.014)	1.3466	10.686	AND87
0	2	1	1		0	2	0	2		165575.639(0.050)	165575.671(0.013)	2.2378	13.835	AND87
0	3	1	2		0	3	0	3		165609.427(0.050)	165609.498(0.013)	3.1190	18.558	AND87
0	4	1	3		0	4	0	4		165690.996(0.050)	165690.992(0.012)	3.9855	24.855	AND87
0	5	1	4		0	5	0	5		165851.224(0.050)	165851.229(0.012)	4.8320	32.723	AND87
0	6	1	5		0	6	0	6		166128.782(0.050)	166128.803(0.014)	5.6529	42.162	AND87
0	11	−1	11		0	10	2	8			166353.583(0.037)	0.0226	102.167	
0	7	1	6		0	7	0	7		166569.486(0.050)	166569.487(0.016)	6.4415	53.169	AND87
0	20	0	20		0	19	3	16			166706.637(0.465)	0.1493	332.479	
0	8	1	7		0	8	0	8		167225.650(0.050)	167225.667(0.018)	7.1913	65.744	AND87
0	11	3	8		0	12	0	12			167263.631(0.044)	0.0220	131.669	
0	9	1	8		0	9	0	9		168155.444(0.050)	168155.491(0.022)	7.8954	79.884	AND87
0	9	4	6	−	0	10	3	7	−	168510.396(0.050)	168510.437(0.021)	2.0602	121.371	AND90a
0	9	4	5	+	0	10	3	8	+	168537.539(0.050)	168537.547(0.021)	2.0601	121.370	AND90a

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	3	2	1		0	2	1	1		168676.499(0.050)	168676.542(0.023)	3.1213	19.358	AND87
0	9	2	8	−	0	8	3	5	−	169356.753(0.050)	169356.731(0.023)	2.2219	91.463	AND90a
0	10	1	9		0	10	0	10		169421.606(0.050)	169421.663(0.025)	8.5471	95.586	AND90a
0	9	2	7		0	8	3	6		170040.962(0.050)	170040.971(0.023)	2.2284	91.463	AND90a
0	11	1	10		0	11	0	11		171089.846(0.050)	171089.889(0.031)	9.1409	112.849	TSU95
0	15	1	15	+	0	14	2	12	+	171285.569(0.050)	171285.600(0.062)	4.9663	191.612	TSU95
0	18	7	12	+	0	19	6	13	+		173171.414(1.112)	4.0900	434.175	
0	18	7	11	−	0	19	6	14	−		173171.416(1.112)	4.0900	434.175	
0	12	1	11		0	12	0	12		173226.899(0.050)	173226.963(0.038)	9.6724	131.669	TSU95
0	7	−1	7		0	6	0	6		174007.462(0.050)	174007.497(0.019)	4.3173	42.162	AND87
1	7	1	7	+	1	8	2	6	+	174073.254(0.050)	174073.261(0.036)	5.1402	264.260	AND90a
0	5	3	2		0	6	−2	5			174096.392(0.025)	$0.1E-4$	51.144	
0	13	1	12		0	13	0	13			175898.626(0.051)	10.1392	152.045	
1	7	1	6	−	1	8	2	7	−	176609.368(0.050)	176609.340(0.034)	5.1156	264.261	AND90a
0	20	6	15	−	0	21	5	16	−		177512.372(0.966)	5.2901	459.680	
0	20	6	14	+	0	21	5	17	+		177512.915(0.966)	5.2901	459.680	
0	15	2	13		0	14	3	11		177780.070(0.050)	177780.085(0.050)	4.5780	198.652	TSU95
0	15	−3	13		0	14	−4	11			178871.382(0.068)	4.1780	226.650	
0	14	1	13		0	14	0	14		179167.337(0.050)	179167.291(0.072)	10.5410	173.974	TSU95
0	13	5	9		0	14	4	10		179463.031(0.050)	179463.074(0.059)	2.9734	232.280	TSU95
0	24	−6	18		0	25	−5	20			179681.300(5.380)	7.2804	597.744	
0	18	−3	16		0	19	0	19			179751.071(0.343)	0.2010	306.836	
0	6	1	5		0	5	−2	4			180141.601(0.028)	0.0043	41.694	
0	2	1	1		0	3	−1	3			180357.883(0.024)	$0.9E-5$	13.342	
1	3	3	1		1	4	2	3			180367.755(0.061)	0.0409	293.748	
0	21	1	20	−	0	21	1	21	+		180891.871(0.446)	0.0612	370.217	
0	13	−1	13		0	12	−2	11			180976.302(0.056)	3.9395	140.952	
0	13	3	11		0	14	2	12			181073.216(0.058)	0.0330	180.949	
0	7	3	4		0	8	1	7			182784.503(0.026)	0.0034	71.322	
0	15	1	14		0	15	0	15			183089.871(0.104)	10.8799	197.453	
0	8	0	8		0	7	2	5			183195.929(0.021)	0.0007	59.633	
0	20	−4	17		0	19	−5	14			184609.185(0.092)	5.8473	385.591	
0	25	3	22		0	24	4	20			185099.133(0.568)	8.4236	538.840	
0	10	0	10	+	0	9	1	9	+	185579.591(0.050)	185579.569(0.029)	9.4354	80.358	AND90a
0	23	5	19		0	22	6	17			186713.917(0.274)	6.6381	522.810	
0	4	1	4		0	3	1	3		187221.901(0.050)	187221.935(0.007)	3.0359	19.485	AND87
1	8	1	8		1	7	0	7		187531.383(0.050)	187531.415(0.026)	4.0636	252.941	AND90a
0	16	1	15		0	16	0	16			187715.861(0.150)	11.1604	222.481	
1	26	0	26		1	26	1	26			188085.123(1.117)	19.2805	752.930	
1	4	1	4	+	1	3	1	3	+	188132.763(0.050)	188132.775(0.012)	3.0362	235.555	AND90a
1	25	0	25		1	25	1	25			188231.002(0.915)	18.8445	712.238	
1	4	−3	1		1	3	−3	0		188298.021(0.050)	188298.038(0.013)	1.4082	233.908	AND90a
1	4	3	2		1	3	3	1		188304.362(0.050)	188304.324(0.017)	1.4144	299.764	AND90a
1	4	−2	2		1	3	−2	1		188308.227(0.050)	188308.325(0.015)	2.4312	262.972	AND90a
1	4	2	2	+	1	3	2	1	+	188308.748(0.050)	188308.827(0.012)	2.4197	217.157	AND90a
1	4	3	2	+	1	3	3	1	+	188309.349(0.050)	188309.369(0.019)	1.4149	284.942	AND90a
1	4	3	1	−	1	3	3	0	−	188309.349(0.050)	188309.371(0.019)	1.4149	284.942	AND90a
1	4	2	3	−	1	3	2	2	−	188310.517(0.050)	188310.453(0.012)	2.4197	217.157	AND90a
1	4	1	4		1	3	1	3		188317.028(0.050)	188317.033(0.012)	3.0296	212.091	AND90a
1	4	0	4		1	3	0	3		188319.531(0.050)*	188319.476(0.012)	3.2355	218.395	AND87
1	4	2	3		1	3	2	2		188319.531(0.050)*	188319.954(0.016)	2.4320	287.466	AND87
1	4	−1	3		1	3	−1	2		188342.511(0.050)	188342.524(0.025)	3.0282	296.770	AND90a
1	24	0	24		1	24	1	24			188359.874(0.744)	18.3773	673.100	
1	4	0	4	+	1	3	0	3	+	188366.162(0.050)	188366.260(0.027)	3.2325	303.883	AND87
1	23	0	23		1	23	1	23			188472.963(0.600)	17.8795	635.519	
1	4	1	3	−	1	3	1	2	−	188500.284(0.050)	188500.226(0.013)	3.0362	235.574	AND90a
1	22	0	22		1	22	1	22			188571.473(0.480)	17.3519	599.495	
1	21	0	21		1	21	1	21			188656.581(0.379)	16.7955	565.029	
1	20	0	20		1	20	1	20			188729.436(0.297)	16.2111	532.122	
0	4	0	4		0	3	0	3		188754.921(0.050)	188754.961(0.007)	3.2328	18.558	HAQ74
0	4	−1	4		0	3	−1	3		188776.224(0.050)	188776.217(0.007)	3.0339	13.342	HAQ74
0	4	0	4	+	0	3	0	3	+	188788.029(0.050)	188787.998(0.007)	3.2346	9.447	HAQ74

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	19	0	19		1	19	1	19			188791.151(0.229)	15.5997	500.776	
0	4	3	2	+	0	3	3	1	+	188802.825(0.100)	188802.872(0.007)	1.4105	44.233	AND87
0	4	3	1	−	0	3	3	0	−	188802.825(0.100)	188802.966(0.007)	1.4105	44.233	AND87
0	4	3	1		0	3	3	0		188804.920(0.050)	188804.991(0.007)	1.4156	42.781	HAQ74
0	4	2	3	−	0	3	2	2	−	188820.042(0.050)	188820.008(0.007)	2.4411	35.720	AND87
0	4	−3	2		0	3	−3	1		188820.042(0.050)	188820.120(0.007)	1.4217	53.193	AND87
0	4	1	3		0	3	1	2		188836.430(0.050)	188836.455(0.007)	3.1132	24.083	HAQ74
0	4	−2	3		0	3	−2	2		188839.565(0.050)*	188839.269(0.007)	2.4286	27.521	AND87
0	4	2	2		0	3	2	1		188839.565(0.050)*	188839.714(0.007)	2.3967	24.985	AND87
0	4	2	2	+	0	3	2	1	+		188840.564(0.007)	2.4411	35.720	
1	18	0	18		1	18	1	18		188845.026(0.050)*	188842.804(0.174)	14.9623	470.992	TSU95
1	17	0	17		1	17	1	17			188885.431(0.130)	14.3001	442.769	
1	16	0	16		1	16	1	16		188921.794(0.050)*	188920.026(0.095)	13.6141	416.110	TSU95
1	15	0	15		1	15	1	15			188947.536(0.068)	12.9055	391.014	
1	14	0	14		1	14	1	14		188968.924(0.050)	188968.861(0.049)	12.1755	367.484	TSU95
1	13	0	13		1	13	1	13		188984.894(0.050)	188984.851(0.036)	11.4253	345.519	TSU95
1	12	0	12		1	12	1	12		188996.356(0.050)	188996.306(0.028)	10.6562	325.120	TSU95
1	1	0	1		1	1	1	1			188996.697(0.022)	1.3343	204.238	
1	2	0	2		1	2	1	2		188998.267(0.050)	188998.155(0.022)	2.2214	207.379	AND90a
1	3	0	3		1	3	1	3		189000.268(0.050)	189000.193(0.022)	3.1049	212.091	AND90a
1	4	0	4		1	4	1	4		189002.630(0.050)	189002.637(0.021)	3.9832	218.372	AND90a
1	11	0	11		1	11	1	11		189004.017(0.050)	189003.972(0.024)	9.8696	306.287	TSU95
1	5	0	5		1	5	1	5		189005.402(0.050)*	189005.250(0.021)	4.8551	226.224	AND90a
1	6	0	6		1	6	1	6		189007.777(0.050)	189007.738(0.021)	5.7190	235.645	AND90a
1	10	0	10		1	10	1	10		189008.610(0.050)	189008.539(0.023)	9.0666	289.022	AND90a
1	7	0	7		1	7	1	7		189009.792(0.050)	189009.750(0.021)	6.5735	246.636	AND90a
1	9	0	9		1	9	1	9		189010.793(0.050)*	189010.647(0.022)	8.2487	273.325	TSU95
1	8	0	8		1	8	1	8			189010.876(0.022)	7.4172	259.196	
0	4	−2	3		0	5	−1	5		189190.559(0.050)	189190.529(0.021)	1.1633	27.509	AND87
0	14	6	9		0	15	5	11		189224.246(0.050)*	189224.445(0.116)	2.9789	283.879	TSU95
0	21	−3	19		0	22	−1	22			190234.556(0.674)	0.0003	400.814	
0	4	1	3	−	0	3	1	2	−	190399.966(0.050)	190399.985(0.007)	3.0360	19.644	AND87
0	11	−5	6		0	12	−4	9			191470.366(0.078)	2.3061	184.172	
0	2	2	0		0	2	0	2			192628.665(0.023)	$0.3E-4$	13.835	
0	3	2	1		0	3	0	3			192656.763(0.022)	0.0001	18.558	
0	4	2	2		0	4	0	4			192741.516(0.021)	0.0002	24.855	
0	5	2	4	−	0	6	1	5	−	192825.762(0.050)	192825.787(0.020)	1.5672	43.459	AND87
0	5	2	3		0	5	0	5			192923.191(0.019)	0.0004	32.723	
0	17	1	16		0	17	0	17			193085.861(0.214)	11.3885	249.055	
0	6	2	4		0	6	0	6			193251.548(0.019)	0.0006	42.162	
0	7	2	5		0	7	0	7			193785.077(0.019)	0.0010	53.169	
0	16	1	15		0	15	3	12			194061.727(0.073)	0.0272	222.269	
0	11	−1	11		0	10	1	9			194233.612(0.035)	0.0009	101.237	
0	8	2	6		0	8	0	8			194589.744(0.021)	0.0014	65.744	
1	16	2	15	−	1	15	1	14	−		195470.154(0.271)	9.0677	414.659	
0	9	2	7		0	9	0	9			195737.107(0.024)	0.0018	79.884	
0	20	−2	19		0	19	−3	17			196021.073(0.160)	6.3456	342.707	
0	10	2	8		0	10	0	10			197301.692(0.029)	0.0022	95.586	
0	2	−2	1		0	1	1	0			197504.830(0.033)	$0.2E-4$	16.209	
0	22	1	21	−	0	22	1	22	+		197604.058(0.562)	0.0577	404.454	
1	12	2	11		1	11	3	9			197869.317(0.181)	0.5761	393.913	
0	6	−4	3		0	7	−3	5		198914.133(0.050)*	198913.892(0.031)	0.7964	87.831	AND90a
0	10	0	10		0	9	−2	8			198956.858(0.031)	0.0008	88.950	
0	22	4	18		0	21	5	17			199024.313(0.158)	6.5743	458.355	
0	18	1	17		0	18	0	18			199230.626(0.298)	11.5718	277.173	
0	22	−8	14		0	23	−7	16			199302.597(5.233)	5.1887	615.696	
0	11	2	9		0	11	0	11			199357.633(0.036)	0.0026	112.849	
0	11	−3	9		0	12	−2	11			200694.836(0.040)	3.4703	140.952	
0	12	2	10		0	12	0	12			201974.672(0.045)	0.0029	131.669	
0	22	2	20		0	21	−3	19			202020.236(0.525)	0.8998	407.160	
0	6	3	3		0	7	2	5		202797.768(0.050)	202797.731(0.021)	1.3950	59.633	AND90a
0	21	0	21		0	20	3	17			204384.080(0.602)	0.1658	363.967	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	16	4	12		0	17	3	14			204477.981(0.179)	5.0335	274.225	
0	13	2	11		0	13	0	13			205213.799(0.057)	0.0031	152.045	
1	16	2	14	+	1	15	1	15	+		205923.337(0.376)	9.2483	414.294	
0	19	1	18		0	19	0	19			206170.671(0.408)	11.7185	306.836	
0	14	−2	13		0	13	3	10			207137.932(0.039)	0.0299	176.610	
0	6	2	4		0	5	−2	4			207264.346(0.027)	$0.3E-4$	41.694	
0	2	2	0		0	3	−1	3			207410.877(0.020)	$0.6E-5$	13.342	
0	18	3	16	+	0	17	4	13	+		207806.489(0.084)	5.4860	296.946	
0	1	1	1	+	0	2	0	2	+	208490.825(0.050)	208490.749(0.022)	0.9940	4.724	AND87
0	18	3	15	−	0	17	4	14	−		208670.048(0.101)	5.4953	296.945	
0	5	1	4		0	4	2	2		208990.796(0.050)	208990.891(0.020)	1.1242	31.284	AND87
0	14	2	12		0	14	0	14			209122.981(0.076)	0.0031	173.974	
0	5	2	3	+	0	6	1	6	+	209580.425(0.050)	209580.473(0.020)	1.5027	42.902	AND87
0	8	0	8		0	7	1	6		210411.469(0.050)	210411.519(0.018)	3.4274	58.725	AND90a
0	20	5	16	+	0	21	4	17	+		210809.693(1.209)	6.1549	419.641	
0	16	1	16	+	0	15	2	13	+		210826.647(0.087)	5.2749	215.231	
0	20	5	15	−	0	21	4	18	−		210898.470(1.214)	6.1553	419.638	
0	12	−1	12		0	11	2	9			212020.997(0.046)	0.0401	119.499	
0	10	3	7		0	11	0	11			212275.722(0.036)	0.0144	112.849	
1	13	2	11		1	14	−3	11			212489.691(7.288)	9.3959	389.288	
0	1	1	0		0	0	0	0		212775.659(0.050)	212775.754(0.014)	0.8936	9.111	AND87
1	23	−3	20		1	22	−2	20			213034.845(7.511)	15.2927	650.207	
0	15	2	13		0	15	0	15			213733.584(0.106)	0.0030	197.453	
0	20	1	19		0	20	0	20			213916.351(0.546)	11.8370	338.040	
0	23	1	22	−	0	23	1	23	+		214934.540(0.699)	0.0546	440.236	
0	8	4	5	−	0	9	3	6	−	215707.918(0.050)	215707.943(0.021)	1.6408	105.630	AND87
0	8	4	4	+	0	9	3	7	+	215722.475(0.050)	215722.532(0.021)	1.6407	105.630	AND87
0	4	2	2		0	3	1	2		215886.963(0.050)	215886.979(0.022)	3.4796	24.083	AND87
0	10	2	9	−	0	9	3	6	−	216370.390(0.050)	216370.374(0.029)	2.6695	105.630	AND90a
0	14	1	13	−	0	13	2	12	−		217044.616(0.064)	5.7864	169.475	
0	10	2	8	+	0	9	3	7	+	217399.550(0.050)	217399.537(0.029)	2.6814	105.630	AND90a
0	3	−2	2		0	2	2	0			217654.810(0.031)	$0.1E-6$	20.261	
0	16	2	14		0	16	0	16			219058.164(0.151)	0.0028	222.481	
0	17	7	11	+	0	18	6	12	+		220321.806(1.117)	3.6454	404.314	
0	17	7	10	−	0	18	6	13	−		220321.807(1.118)	3.6454	404.314	
0	17	−3	15		0	18	0	18			220362.774(0.257)	0.1625	277.173	
0	8	−1	8		0	7	0	7		221285.241(0.050)	221285.265(0.020)	5.0142	53.169	AND87
0	4	3	1		0	5	−2	4			221383.842(0.026)	$0.2E-5$	41.694	
1	6	1	6	+	1	7	2	5	+	221423.997(0.050)	221423.992(0.033)	4.6804	251.701	AND90a
0	21	1	20		0	21	0	21			222468.344(0.718)	11.9350	370.784	
1	6	1	5	−	1	7	2	6	−	223332.040(0.050)	223332.021(0.030)	4.6635	251.702	AND90a
0	19	6	14	−	0	20	5	15	−		224888.430(0.929)	4.8512	426.673	
0	19	6	13	+	0	20	5	16	+		224888.764(0.929)	4.8512	426.673	
0	17	2	15		0	17	0	17			225090.211(0.215)	0.0025	249.055	
0	16	2	14		0	15	3	12			225404.030(0.070)	4.8923	222.269	
0	14	−1	14		0	13	−2	12			225566.994(0.073)	4.1013	161.445	
0	16	−3	14		0	15	−4	12			226077.582(0.081)	4.6439	250.244	
0	12	5	8		0	13	4	9			226716.392(0.068)	2.5557	210.253	
0	23	−6	17		0	24	−5	19			226915.908(5.509)	6.8430	558.470	
0	7	1	6		0	6	−2	5			227290.372(0.028)	0.0094	51.144	
0	1	1	0		0	2	−1	2			227534.579(0.025)	$0.2E-5$	8.619	
0	12	−3	10		0	13	2	11			229100.871(0.055)	0.0174	158.890	
0	9	0	9		0	8	2	6			229307.716(0.023)	0.0011	72.235	
0	6	3	3		0	7	1	6			230013.321(0.026)	0.0020	58.725	
0	21	−4	18		0	20	−5	15			231389.062(0.132)	6.2965	417.033	
0	18	2	16		0	18	0	18			231806.164(0.302)	0.0022	277.173	
0	22	1	21		0	22	0	22			231818.380(0.927)	12.0196	405.069	
0	20	−3	18		0	21	−1	21			232113.947(0.532)	0.0003	366.408	
0	24	1	23	−	0	24	1	24	+		232853.023(0.859)	0.0518	477.564	
0	24	5	20		0	23	6	18			233487.915(0.368)	7.1142	558.936	
0	5	1	5	+	0	4	1	4	+	234011.580(0.050)	234011.614(0.008)	3.8859	25.730	BLA84
1	9	1	9		1	8	0	8		234560.890(0.050)	234560.936(0.027)	4.5341	265.501	AND90a

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	26	3	23		0	25	4	21			234865.827(0.745)	8.8224	578.110	
1	5	1	5	+	1	4	1	4	+	235153.951(0.050)	235153.978(0.014)	3.8864	241.831	AND90a
1	5	4	2		1	4	4	1		235342.117(0.050)	235342.130(0.018)	1.4431	268.653	AND90a
1	5	3	3		1	4	3	2		235352.939(0.050)	235352.859(0.018)	2.5860	306.046	AND90a
1	5	−3	2		1	4	−3	1		235361.917(0.050)	235362.029(0.014)	2.5750	240.189	AND90a
1	5	4	1	+	1	4	4	0	+	235363.329(0.050)*	235363.116(0.034)	1.4554	350.418	AND90a
1	5	4	2	−	1	4	4	1	−	235363.329(0.050)*	235363.116(0.034)	1.4554	350.418	AND90a
1	5	−4	1		1	4	−4	0		235366.134(0.050)	235366.108(0.019)	1.4554	297.822	AND90a
1	5	−2	3		1	4	−2	2		235371.092(0.050)	235371.060(0.017)	3.4036	269.253	AND90a
1	5	2	3	+	1	4	2	2	+	235374.798(0.050)	235374.768(0.013)	3.3876	223.438	AND90a
1	5	2	4	−	1	4	2	3	−	235378.020(0.050)	235378.019(0.013)	3.3876	223.438	AND90a
1	5	3	3	+	1	4	3	2	+	235380.790(0.050)	235380.761(0.022)	2.5873	291.223	AND90a
1	5	3	2	−	1	4	3	1	−	235380.790(0.050)	235380.766(0.022)	2.5873	291.223	AND90a
1	5	1	5		1	4	1	4		235385.387(0.050)	235385.402(0.014)	3.8779	218.372	AND90a
1	5	0	5		1	4	0	4		235387.980(0.050)	235388.014(0.013)	4.0444	224.677	AND87
1	5	2	4		1	4	2	3		235393.600(0.050)	235393.647(0.018)	3.4047	293.748	AND90a
1	5	−1	4		1	4	−1	3		235421.401(0.050)	235421.373(0.029)	3.8760	303.052	AND90a
1	5	0	5	+	1	4	0	4	+	235450.939(0.050)	235450.959(0.031)	4.0407	310.166	AND90a
1	5	1	4	−	1	4	1	3	−	235612.994(0.050)	235613.029(0.014)	3.8863	241.861	AND90a
0	5	0	5		0	4	0	4		235881.170(0.050)	235881.179(0.008)	4.0404	24.855	BLA84
0	5	−1	5		0	4	−1	4		235938.220(0.050)	235938.210(0.008)	3.8833	19.639	BLA84
0	5	0	5	+	0	4	0	4	+	235960.370(0.050)	235960.390(0.008)	4.0432	15.744	BLA84
0	5	4	2	−	0	4	4	1	−	235971.070(0.050)	235971.104(0.009)	1.4541	71.897	BLA84
0	5	4	1	+	0	4	4	0	+	235971.070(0.050)	235971.105(0.009)	1.4541	71.897	BLA84
0	5	−4	2		0	4	−4	1		235978.620(0.050)	235978.630(0.009)	1.4512	77.150	BLA84
0	5	4	1		0	4	4	0		235994.420(0.050)	235994.432(0.010)	1.4608	82.765	BLA84
0	5	3	3	+	0	4	3	2	+	235997.230(0.200)	235997.100(0.008)	2.5792	50.531	BLA84
0	5	3	2	−	0	4	3	1	−	235997.230(0.200)	235997.431(0.008)	2.5792	50.531	BLA84
0	5	3	2		0	4	3	1		236006.100(0.050)	236006.170(0.008)	2.5885	49.079	BLA84
0	5	2	4	−	0	4	2	3	−	236008.390(0.050)	236008.434(0.007)	3.4175	42.018	BLA84
0	5	−3	3		0	4	−3	2		236016.550(0.050)	236016.581(0.008)	2.5997	59.491	BLA84
0	5	1	4		0	4	1	3		236041.400(0.050)	236041.416(0.008)	3.9839	30.381	BLA84
0	5	2	3	+	0	4	2	2	+	236049.520(0.050)	236049.534(0.007)	3.4175	42.019	BLA84
0	5	−2	4		0	4	−2	3		236062.000(0.050)	236062.064(0.008)	3.4000	33.820	BLA84
0	5	2	3		0	4	2	2		236062.850(0.050)	236062.854(0.008)	3.3559	31.284	BLA84
0	3	−2	2		0	4	−1	4		236289.519(0.050)	236289.469(0.022)	0.7350	19.639	AND87
0	11	0	11	+	0	10	1	10	+		236353.064(0.034)	10.5918	95.961	
0	13	6	8		0	14	5	10			236370.979(0.135)	2.5517	260.288	
0	5	1	4	−	0	4	1	3	−	237983.380(0.050)	237983.455(0.008)	3.8861	25.995	BLA84
0	10	−5	5		0	11	−4	8			238632.375(0.084)	1.8890	165.291	
0	19	2	17		0	19	0	19			239169.544(0.415)	0.0020	306.836	
0	12	−1	12		0	11	1	10			240288.742(0.043)	0.0012	118.556	
0	17	1	16		0	16	3	13			240894.705(0.103)	0.0308	247.460	
0	22	0	22		0	21	3	18			241035.629(0.766)	0.1802	397.029	
1	17	2	16	−	1	16	1	15	−		241797.703(0.384)	9.6095	439.775	
0	23	1	22		0	23	0	23			241950.125(1.179)	12.0968	440.893	
0	4	2	3	−	0	5	1	4	−	242373.155(0.050)	242373.176(0.020)	1.1196	33.933	AND87
0	11	0	11		0	10	−2	9			244128.835(0.036)	0.0010	104.705	
0	26	3	23	−	0	26	2	24	+		244332.680(0.949)	26.5754	578.840	
0	3	−2	2		0	2	1	1			244707.804(0.032)	0.0002	19.358	
0	25	3	22	−	0	25	2	23	+		245232.902(0.780)	25.2840	537.928	
1	13	2	12		1	12	3	10			245648.544(0.297)	0.6414	412.726	
0	5	−4	2		0	6	−3	4		246143.897(0.050)	246143.792(0.035)	0.4635	76.811	AND90a
0	24	3	21	−	0	24	2	22	+		246159.133(0.641)	24.0395	498.586	
0	23	4	19		0	22	5	18			246426.116(0.217)	7.0499	492.915	
0	21	−8	13		0	22	−7	15			246527.267(5.183)	4.7321	579.579	
0	23	3	20	−	0	23	2	21	+		247086.264(0.525)	22.8379	460.814	
0	20	2	18		0	20	0	20			247136.459(0.555)	0.0018	338.040	
0	22	3	19	−	0	22	2	20	+		247993.783(0.429)	21.6749	424.613	
0	21	−2	20		0	20	−3	18			248094.409(0.224)	6.5677	374.150	
0	10	−3	8		0	11	−2	10			248654.969(0.041)	3.0389	122.039	
0	21	3	18	−	0	21	2	19	+		248865.451(0.350)	20.5464	389.983	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	23	2	21		0	22	−3	20			248950.062(0.662)	1.1301	441.736	
0	20	3	17	−	0	20	2	18	+		249688.913(0.284)	19.4479	356.925	
0	17	1	17	+	0	16	2	14	+		249729.140(0.121)	5.5612	240.423	
0	5	3	2		0	6	2	4		250125.689(0.050)	250125.667(0.022)	0.9828	48.608	AND90a
0	19	3	16	−	0	19	2	17	+		250455.289(0.230)	18.3755	325.440	
0	2	0	2		0	1	−1	1		250784.606(0.050)	250784.570(0.020)	0.4980	5.470	AND87
0	18	3	15	−	0	18	2	16	+		251158.747(0.186)	17.3252	295.528	
0	25	1	24	−	0	25	1	25	+		251325.875(1.045)	0.0492	516.435	
0	17	3	14	−	0	17	2	15	+		251796.079(0.149)	16.2932	267.188	
0	16	3	13	−	0	16	2	14	+		252366.295(0.120)	15.2762	240.423	
0	15	4	11		0	16	3	13			252366.646(0.205)	4.5953	247.460	
0	24	1	23		0	24	0	24			252840.118(1.478)	12.1714	478.254	
0	15	3	12	−	0	15	2	13	+		252870.225(0.095)	14.2707	215.231	
0	14	3	11	−	0	14	2	12	+		253310.162(0.076)	13.2738	191.612	
1	17	2	15	+	1	16	1	16	+		253565.438(0.516)	9.8250	439.362	
0	13	3	10	−	0	13	2	11	+		253689.530(0.060)	12.2825	169.568	
0	12	3	9	−	0	12	2	10	+		254012.582(0.047)	11.2940	149.098	
0	11	3	8	−	0	11	2	9	+		254284.138(0.037)	10.3053	130.203	
0	4	2	2	+	0	5	1	5	+	254321.721(0.050)	254321.787(0.020)	1.0866	33.536	AND87
0	7	2	5		0	6	2	5			254505.961(0.027)	0.0001	51.144	
0	10	3	7	−	0	10	2	8	+	254509.364(0.050)	254509.349(0.029)	9.3133	112.881	AND90a
0	19	3	17	+	0	18	4	14	+		254586.974(0.119)	5.8970	325.264	
0	12	3	9		0	11	−3	9			254677.812(0.055)	$0.2E-7$	147.647	
0	9	3	6	−	0	9	2	7	+	254693.481(0.050)	254693.500(0.023)	8.3146	97.135	AND87
0	8	3	5	−	0	8	2	6	+	254841.818(0.050)	254841.836(0.019)	7.3044	82.962	AND87
0	7	3	4	−	0	7	2	5	+	254959.398(0.050)	254959.414(0.016)	6.2767	70.365	AND87
0	6	3	3	−	0	6	2	4	+	255050.965(0.050)	255050.985(0.016)	5.2219	59.341	AND87
0	5	3	2	−	0	5	2	3	+	255120.837(0.050)	255120.895(0.016)	4.1240	49.893	AND87
0	4	3	1	−	0	4	2	2	+	255173.019(0.050)	255172.998(0.018)	2.9526	42.019	AND87
0	5	3	3	+	0	5	2	4	−	255192.375(0.050)	255192.391(0.016)	4.1227	49.891	AND90a
0	6	3	4	+	0	6	2	5	−	255193.509(0.050)	255193.491(0.016)	5.2187	59.337	AND90a
0	4	3	2	+	0	4	2	3	−	255203.728(0.050)	255203.725(0.018)	2.9522	42.018	AND87
0	3	3	0	−	0	3	2	1	+	255210.605(0.050)	255210.596(0.020)	1.6404	35.720	AND87
0	7	3	5	+	0	7	2	6	−	255214.891(0.050)	255214.890(0.016)	6.2697	70.356	AND87
0	3	3	1	+	0	3	2	2	−	255220.865(0.050)	255220.861(0.020)	1.6403	35.720	AND87
0	8	3	6	+	0	8	2	7	−	255265.637(0.050)	255265.639(0.019)	7.2908	82.948	AND87
0	9	3	7	+	0	9	2	8	−	255355.930(0.050)	255355.916(0.023)	8.2903	97.112	AND90a
0	10	3	8	+	0	10	2	9	−	255496.966(0.050)	255496.963(0.030)	9.2728	112.848	AND90a
0	15	−2	14		0	14	3	11			255528.179(0.045)	0.0538	198.652	
0	21	2	19		0	21	0	21			255661.349(0.725)	0.0018	370.784	
0	11	3	9	+	0	11	2	10	−		255701.008(0.038)	10.2407	130.154	
0	19	3	16	−	0	18	4	15	−		255775.532(0.143)	5.9107	325.263	
0	12	3	10	+	0	12	2	11	−		255981.193(0.050)	11.1954	149.030	
0	6	1	5		0	5	2	3		256171.587(0.050)	256171.628(0.020)	1.5480	39.158	AND87
0	13	3	11	+	0	13	2	12	−		256351.482(0.064)	12.1372	169.475	
0	9	0	9		0	8	1	7		256671.817(0.050)	256671.793(0.021)	3.9617	71.322	AND87
0	14	3	12	+	0	14	2	13	−		256826.572(0.083)	13.0658	191.489	
0	13	−1	13		0	12	2	10			257304.509(0.059)	0.0680	138.406	
0	15	3	13	+	0	15	2	14	−		257421.792(0.106)	13.9805	215.069	
0	9	3	6		0	10	0	10			257786.588(0.032)	0.0089	95.586	
0	16	3	14	+	0	16	2	15	−		258153.004(0.135)	14.8801	240.216	
0	19	5	15	+	0	20	4	16	+		258460.830(1.282)	5.7171	386.612	
0	19	5	14	−	0	20	4	17	−		258521.376(1.286)	5.7174	386.610	
0	17	3	15	+	0	17	2	16	−		259036.489(0.170)	15.7634	266.927	
1	12	−2	10		1	13	−3	10			259575.198(7.304)	8.8477	367.324	
0	2	1	1		0	1	0	1		259986.530(0.050)	259986.566(0.014)	1.3344	10.686	AND87
0	18	3	16	+	0	18	2	17	−		260088.839(0.214)	16.6286	295.202	
1	24	−3	21		1	23	−2	21			260637.531(7.794)	16.0712	686.201	
0	19	3	17	+	0	19	2	18	−		261326.838(0.267)	17.4740	325.039	
0	16	−3	14		0	17	0	17			261742.823(0.190)	0.1283	249.055	
0	20	3	18	+	0	20	2	19	−		262767.346(0.332)	18.2978	356.437	
0	7	4	4	−	0	8	3	5	−	262913.043(0.050)	262913.026(0.023)	1.2344	91.463	AND87

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	7	4	3	+	0	8	3	6	+	262920.308(0.050)	262920.316(0.023)	1.2344	91.463	AND90a
0	5	2	3		0	4	1	3		263113.343(0.050)	263113.378(0.020)	3.8539	30.381	AND87
0	11	2	10	−	0	10	3	7	−		263306.048(0.038)	3.1233	121.371	
0	25	−7	18		0	26	−6	20			263577.887(4.989)	6.7907	683.823	
0	21	3	19	+	0	21	2	20	−		264427.173(0.411)	19.0980	389.394	
0	25	1	24		0	25	0	25			264458.698(1.830)	12.2473	517.153	
0	22	2	20		0	22	0	22			264701.750(0.925)	0.0019	405.069	
0	11	2	9	+	0	10	3	8	+		264797.145(0.037)	3.1434	121.370	
0	4	−2	3		0	3	2	1			264870.532(0.030)	0.1E−5	24.985	
0	22	3	20	+	0	22	2	21	−		266322.964(0.507)	19.8727	423.910	
0	16	7	10	+	0	17	6	11	+		267491.128(1.126)	3.2100	376.020	
0	16	7	9	−	0	17	6	12	−		267491.129(1.125)	3.2100	376.020	
0	23	3	21	+	0	23	2	22	−		268471.064(0.624)	20.6198	459.982	
0	9	−1	9		0	8	0	8		268635.444(0.050)	268635.458(0.021)	5.7725	65.744	AND87
0	3	3	0		0	4	−2	3			268640.915(0.026)	0.1E−6	33.820	
0	2	−2	1		0	2	0	2			268660.062(0.029)	0.2E−4	13.835	
0	3	−2	2		0	3	0	3			268688.026(0.028)	0.0001	18.558	
1	5	1	5	+	1	6	2	4	+	268739.438(0.050)	268739.430(0.030)	4.2326	240.710	AND90a
0	4	−2	3		0	4	0	4			268772.333(0.027)	0.0002	24.855	
0	5	−2	4		0	5	0	5			268953.219(0.026)	0.0003	32.723	
0	6	−2	5		0	6	0	6			269280.822(0.025)	0.0006	42.162	
0	15	−1	15		0	14	−2	13			269530.487(0.095)	4.2021	183.519	
0	7	−2	6		0	7	0	7			269814.993(0.025)	0.0009	53.169	
0	15	1	14	−	0	14	2	13	−		269908.789(0.079)	6.4103	191.489	
1	5	1	4	−	1	6	2	5	−	270106.066(0.050)	270106.079(0.027)	4.2217	240.711	AND90a
0	26	1	25	−	0	26	1	26	+		270316.064(1.260)	0.0469	556.848	
0	8	−2	7		0	8	0	8			270624.964(0.026)	0.0012	65.744	
0	24	3	22	+	0	24	2	23	−		270887.404(0.764)	21.3376	497.610	
0	9	−2	8		0	9	0	9			271788.862(0.028)	0.0017	79.884	
0	18	6	13	−	0	19	5	14	−		272236.176(0.908)	4.4176	395.233	
0	18	6	12	+	0	19	5	15	+		272236.377(0.907)	4.4176	395.233	
0	17	2	15		0	16	3	13			272899.055(0.102)	5.1715	247.460	
0	17	−3	15		0	16	−4	13			273278.228(0.097)	5.1161	275.408	
0	10	−2	9		0	10	0	10			273393.022(0.031)	0.0022	95.586	
0	25	3	23	+	0	25	2	24	−		273587.373(0.932)	22.0243	536.790	
0	11	5	7		0	12	4	8			273962.690(0.077)	2.1486	189.797	
0	22	−6	16		0	23	−5	18			274139.075(5.626)	6.4046	520.762	
0	23	2	21		0	23	0	23			274221.258(1.157)	0.0023	440.893	
0	8	1	7		0	7	−2	6			274391.680(0.029)	0.0183	62.169	
0	19	−3	17		0	20	−1	20			274605.796(0.415)	0.0003	333.547	
0	10	0	10		0	9	2	7			275008.613(0.028)	0.0017	86.413	
0	11	−2	10		0	11	0	11			275531.085(0.036)	0.0028	112.849	
0	26	3	24	+	0	26	2	25	−		276585.697(1.132)	22.6781	577.522	
0	23	0	23		0	22	3	19			276638.889(0.961)	0.1919	431.665	
0	26	1	25		0	26	0	26			276770.896(2.238)	12.3269	557.589	
0	11	−3	9		0	12	2	10			277023.043(0.054)	0.0085	138.406	
0	5	3	2		0	6	1	5			277248.411(0.026)	0.0011	47.703	
0	22	−4	19		0	21	−5	16			278098.436(0.186)	6.7447	450.042	
0	12	−2	11		0	12	0	12			278302.879(0.043)	0.0034	131.669	
0	25	5	21		0	24	6	19			280197.784(0.481)	7.5928	596.626	
0	6	1	6	+	0	5	1	5	+	280790.743(0.050)	280790.847(0.009)	4.7223	33.536	AND87
1	10	1	10		1	9	0	9		281578.684(0.050)	281578.764(0.031)	5.0111	279.630	AND90a
0	13	−2	12		0	13	0	13			281813.075(0.055)	0.0040	152.045	
1	6	1	6	+	1	5	1	5	+	282167.288(0.050)	282167.191(0.014)	4.7230	249.675	AND90a
1	6	5	1	−	1	5	5	0	−	282364.928(0.050)	282364.920(0.024)	1.4604	316.413	AND90a
1	6	5	2	+	1	5	5	1	+	282364.928(0.050)	282364.920(0.024)	1.4604	316.413	AND90a
1	6	3	4		1	5	3	3		282383.033(0.050)	282383.048(0.018)	3.6360	313.896	AND90a
1	6	4	3		1	5	4	2		282395.053(0.050)	282395.121(0.020)	2.6725	276.503	AND90a
1	6	−3	3		1	5	−3	2		282419.021(0.050)	282419.010(0.015)	3.6211	248.040	AND90a
1	6	−2	4		1	5	−2	3		282424.212(0.050)	282424.233(0.018)	4.3220	277.104	AND90a
1	6	2	4	+	1	5	2	3	+	282433.145(0.050)	282433.202(0.014)	4.3017	231.290	AND90a
1	6	−4	2		1	5	−4	1		282434.336(0.050)	282434.315(0.020)	2.6953	305.673	AND90a

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	6	5	1		1	5	5	0		282436.442(0.050)	282436.405(0.025)	1.4845	322.346	AND90a
1	6	−5	2		1	5	−5	1		282438.034(0.050)	282438.137(0.062)	1.4744	403.644	AND90a
1	6	2	5	−	1	5	2	4	−	282438.887(0.050)	282438.889(0.014)	4.3017	231.290	AND90a
1	6	1	6		1	5	1	5		282446.467(0.050)	282446.513(0.014)	4.7127	226.224	AND90a
1	6	3	4	+	1	5	3	3	+	282448.135(0.050)	282448.182(0.023)	3.6384	299.074	AND90a
1	6	3	3	−	1	5	3	2	−	282448.135(0.050)	282448.196(0.023)	3.6384	299.074	AND90a
1	6	4	2	+	1	5	4	1	+	282449.004(0.050)	282448.970(0.034)	2.6951	358.268	AND90a
1	6	4	3	−	1	5	4	2	−	282449.004(0.050)	282448.970(0.034)	2.6951	358.268	AND90a
1	6	0	6		1	5	0	5		282449.004(0.050)	282449.001(0.014)	4.8533	232.528	AND90a
1	6	2	5		1	5	2	4		282463.121(0.050)	282463.141(0.018)	4.3235	301.600	AND90a
1	6	−1	5		1	5	−1	4		282495.697(0.050)	282495.698(0.032)	4.7105	310.905	AND90a
1	6	0	6	+	1	5	0	5	+	282531.066(0.050)	282531.080(0.034)	4.8488	318.020	AND90a
1	6	1	5	−	1	5	1	4	−	282717.665(0.050)	282717.667(0.014)	4.7229	249.721	AND90a
0	6	0	6		0	5	0	5		282965.950(0.050)	282966.016(0.008)	4.8477	32.723	AND87
0	6	−1	6		0	5	−1	5		283078.845(0.050)	283078.875(0.008)	4.7192	27.509	AND87
0	6	0	6		0	5	0	5		283116.430(0.050)	283116.397(0.009)	4.8518	23.615	AND87
0	6	−5	1		0	5	−5	0		283117.229(0.050)	283117.120(0.013)	1.4781	110.299	AND90a
0	6	5	2		0	5	5	1		283138.747(0.050)	283138.691(0.014)	1.4784	118.674	AND87
0	6	5	1	−	0	5	5	0	−	283144.240(0.050)	283144.178(0.014)	1.4860	119.935	AND87
0	6	5	2	+	0	5	5	1	+	283144.240(0.050)	283144.178(0.014)	1.4860	119.935	AND87
0	6	4	3	−	0	5	4	2	−	283158.560(0.050)	283158.632(0.009)	2.6928	79.769	AND87
0	6	4	2	+	0	5	4	1	+	283158.560(0.050)	283158.635(0.009)	2.6928	79.769	AND87
0	6	−4	3		0	5	−4	2		283161.310(0.050)	283161.317(0.010)	2.6874	85.021	AND87
1	2	0	2		1	1	1	1			283162.480(0.025)	0.4458	204.238	
0	6	4	2		0	5	4	1		283181.395(0.050)	283181.454(0.011)	2.7051	90.637	AND87
0	6	2	5	−	0	5	2	4	−	283185.828(0.050)	283185.813(0.008)	4.3397	49.891	AND90a
0	6	3	4	+	0	5	3	3	+	283187.353(1.000)	283186.913(0.008)	3.6271	58.403	AND87
0	6	3	3	−	0	5	3	2	−	283187.353(1.000)	283187.795(0.008)	3.6271	58.403	AND87
0	6	3	3		0	5	3	2		283207.252(0.050)*	283207.300(0.008)	3.6401	56.951	AND87
0	6	−3	4		0	5	−3	3		283207.252(0.050)	283207.328(0.008)	3.6559	67.364	AND87
0	6	1	5		0	5	1	4		283243.521(0.050)	283243.591(0.008)	4.8398	38.255	AND87
0	6	2	4	+	0	5	2	3	+	283257.647(0.050)	283257.705(0.008)	4.3397	49.893	AND87
0	6	−2	5		0	5	−2	4		283293.574(0.050)	283293.620(0.008)	4.3174	41.694	AND90a
0	6	2	4		0	5	2	3		283294.392(0.050)	283294.373(0.008)	4.2622	39.158	AND90a
0	2	−2	1		0	3	−1	3		283442.303(0.050)	283442.274(0.023)	0.3294	13.342	AND87
0	12	6	7		0	13	5	9			283538.987(0.154)	2.1359	238.266	
0	24	2	22		0	24	0	24			284190.534(1.423)	0.0030	478.254	
0	6	1	5	−	0	5	1	4	−	285555.738(0.050)	285555.823(0.009)	4.7226	33.933	AND87
0	9	−5	4		0	10	−4	7			285813.070(0.090)	1.4857	147.980	
0	13	−1	13		0	12	1	11			286052.218(0.055)	0.0018	137.447	
0	14	−2	13		0	14	0	14			286169.589(0.073)	0.0046	173.974	
0	2	2	0		0	1	0	1			287039.560(0.024)	0.2E−4	10.686	
0	12	0	12	+	0	11	1	11	+		287418.806(0.041)	11.7790	113.122	
0	18	1	17		0	17	3	14			287615.347(0.144)	0.0343	274.225	
0	18	1	18	+	0	17	2	15	+		287968.538(0.166)	5.8237	267.188	
1	18	2	17	−	1	17	1	16	−		288094.055(0.526)	10.1639	466.456	
0	12	0	12		0	11	−2	10			288692.570(0.043)	0.0013	122.039	
0	15	−2	14		0	15	0	15			291481.678(0.099)	0.0052	197.453	
0	3	2	2	−	0	4	1	3	−	291536.562(0.050)	291536.623(0.022)	0.6950	25.995	AND87
0	26	−3	24		0	26	3	23			291908.427(0.732)	0.0003	585.944	
0	4	−2	3		0	3	1	2			291917.796(0.031)	0.0008	24.083	
0	4	−4	1		0	5	−3	3			293372.489(0.039)	0.1850	67.364	
1	14	2	13		1	13	3	11			293626.988(0.469)	0.7040	433.100	
0	20	−8	12		0	21	−7	14			293758.502(5.153)	4.2838	545.026	
0	24	4	20		0	23	5	19			293857.019(0.292)	7.5307	529.038	
0	25	2	23		0	25	0	25			294586.760(1.725)	0.0042	517.153	
0	25	−3	23		0	25	3	22			294861.019(0.604)	0.0002	545.015	
0	24	2	22		0	23	−3	21			295520.916(0.818)	1.3768	477.876	
0	9	−3	7		0	10	−2	9		296424.499(0.050)	296424.593(0.041)	2.6061	104.705	AND90a
0	4	3	1		0	5	2	3		297413.985(0.050)	297413.870(0.025)	0.5929	39.158	AND90a
0	24	−3	22		0	24	3	21			297500.647(0.494)	0.0001	505.658	
0	16	−2	15		0	16	0	16			297857.587(0.137)	0.0056	222.481	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	3	0	3		0	2	−1	2		297974.812(0.050)	297974.797(0.019)	1.0119	8.619	AND87
0	3	2	1	+	0	4	1	4	+	299492.793(0.050)	299492.837(0.022)	0.6813	25.730	AND87
0	23	−3	21		0	23	3	20			299844.263(0.399)	0.0001	467.875	
0	14	4	10		0	15	3	12			300131.722(0.224)	4.1565	222.269	
0	22	−2	21		0	21	−3	19			300860.987(0.306)	6.7570	407.160	
1	18	2	16	+	1	17	1	17	+		301238.558(0.690)	10.4186	465.991	
0	20	3	18	+	0	19	4	15	+		301272.475(0.164)	6.3004	355.152	
0	8	2	6		0	7	−2	6			301755.757(0.028)	0.0002	62.169	
0	22	−3	20		0	22	3	19			301910.085(0.319)	0.4E−4	431.665	
0	13	3	10		0	12	−3	10			302121.958(0.059)	0.5E−7	166.532	
0	14	−1	14		0	13	2	11			302166.269(0.077)	0.1102	158.890	
0	10	0	10		0	9	1	8		302590.285(0.050)	302590.230(0.025)	4.5016	85.493	AND90a
0	20	3	17	−	0	19	4	16	−		302882.003(0.198)	6.3203	355.151	
0	7	1	6		0	6	2	4		303319.623(0.050)	303319.646(0.020)	1.9702	48.608	AND87
0	1	1	0	−	0	1	0	1	+	303692.682(0.050)	303692.584(0.023)	2.9657	1.575	AND90a
0	21	−3	19		0	21	3	18			303717.144(0.252)	0.3E 4	397.029	
0	8	3	5		0	9	0	9			303722.067(0.029)	0.0051	79.884	
0	15	−3	13		0	16	0	16			303865.391(0.140)	0.0987	222.481	
0	16	−2	15		0	15	3	12			304203.454(0.055)	0.0916	222.269	
0	2	1	1		0	2	0	2	+	304494.300(0.050)	304494.231(0.022)	4.9338	4.724	AND87
0	20	−3	18		0	20	3	17			305284.908(0.196)	0.2E−4	363.967	
0	26	2	24		0	26	0	26			305392.225(2.064)	0.0062	557.589	
0	17	−2	16		0	17	0	17			305401.608(0.189)	0.0059	249.055	
0	3	1	2	−	0	3	0	3	+	305699.456(0.050)	305699.426(0.021)	6.8882	9.447	AND87
0	18	5	14	+	0	19	4	15	+		306039.401(1.345)	5.2785	355.152	
0	18	5	13	−	0	19	4	16	−		306079.870(1.348)	5.2787	355.151	
0	19	−3	17		0	19	3	16			306632.972(0.152)	0.9E−5	332.479	
1	11	−2	9		1	12	−3	9			306643.266(7.315)	8.3178	346.927	
0	3	1	2		0	2	0	2		307204.909(0.050)	307204.948(0.014)	1.7737	13.835	AND87
0	4	1	3	−	0	4	0	4	+	307311.471(0.050)	307311.413(0.020)	8.8234	15.744	AND87
0	18	−3	16		0	18	3	15			307780.796(0.117)	0.5E−5	302.565	
1	25	−3	22		1	24	−2	22			308332.862(8.230)	16.8772	723.747	
0	17	−3	15		0	17	3	14			308747.495(0.091)	0.3E−5	274.225	
0	5	1	4	−	0	5	0	5	+	309334.528(0.050)	309334.477(0.020)	10.7341	23.615	AND87
0	16	−3	14		0	16	3	13			309551.667(0.073)	0.1E−5	247.460	
0	6	4	3	−	0	7	3	4	−	310123.877(0.050)	310123.855(0.026)	0.8488	78.869	AND87
0	6	4	2	+	0	7	3	5	+	310127.172(0.050)	310127.167(0.026)	0.8488	78.869	AND87
0	12	2	11	−	0	11	3	8	−		310146.771(0.049)	3.5813	138.685	
0	15	−3	13		0	15	3	12			310211.257(0.061)	0.7E−6	222.269	
0	6	2	4		0	5	1	4		310366.363(0.050)	310366.336(0.019)	4.2262	38.255	AND87
0	14	−3	12		0	14	3	11			310743.442(0.055)	0.3E−6	198.652	
0	24	−7	17		0	25	−6	19			311066.362(4.747)	6.3492	642.999	
0	13	−3	11		0	13	3	10			311164.541(0.053)	0.1E−6	176.610	
0	24	0	24		0	23	3	20			311174.646(1.189)	0.2007	467.875	
0	12	−3	10		0	12	3	9			311489.950(0.051)	0.6E−7	156.142	
0	11	−3	9		0	11	3	8			311734.084(0.051)	0.2E−7	137.249	
0	6	1	5	−	0	6	0	6	+	311773.919(0.050)	311773.903(0.021)	12.6147	33.059	AND87
0	5	−2	4		0	4	2	2			312092.882(0.029)	0.7E−5	31.284	
0	12	2	10	+	0	11	3	9	+		312241.257(0.048)	3.6136	138.683	
0	16	−1	16		0	15	−2	14			312770.522(0.125)	4.2379	207.176	
0	18	−2	17		0	18	0	18			314210.477(0.258)	0.0061	277.173	
0	7	1	6	−	0	7	0	7	+	314635.901(0.050)	314635.925(0.022)	14.4599	44.075	AND87
0	15	7	8	−	0	16	6	11	−		314677.124(1.135)	2.7850	349.294	
0	15	7	9	+	0	16	6	10	+		314677.124(1.135)	2.7850	349.294	
1	4	1	4	+	1	5	2	3	+	316018.717(0.050)	316018.655(0.028)	3.7990	231.290	AND90a
0	10	−1	10		0	9	0	9		316083.286(0.050)	316083.227(0.024)	6.5996	79.884	AND90a
1	4	1	3	−	1	5	2	4	−	316931.923(0.050)	316931.938(0.026)	3.7925	231.290	AND90a
0	18	−3	16		0	19	−1	19			317672.461(0.319)	0.0002	302.235	
0	8	1	7	−	0	8	0	8	+	317927.703(0.050)	317927.665(0.023)	16.2642	56.663	AND87
0	17	6	12	−	0	18	5	13	−		319559.027(0.897)	3.9898	365.361	
0	17	6	11	+	0	18	5	14	+		319559.144(0.897)	3.9898	365.361	
0	18	2	16		0	17	3	14			320190.885(0.144)	5.4102	274.225	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	11	0	11		0	10	2	8			320220.165(0.035)	0.0024	102.167	
0	18	−3	16		0	17	−4	14			320472.961(0.118)	5.5942	302.142	
0	10	5	6		0	11	4	7			321203.195(0.087)	1.7542	170.913	
0	21	−6	15		0	22	−5	17			321352.486(5.729)	5.9657	484.619	
0	9	1	8		0	8	−2	7			321427.987(0.030)	0.0321	74.771	
0	9	1	8	−	0	9	0	9	+	321657.026(0.050)	321657.048(0.026)	18.0222	70.821	AND87
0	1	1	0		0	1	−1	1			321939.802(0.025)	$0.2E-5$	5.470	
0	2	1	1		0	2	−1	2			321955.018(0.024)	$0.1E-4$	8.619	
0	3	1	2		0	3	−1	3			321987.160(0.023)	$0.3E-4$	13.342	
0	4	1	3		0	4	−1	4			322047.397(0.021)	0.0001	19.639	
0	5	1	4		0	5	−1	5			322150.603(0.020)	0.0001	27.509	
0	6	1	5		0	6	−1	6			322315.319(0.019)	0.0002	36.952	
0	7	1	6		0	7	−1	7			322563.697(0.020)	0.0004	47.966	
0	8	1	7		0	8	−1	8			322921.408(0.022)	0.0006	60.550	
0	16	1	15	−	0	15	2	14	−		323117.368(0.098)	7.0625	215.069	
0	9	1	8		0	9	−1	9			323417.494(0.025)	0.0008	74.705	
0	10	1	9		0	10	−1	10			324084.157(0.029)	0.0011	90.427	
0	19	−2	18		0	19	0	19			324369.285(0.349)	0.0062	306.836	
0	4	3	1		0	5	1	4			324485.832(0.028)	0.0004	38.255	
0	23	−4	20		0	22	−5	17			324730.963(0.253)	7.1915	484.619	
0	10	−3	8		0	11	2	9			324828.421(0.053)	0.0039	119.499	
0	11	1	10		0	11	−1	11			324956.471(0.035)	0.0014	107.716	
0	19	1	19	+	0	18	2	16	+		325520.283(0.224)	6.0610	295.528	
0	10	1	9	−	0	10	0	10	+	325832.698(0.050)	325832.710(0.029)	19.7288	86.549	AND90a
0	12	1	11		0	12	−1	12			326071.988(0.043)	0.0017	126.571	
0	26	5	22		0	25	6	20			326838.441(0.613)	8.0739	635.879	
0	13	1	12		0	13	−1	13			327470.251(0.054)	0.0020	146.989	
0	7	1	7	+	0	6	1	6	+	327557.674(0.050)	327557.634(0.009)	5.5508	42.902	AND87
1	11	1	11		1	10	0	10			328583.980(0.037)	5.4952	295.327	
1	7	1	7	+	1	6	1	6	+	329170.807(0.050)	329170.821(0.014)	5.5518	259.087	AND90a
0	14	1	13		0	14	−1	14			329192.194(0.071)	0.0022	168.969	
1	7	6	1	+	1	6	6	0	+	329324.659(0.050)	329324.638(0.035)	1.5090	359.151	AND90a
1	7	6	2	−	1	6	6	1	−	329324.659(0.050)	329324.638(0.035)	1.5090	359.151	AND90a
1	7	−6	2		1	6	−6	1		329353.267(0.050)	329353.301(0.050)	1.4605	376.704	AND90a
1	7	3	5		1	6	3	4		329391.237(0.050)	329391.262(0.018)	4.6162	323.315	AND90a
1	7	5	2	−	1	6	5	1	−	329405.644(0.050)	329405.633(0.024)	2.7312	325.832	AND90a
1	7	5	3	+	1	6	5	2	+	329405.644(0.050)	329405.633(0.024)	2.7312	325.832	AND90a
1	7	4	4		1	6	4	3		329439.715(0.050)	329439.697(0.021)	3.7797	285.923	AND90a
1	7	−2	5		1	6	−2	4		329465.860(0.050)	329465.940(0.018)	5.2093	286.525	AND90a
1	7	−3	4		1	6	−3	3		329467.574(0.050)	329467.580(0.015)	4.5983	257.460	AND90a
1	7	6	1		1	6	6	0			329475.732(0.611)	1.4369	445.343	
1	7	2	5	+	1	6	2	4	+	329482.597(0.050)	329482.629(0.014)	5.1851	240.710	AND90a
1	7	2	6	−	1	6	2	5	−	329491.721(0.050)	329491.724(0.014)	5.1851	240.711	AND90a
1	7	1	7		1	6	1	6		329498.920(0.050)	329498.917(0.015)	5.5398	235.645	AND90a
1	7	−4	3		1	6	−4	2		329499.807(0.050)	329499.781(0.022)	3.8119	315.094	AND90a
1	7	0	7		1	6	0	6		329500.907(0.050)	329500.929(0.014)	5.6621	241.950	AND90a
1	7	−5	3		1	6	−5	2		329508.216(0.050)	329508.255(0.058)	2.7574	413.065	AND90a
1	7	3	5	+	1	6	3	4	+	329510.863(0.050)	329510.836(0.024)	4.6202	308.496	AND90a
1	7	3	4	−	1	6	3	3	−	329510.863(0.050)	329510.867(0.024)	4.6202	308.496	AND90a
1	7	2	6		1	6	2	5		329527.567(0.050)	329527.592(0.018)	5.2114	311.022	AND90a
1	7	5	2		1	6	5	1		329528.960(0.050)	329528.884(0.027)	2.7764	331.767	AND90a
1	7	4	3	+	1	6	4	2	+	329541.974(0.050)	329541.966(0.032)	3.8115	367.690	AND90a
1	7	4	4	−	1	6	4	3	−	329541.974(0.050)	329541.966(0.032)	3.8115	367.690	AND90a
1	7	−1	6		1	6	−1	5		329564.601(0.050)	329564.594(0.034)	5.5372	320.328	AND90a
1	7	0	7	+	1	6	0	6	+	329605.736(0.050)	329605.704(0.037)	5.6569	327.444	AND90a
1	7	1	6	−	1	6	1	5	−	329812.446(0.050)	329812.506(0.014)	5.5518	259.151	AND90a
0	7	0	7		0	6	0	6		330001.752(0.050)	330001.707(0.008)	5.6544	42.162	AND87
0	7	−1	7		0	6	−1	6		330194.042(0.050)	330194.012(0.009)	5.5472	36.952	AND87
0	7	6	2		0	6	6	1		330239.565(0.050)	330239.618(0.020)	1.4934	158.043	AND87
1	3	0	3		1	2	1	2		330243.110(0.050)	330243.050(0.025)	0.8931	207.379	AND90a
0	7	0	7	+	0	6	0	6	+	330252.798(0.050)	330252.765(0.009)	5.6603	33.059	AND87
0	7	−6	1		0	6	−6	0		330265.233(0.050)	330265.175(0.019)	1.5031	165.089	AND87

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	7	6	1	+	0	6	6	0	+	330277.270(0.050)	330277.225(0.021)	1.4981	168.391	AND87
0	7	6	2	−	0	6	6	1	−	330277.270(0.050)	330277.225(0.021)	1.4981	168.391	AND87
0	7	−5	2		0	6	−5	1		330289.345(0.050)	330289.337(0.013)	2.7643	119.743	AND87
0	7	5	3		0	6	5	2		330309.191(0.050)	330309.180(0.013)	2.7648	128.118	AND87
0	7	5	2	−	0	6	5	1	−	330319.110(0.050)	330319.078(0.014)	2.7791	129.380	AND87
0	7	5	3	+	0	6	5	2	+	330319.110(0.050)	330319.078(0.014)	2.7791	129.380	AND87
0	7	−4	4		0	6	−4	3		330336.917(0.050)	330336.889(0.010)	3.8009	94.466	AND87
0	7	4	4	−	0	6	4	3	−	330342.534(0.050)	330342.506(0.009)	3.8084	89.214	AND87
0	7	4	3	+	0	6	4	2	+	330342.534(0.050)	330342.516(0.009)	3.8084	89.214	AND87
0	7	2	6	−	0	6	2	5	−	330349.987(0.050)	330349.942(0.008)	5.2307	59.337	AND87
0	7	4	3		0	6	4	2		330362.042(0.050)	330362.003(0.011)	3.8258	100.083	AND87
0	7	3	5	+	0	6	3	4	+	330371.293(0.050)	330371.340(0.008)	4.6060	67.849	AND87
0	7	3	4	−	0	6	3	3	−	330373.443(0.050)	330373.325(0.008)	4.6060	67.849	AND87
0	7	−3	5		0	6	−3	4		330391.188(0.050)	330391.216(0.008)	4.6423	76.811	AND90a
0	7	3	4		0	6	3	3		330408.395(0.050)	330408.368(0.008)	4.6224	66.398	AND87
0	7	1	6		0	6	1	5		330442.421(0.050)	330442.391(0.009)	5.6863	47.703	AND87
0	11	1	10	−	0	11	0	11	+		330463.873(0.033)	21.3787	103.845	
0	7	2	5	+	0	6	2	4	+	330464.947(0.050)	330464.897(0.008)	5.2307	59.341	AND90a
0	7	2	5		0	6	2	4		330535.222(0.050)	330535.235(0.008)	5.1386	48.608	AND90a
0	7	−2	6		0	6	−2	5		330535.890(0.050)	330535.877(0.008)	5.2039	51.144	AND90a
0	11	6	6		0	12	5	8			330725.068(0.173)	1.7343	217.816	
0	15	1	14		0	15	−1	15			331279.441(0.096)	0.0023	192.510	
0	14	−1	14		0	13	1	12			331481.443(0.072)	0.0025	157.912	
0	13	0	13		0	12	−2	11			332547.928(0.055)	0.0016	140.952	
0	8	−5	3		0	9	−4	6			333008.620(0.098)	1.1015	132.243	
0	7	1	6	−	0	6	1	5	−	333114.779(0.050)	333114.787(0.009)	5.5514	43.459	AND87
0	16	1	15		0	16	−1	16			333773.514(0.132)	0.0023	217.609	
0	19	1	18		0	18	3	15			334200.396(0.197)	0.0379	302.565	
0	3	2	1		0	2	0	2			334252.213(0.023)	0.0001	13.835	
1	19	2	18	−	1	18	1	17	−		334362.759(0.703)	10.7317	494.700	
0	12	1	11	−	0	12	0	12	+		335560.207(0.040)	22.9669	122.709	
0	20	−2	19		0	20	0	20			335947.408(0.466)	0.0061	338.040	
0	17	1	16		0	17	−1	17			336714.976(0.181)	0.0021	244.264	
0	13	0	13	+	0	12	1	12	+		338759.948(0.050)	12.9996	131.840	
0	5	−2	4		0	4	1	3			339143.406(0.030)	0.0023	30.381	
0	18	1	17		0	18	−1	18			340142.522(0.247)	0.0017	272.473	
0	2	2	1	−	0	3	1	2	−	340313.873(0.050)	340313.866(0.024)	0.3071	19.644	AND87
0	19	−8	11		0	20	−7	13			340995.708(5.137)	3.8443	512.037	
0	13	1	12	−	0	13	0	13	+		341131.665(0.050)	24.4884	143.139	
0	25	4	21		0	24	5	20			341320.102(0.384)	8.0165	566.725	
1	22	3	20		1	22	2	21			341554.978(8.553)	3.7038	675.078	
0	25	2	23		0	24	−3	22			341712.280(0.996)	1.6332	515.582	
1	15	2	14		1	14	3	12			341836.051(0.711)	0.7636	455.033	
0	8	−3	6		0	9	−2	8		344040.468(0.050)*	344040.629(0.042)	2.1753	88.950	AND87
0	19	1	18		0	19	−1	19			344092.061(0.333)	0.0012	302.235	
0	25	0	25		0	24	3	21			344626.167(1.453)	0.2064	505.658	
0	3	3	0		0	4	2	2			344671.733(0.028)	0.2481	31.284	
0	2	2	0	+	0	3	1	3	+	345083.793(0.050)	345083.805(0.024)	0.3035	19.485	AND87
0	4	0	4		0	3	−1	3		345132.599(0.050)	345132.623(0.019)	1.5496	13.342	AND87
1	21	3	19		1	21	2	20			345864.491(6.573)	3.5591	640.577	
0	15	−1	15		0	14	2	12			346577.095(0.101)	0.1713	180.949	
0	14	−3	12		0	15	0	15			346696.940(0.104)	0.0738	197.453	
0	14	1	13	−	0	14	0	14	+		347188.283(0.064)	25.9387	165.134	
0	13	4	9		0	14	3	11			347788.400(0.238)	3.7183	198.652	
0	21	3	19	+	0	20	4	16	+		347848.484(0.220)	6.6952	386.612	
0	11	0	11		0	10	1	9			348100.194(0.030)	5.0422	101.237	
0	20	1	19		0	20	−1	20			348595.812(0.444)	0.0007	333.547	
1	19	2	17	+	1	18	1	18	+		348942.699(0.901)	11.0301	494.182	
0	21	−2	20		0	21	0	21			348995.238(0.613)	0.0059	370.784	
0	2	2	0		0	2	−1	2			349008.012(0.020)	$0.7E-5$	8.619	
0	9	2	7		0	8	−2	7			349009.604(0.030)	0.0005	74.771	
0	3	2	1		0	3	−1	3			349034.424(0.020)	$0.4E-4$	13.342	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	4	2	2		0	4	−1	4			349097.921(0.019)	0.0001	19.639	
0	5	2	3		0	5	−1	5			349222.565(0.019)	0.0003	27.509	
0	6	2	4		0	6	−1	6			349438.063(0.020)	0.0006	36.952	
0	14	3	11		0	13	−3	11			349646.947(0.066)	0.1E−6	186.989	
1	20	3	18		1	20	2	19			349686.960(4.976)	3.4086	607.641	
0	7	2	5		0	7	−1	7			349779.287(0.021)	0.0009	47.966	
0	21	3	18	−	0	20	4	17	−		349996.298(0.269)	6.7235	386.610	
0	7	3	4		0	8	0	8			350010.171(0.027)	0.0027	65.744	
0	1	1	1	+	0	0	0	0	+	350103.118(0.050)	350103.084(0.023)	1.9772	0.000	AND87
0	8	2	6		0	8	−1	8			350285.485(0.024)	0.0010	60.550	
0	8	1	7		0	7	2	5		350421.585(0.050)	350421.596(0.022)	2.3857	59.633	AND87
0	9	2	7		0	9	−1	9			350999.110(0.027)	0.0007	74.705	
0	10	2	8		0	10	−1	10			351964.186(0.032)	0.0002	90.427	
1	19	3	17		1	19	2	18			353046.785(3.707)	3.2524	576.268	
0	17	−2	16		0	16	3	13			353210.452(0.068)	0.1485	247.460	
0	11	2	9		0	11	−1	11			353224.215(0.039)	0.0001	107.716	
0	17	5	13	+	0	18	4	14	+		353553.707(1.398)	4.8398	325.264	
0	17	5	12	−	0	18	4	15	−		353580.158(1.400)	4.8399	325.263	
0	21	1	20		0	21	−1	21			353681.463(0.584)	0.0003	366.408	
1	10	−2	8		1	11	−3	8			353698.502(7.323)	7.8057	328.096	
0	15	1	14	−	0	15	0	15	+		353739.964(0.084)	27.3134	188.692	
0	23	−2	22		0	22	−3	20			354327.394(0.409)	6.9192	441.736	
0	4	1	3		0	3	0	3		354445.952(0.050)	354445.953(0.014)	2.2131	18.558	AND87
0	12	2	10		0	12	−1	12			354819.697(0.048)	0.0028	126.571	
0	17	−1	17		0	16	−2	15			355184.988(0.165)	4.2064	232.416	
1	18	3	16		1	18	2	17			355971.016(2.713)	3.0910	546.461	
1	26	−3	23		1	25	−2	23			356128.892(8.865)	17.7113	762.846	
0	13	2	11		0	13	−1	13			356785.425(0.060)	0.0129	146.989	
0	13	2	12	−	0	12	3	9	−		356873.814(0.064)	4.0418	157.571	
0	5	4	2	−	0	6	3	3	−	357338.598(0.050)	357338.548(0.031)	0.4963	67.849	AND87
0	5	4	1	+	0	6	3	4	+	357339.947(0.050)	357339.873(0.031)	0.4963	67.849	AND87
0	7	2	5		0	6	1	5		357657.954(0.050)	357657.980(0.019)	4.5884	47.703	AND87
1	17	3	15		1	17	2	16			358489.001(1.947)	2.9248	518.220	
0	23	−7	16		0	24	−6	18			358512.314(4.565)	5.9112	603.737	
0	14	2	12		0	14	−1	14			359147.884(0.077)	0.0392	168.969	
0	6	−2	5		0	5	2	3			359323.647(0.029)	0.3E−4	39.158	
0	22	1	21		0	22	−1	22			359371.421(0.757)	0.2E−4	400.814	
0	13	2	11	+	0	12	3	10	+		359740.153(0.061)	4.0916	157.569	
1	16	3	14		1	16	2	15			360631.947(1.367)	2.7545	491.544	
0	16	1	15	−	0	16	0	16	+		360796.220(0.111)	28.6083	213.812	
0	17	−3	15		0	18	−1	18			361274.669(0.242)	0.0002	272.473	
0	14	7	7	−	0	15	6	10	−		361877.594(1.146)	2.3721	324.136	
0	14	7	8	+	0	15	6	9	+		361877.594(1.147)	2.3721	324.136	
0	15	2	13		0	15	−1	15			361923.154(0.102)	0.0951	192.510	
0	20	1	20	+	0	19	2	17	+		362360.092(0.298)	6.2719	325.440	
1	15	3	13		1	15	2	14			362432.396(0.934)	2.5808	466.436	
0	2	−2	1		0	1	0	1			363070.957(0.030)	0.1E−4	10.686	
1	3	1	3	+	1	4	2	2	+	363260.759(0.050)	363260.648(0.027)	3.3852	223.438	AND90a
0	22	−2	21		0	22	0	22			363542.502(0.794)	0.0056	405.069	
0	11	−1	11		0	10	0	10			363655.275(0.029)	7.5027	95.586	
1	3	1	2	−	1	4	2	3	−	363809.703(0.050)	363809.732(0.026)	3.3817	223.438	AND90a
1	14	3	12		1	14	2	13			363923.666(0.618)	2.4042	442.894	
0	12	0	12		0	11	2	9			364866.022(0.044)	0.0033	119.499	
0	16	2	14		0	16	−1	16			365115.817(0.137)	0.1994	217.609	
1	13	3	11		1	13	2	12			365139.273(0.393)	2.2254	420.920	
0	23	1	22		0	23	−1	23			365682.205(0.969)	0.0001	436.765	
1	12	3	10		1	12	2	11			366112.373(0.237)	2.0449	400.514	
0	16	6	11	−	0	17	5	12	−		366860.176(0.894)	3.5685	337.057	
0	16	6	10	+	0	17	5	13	+		366860.242(0.895)	3.5685	337.057	
1	11	3	9		1	11	2	10			366875.236(0.135)	1.8630	381.676	
0	19	2	17		0	18	3	15			367199.269(0.200)	5.6037	302.565	
1	10	3	8		1	10	2	9		367458.742(0.050)	367458.789(0.078)	1.6801	364.407	AND90a

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	19	−3	17		0	18	−4	15			367661.505(0.144)	6.0781	330.443	
1	9	3	7		1	9	2	8		367892.300(0.050)	367892.217(0.055)	1.4960	348.706	AND90a
1	8	3	6		1	8	2	7		368202.726(0.050)	368202.642(0.052)	1.3105	334.575	AND90a
0	17	1	16	−	0	17	0	17	+		368365.888(0.147)	29.8198	240.492	
0	10	1	9		0	9	−2	8			368378.522(0.032)	0.0521	88.950	
1	7	3	5		1	7	2	6		368415.032(0.050)*	368414.869(0.050)	1.1228	322.014	AND90a
0	9	5	5		0	10	4	6			368438.947(0.097)	1.3754	153.601	
1	6	3	4		1	6	2	5		368551.223(0.050)	368551.198(0.047)	0.9314	311.022	AND90a
0	20	−6	14		0	21	−5	16			368557.705(5.819)	5.5267	450.042	
1	5	3	3		1	5	2	4		368631.292(0.050)	368631.291(0.047)	0.7335	301.600	AND90a
1	4	3	2		1	4	2	3		368671.965(0.050)	368672.079(0.054)	0.5239	293.748	AND90a
1	3	3	1		1	3	2	2		368687.676(0.050)	368687.709(0.065)	0.2904	287.466	AND90a
0	17	2	15		0	17	−1	17			368719.326(0.186)	0.3754	244.264	
0	24	−4	21		0	23	−5	18			371280.145(0.335)	7.6363	520.762	
0	3	3	0		0	4	1	3			371722.257(0.031)	0.0001	30.381	
0	9	−3	7		0	10	2	8			372515.923(0.053)	0.0016	102.167	
0	24	1	23		0	24	−1	24			372623.992(1.225)	0.0008	474.259	
0	18	2	16		0	18	−1	18			372718.060(0.252)	0.6481	272.473	
0	8	1	8	+	0	7	1	7	+	374310.042(0.050)	374310.020(0.009)	6.3745	53.828	AND87
1	12	1	12		1	11	0	11			375575.724(0.047)	5.9873	312.592	
0	14	0	14		0	13	−2	12			375591.897(0.073)	0.0018	161.445	
1	8	1	8	+	1	7	1	7	+	376163.270(0.050)	376163.276(0.015)	6.3759	270.067	AND90a
1	8	7	1		1	7	7	0			376258.401(0.478)	1.4535	448.910	
1	8	6	2	+	1	7	6	1	+	376300.003(0.050)	376299.921(0.033)	2.8437	370.136	AND90a
1	8	6	3	−	1	7	6	2	−	376300.003(0.050)	376299.921(0.033)	2.8437	370.136	AND90a
1	8	−7	2		1	7	−7	1			376329.880(0.178)	1.5384	408.760	
1	8	3	6		1	7	3	5		376373.898(0.050)	376373.928(0.022)	5.5525	334.303	AND90a
1	8	−6	3		1	7	6	2		376376.654(0.050)	376376.593(0.052)	2.7526	387.690	AND90a
1	8	7	1	−	1	7	7	0	−	376379.544(0.050)	376379.421(0.042)	1.5251	482.687	AND90a
1	8	7	2	+	1	7	7	1	+	376379.544(0.050)	376379.421(0.042)	1.5251	482.687	AND90a
1	8	5	3	−	1	7	5	2	−	376437.073(0.050)	376437.069(0.026)	3.8836	336.820	AND90a
1	8	5	4	+	1	7	5	3	+	376437.073(0.050)	376437.069(0.026)	3.8836	336.820	AND90a
0	18	1	17	−	0	18	0	18	+		376456.815(0.191)	30.9447	268.731	
1	8	4	5		1	7	4	4		376474.487(0.050)	376474.459(0.023)	4.8105	296.912	AND90a
1	8	6	2		1	7	6	1			376491.278(2.162)	2.7079	456.333	
1	8	−2	6		1	7	−2	5		376494.215(0.050)	376494.277(0.018)	6.0774	297.514	AND90a
1	8	−3	5		1	7	−3	4		376506.277(0.050)	376506.340(0.015)	5.5323	268.450	AND90a
1	8	2	6	+	1	7	2	5	+	376521.579(0.050)	376521.551(0.014)	6.0493	251.701	AND90a
0	15	−1	15		0	14	1	13			376532.785(0.096)	0.0035	179.950	
1	8	2	7	−	1	7	2	6	−	376535.175(0.050)	376535.187(0.013)	6.0493	251.702	AND90a
1	8	1	8		1	7	1	7		376541.084(0.050)	376541.166(0.015)	6.3621	246.636	AND90a
1	8	0	8		1	7	0	7		376542.352(0.050)	376542.291(0.015)	6.4710	252.941	AND90a
1	8	−4	4		1	7	−4	3		376562.050(0.050)	376562.040(0.025)	4.8516	326.085	AND90a
1	8	3	6	+	1	7	3	5	+	376567.905(0.050)	376567.923(0.025)	5.5586	319.487	AND90a
1	8	3	5	−	1	7	3	4	−	376567.905(0.050)	376567.986(0.025)	5.5586	319.487	AND90a
1	8	−5	4		1	7	−5	3		376576.911(0.050)	376576.997(0.065)	3.9207	424.056	AND90a
1	8	2	7		1	7	2	6		376586.129(0.050)	376586.155(0.021)	6.0800	322.014	AND90a
1	8	−1	7		1	7	−1	6		376627.209(0.050)	376627.151(0.037)	6.3591	331.321	AND90a
1	8	5	3		1	7	5	2		376630.438(0.050)	376630.354(0.033)	3.9482	342.759	AND90a
1	8	4	4	+	1	7	4	3	+	376643.148(0.050)	376643.190(0.031)	4.8509	378.682	AND90a
1	8	4	5	−	1	7	4	4	−	376643.148(0.050)	376643.190(0.031)	4.8509	378.682	AND90a
0	17	1	16	−	0	16	2	15	−		376662.515(0.123)	7.7459	240.216	
1	8	0	8	+	1	7	0	7	+	376673.953(0.050)	376673.912(0.041)	6.4650	338.439	AND90a
1	8	1	7	−	1	7	1	6	−	376895.901(0.050)	376895.917(0.015)	6.3758	270.152	AND90a
0	26	0	26		0	25	3	22			376978.701(1.756)	0.2091	545.015	
0	8	0	8		0	7	0	7		376981.069(0.050)	376981.006(0.008)	6.4607	53.169	AND87
0	19	2	17		0	19	−1	19			377090.934(0.338)	1.0397	302.235	
0	8	−1	8		0	7	−1	7		377279.509(0.050)	377279.475(0.009)	6.3704	47.966	AND87
1	4	0	4		1	3	1	3		377319.723(0.050)	377319.670(0.026)	1.3425	212.091	AND90a
0	8	7	1	−	0	7	7	0	−	377335.608(0.050)	377335.645(0.028)	1.5030	215.098	AND90a
0	8	7	2	+	0	7	7	1	+	377335.608(0.050)	377335.645(0.028)	1.5030	215.098	AND90a
0	8	7	2		0	7	7	1		377353.893(0.050)	377353.903(0.028)	1.5147	218.650	AND87

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	8	0	8	+	0	7	0	7	+	377366.281(0.050)	377366.256(0.009)	6.4688	44.075	AND87
0	8	−7	1		0	7	−7	0		377387.007(0.050)	377386.957(0.035)	1.5131	225.875	AND87
0	8	6	3		0	7	6	2		377394.541(0.050)	377394.537(0.020)	2.8145	169.059	AND87
0	8	−6	2		0	7	−6	1		377425.269(0.050)	377425.230(0.018)	2.8327	176.106	AND87
0	8	6	2	+	0	7	6	1	+	377434.104(0.050)	377434.075(0.020)	2.8234	179.408	AND87
0	8	6	3	−	0	7	6	2	−	377434.104(0.050)	377434.075(0.020)	2.8234	179.408	AND87
0	8	−5	3		0	7	−5	2		377455.193(0.050)	377455.103(0.013)	3.9305	130.760	AND90a
0	8	5	4		0	7	5	3		377470.804(0.050)	377470.762(0.013)	3.9313	139.136	AND87
0	8	5	3	−	0	7	5	2	−	377486.715(0.050)	377486.687(0.014)	3.9515	140.398	AND87
0	8	5	4	+	0	7	5	3	+	377486.715(0.050)	377486.687(0.014)	3.9515	140.398	AND87
0	8	2	7	−	0	7	2	6	−	377498.650(0.050)	377498.618(0.009)	6.1023	70.356	AND87
0	8	−4	5		0	7	−4	4		377504.198(0.050)	377504.160(0.010)	4.8377	105.485	AND87
0	8	4	5	−	0	7	4	4	−	377522.156(0.050)	377522.112(0.010)	4.8470	100.233	AND87
0	8	4	4	+	0	7	4	3	+	377522.156(0.050)	377522.139(0.010)	4.8470	100.233	AND87
0	8	4	4		0	7	4	3		377535.032(0.050)	377534.999(0.011)	4.8692	111.102	AND90a
0	8	3	6	+	0	7	3	5	+	377549.335(0.050)	377549.367(0.008)	5.5419	78.869	AND87
0	8	3	5	−	0	7	3	4	−	377553.387(0.050)	377553.335(0.008)	5.5419	78.869	AND87
0	8	−3	6		0	7	−3	5		377567.123(0.050)	377567.103(0.008)	5.5853	87.831	AND87
0	8	3	5		0	7	3	4		377609.376(0.050)	377609.357(0.008)	5.5613	77.419	AND87
0	8	1	7		0	7	1	6		377637.206(0.050)	377637.186(0.008)	6.5259	58.725	AND87
0	8	2	6	+	0	7	2	5	+	377670.950(0.050)	377670.913(0.008)	6.1024	70.365	AND87
0	8	2	6		0	7	2	5		377785.678(0.050)	377785.673(0.008)	5.9963	59.633	AND87
0	8	−2	7		0	7	−2	6		377790.996(0.050)	377790.977(0.008)	6.0711	62.169	AND87
0	10	6	5		0	11	5	7			377925.984(0.192)	1.3506	198.936	
0	23	−2	22		0	23	0	23			379598.590(1.013)	0.0052	440.893	
0	25	1	24		0	25	−1	25			380200.359(1.530)	0.0023	513.293	
0	7	−5	2		0	8	−4	5			380215.459(0.106)	0.7441	118.077	
1	20	2	19	−	1	19	1	18	−		380607.621(0.920)	11.3135	524.507	
0	20	1	19		0	19	3	16			380622.988(0.263)	0.0416	332.479	
0	8	1	7	−	0	7	1	6	−	380658.025(0.050)	380657.996(0.009)	6.3754	54.570	AND87
0	4	2	2		0	3	0	3			381496.477(0.022)	0.0001	18.558	
0	20	2	18		0	20	−1	20			381815.920(0.445)	1.5651	333.547	
0	19	1	18	−	0	19	0	19	+		385075.516(0.247)	31.9801	298.526	
0	6	−2	5		0	5	1	4			386395.610(0.029)	0.0055	38.255	
0	21	2	19		0	21	−1	21			386874.468(0.577)	2.2277	366.408	
0	26	2	24		0	25	−3	23			387509.907(1.196)	1.8929	554.850	
0	18	−8	10		0	19	−7	12			388238.270(5.133)	3.4146	480.614	
0	26	1	25		0	26	−1	26			388408.217(1.891)	0.0051	553.865	
0	26	4	22		0	25	5	21			388818.574(0.496)	8.5073	605.972	
0	26	2	24	+	0	26	1	25	−		388971.017(1.483)	28.9233	565.865	
0	13	−3	11		0	14	0	14			390196.197(0.080)	0.0534	173.974	
1	16	2	15		1	15	3	13			390308.011(1.045)	0.8195	478.525	
0	14	0	14	+	0	13	1	13	+		390358.371(0.063)	14.2556	152.113	
0	16	−1	16		0	15	2	13			390518.616(0.135)	0.2557	204.582	
0	7	−3	5		0	8	−2	7		391534.750(0.050)	391534.885(0.042)	1.7498	74.771	AND87
0	5	0	5		0	4	−1	4		392237.580(0.050)	392237.584(0.018)	2.1189	19.639	AND87
0	22	2	20		0	22	−1	22			392254.792(0.735)	3.0180	400.814	
0	25	2	23	+	0	25	1	24			393031.565(1.208)	27.7656	524.818	
0	12	0	12		0	11	1	10			393133.766(0.039)	5.5769	118.556	
0	20	1	19	−	0	20	0	20	+		394226.804(0.315)	32.9238	329.875	
0	22	3	20	+	0	21	4	17	+		394299.022(0.289)	7.0805	419.641	
0	12	4	8		0	13	3	10			395351.040(0.247)	3.2818	176.610	
0	10	2	8		0	9	−2	8			396258.550(0.032)	0.0010	88.950	
0	2	1	2	+	0	1	0	1	+	396517.317(0.050)	396517.309(0.023)	2.9658	1.575	AND87
0	6	3	3		0	7	0	7			396582.808(0.027)	0.0012	53.169	
0	18	−1	18		0	17	−2	16			396668.279(0.217)	4.1079	259.242	
1	20	2	18	+	1	19	1	19	+		396677.923(1.154)	11.6603	523.932	
0	3	3	1	+	0	2	2	0	+	396841.535(0.050)	396841.547(0.021)	4.6625	30.996	AND87
0	3	3	0	−	0	2	2	1	−	396843.687(0.050)	396843.619(0.021)	4.6624	30.996	AND87
0	22	3	19	−	0	21	4	18	−		397127.073(0.359)	7.1200	419.638	
0	24	−2	23		0	24	0	24			397154.727(1.275)	0.0048	478.254	
0	15	3	12		0	14	−3	12			397267.047(0.076)	0.2E−6	209.017	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	24	2	22	+	0	24	1	23	−		397382.647(0.979)	26.5701	485.331	
0	9	1	8		0	8	2	6		397463.177(0.050)	397463.207(0.023)	2.7923	72.235	AND87
0	23	2	21		0	23	−1	23			397953.337(0.922)	3.9156	436.765	
0	21	1	21	+	0	20	2	18	+		398464.267(0.388)	6.4553	356.925	
1	9	−2	7		1	10	−3	7			400745.042(7.328)	7.3112	310.832	
0	16	5	12	+	0	17	4	13	+		401011.459(1.441)	4.4016	296.946	
0	16	5	11	−	0	17	4	14	−		401028.325(1.442)	4.4016	296.945	
0	5	1	4		0	4	0	4		401732.379(0.050)	401732.407(0.015)	2.6540	24.855	AND87
0	23	2	21	+	0	23	1	22	−		401974.975(0.787)	25.3466	447.406	
0	18	−2	17		0	17	3	14			402595.197(0.086)	0.2295	274.225	
0	14	2	13	−	0	13	3	10	−		403466.621(0.083)	4.5032	178.030	
0	21	1	20	−	0	21	0	21	+		403913.410(0.397)	0.3377	362.821	
0	24	2	22		0	24	−1	24			403974.407(1.139)	4.8925	474.259	
0	4	4	1	−	0	5	3	2	−	404555.514(0.200)	404555.239(0.035)	0.1989	58.403	AND87
0	4	4	0	+	0	5	3	3	+	404555.514(0.200)	404555.680(0.035)	0.1989	58.403	AND87
0	8	2	6		0	7	1	6		405001.264(0.050)	405001.263(0.021)	1.9364	58.725	AND87
0	16	−3	14		0	17	−1	17			405371.938(0.181)	0.0002	244.264	
0	22	−7	15		0	23	−6	17			405919.899(4.434)	5.4772	566.039	
0	7	−2	6		0	6	2	4			406565.151(0.029)	0.0001	48.608	
0	22	2	20		0	22	1	21	−		406760.041(0.629)	24.1045	411.045	
0	14	2	12	+	0	13	3	11	+		407302.905(0.078)	4.5775	178.026	
0	24	−2	23		0	23	−3	21			408485.110(0.535)	7.0607	477.876	
0	13	0	13		0	12	2	10			408876.135(0.057)	0.0044	138.406	
0	13	7	6	−	0	14	6	9	−		409090.395(1.158)	1.9731	300.547	
0	13	7	7	+	0	14	6	8	+		409090.395(1.157)	1.9731	300.547	
0	3	−2	2		0	2	0	2			410283.475(0.029)	0.4E−4	13.835	
0	25	2	23		0	25	−1	25			410328.422(1.391)	5.9182	513.293	
1	2	1	2	+	1	3	2	1	+	410464.266(0.050)	410464.297(0.029)	3.0052	217.157	AND90a
1	2	1	1	−	1	3	2	2	−	410739.253(0.050)	410739.297(0.029)	3.0036	217.157	AND90a
0	12	−1	12		0	11	0	11			411378.630(0.035)	8.4879	112.849	
0	21	2	19	+	0	21	1	20	−		411690.400(0.499)	22.8522	376.251	
0	26	3	23		0	26	−2	25			413394.768(0.744)	7.1353	572.155	
0	20	2	18		0	19	3	16			413843.096(0.269)	5.7491	332.479	
0	22	1	21	−	0	22	0	22	+		414135.581(0.495)	34.5302	397.231	
0	15	6	10	−	0	16	5	11	−		414142.596(0.897)	3.1543	310.322	
0	15	6	9	+	0	16	5	12	+		414142.632(0.897)	3.1543	310.322	
0	20	−3	18		0	19	−4	16			414843.684(0.179)	6.5675	360.312	
0	11	1	10		0	10	−2	9			415218.724(0.034)	0.0794	104.705	
0	8	5	4		0	9	4	5			415670.795(0.106)	1.0168	137.862	
0	19	−6	13		0	20	−5	15			415756.174(5.896)	5.0884	417.033	
0	25	−2	24		0	25	0	25			416187.381(1.584)	0.0044	517.153	
0	2	1	1		0	1	−1	1			416360.241(0.025)	0.2E−5	5.470	
0	20	2	18	+	0	20	1	19	−		416719.927(0.392)	21.5974	343.025	
0	15	0	15		0	14	−2	13			417720.057(0.099)	0.0021	183.519	
0	25	−4	22		0	24	−5	19			417739.358(0.433)	8.0788	558.470	
0	25	3	22		0	25	−2	24			419066.342(0.616)	5.9762	531.036	
0	8	−3	6		0	9	2	7			420092.384(0.053)	0.0006	86.413	
0	9	1	9	+	0	8	1	8	+	421046.082(0.050)	421046.106(0.008)	7.1948	66.314	AND90a
0	16	−1	16		0	15	1	14			421162.329(0.129)	0.0047	203.560	
0	19	2	17	+	0	19	1	18	−		421804.027(0.306)	20.3465	311.370	
1	13	1	13		1	12	0	12			422553.194(0.061)	6.4881	331.424	
1	9	1	9	+	1	8	1	8	+	423142.974(0.050)	423142.969(0.020)	7.1967	282.614	AND90a
1	9	6	3	+	1	8	6	2	+	423247.107(0.050)	423247.065(0.037)	4.0624	382.688	AND90a
1	9	6	4	−	1	8	6	3	−	423247.107(0.050)	423247.065(0.037)	4.0624	382.688	AND90a
1	9	7	2		1	8	7	1			423254.880(0.548)	2.7563	461.461	
1	9	−7	3		1	8	−7	2			423314.795(0.231)	2.9171	421.313	
1	9	−8	2		1	8	−8	1			423326.214(0.170)	1.5297	527.176	
1	9	3	7		1	8	3	6		423327.511(0.050)	423327.560(0.031)	6.4594	346.857	AND90a
1	9	−6	4		1	8	−6	3		423389.148(0.050)*	423389.019(0.056)	3.9325	400.245	AND90a
1	9	8	1		1	8	8	0			423390.630(4.357)	1.6025	471.518	
1	9	7	2	−	1	8	7	1	−	423399.629(0.050)	423399.583(0.041)	2.8919	495.242	AND90a
1	9	7	3	+	1	8	7	2	+	423399.629(0.050)	423399.583(0.041)	2.8919	495.242	AND90a

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	9	5	4	−	1	8	5	3	−	423457.917(0.050)	423457.907(0.030)	4.9570	349.376	AND90a
1	9	5	5	+	1	8	5	4	+	423457.917(0.050)	423457.907(0.030)	4.9570	349.376	AND90a
1	9	6	3		1	8	6	2			423485.702(4.498)	3.8684	468.892	
1	9	4	6		1	8	4	5		423498.037(0.050)	423498.010(0.028)	5.7906	309.470	AND90a
1	9	−2	7		1	8	−2	6		423507.292(0.050)	423507.346(0.022)	6.9325	310.073	AND90a
1	9	−3	6		1	8	−3	5		423533.832(0.050)	423533.894(0.016)	6.4377	281.009	AND90a
1	9	2	7	+	1	8	2	6	+	423548.541(0.050)	423548.474(0.016)	6.9008	264.260	AND90a
1	9	2	8	−	1	8	2	7	−	423567.937(0.050)	423567.942(0.016)	6.9008	264.261	AND90a
1	9	0	9		1	8	0	8			423571.583(0.019)	7.2798	265.501	
1	9	1	9		1	8	1	8			423571.812(0.018)	7.1813	259.196	
1	9	3	7	+	1	8	3	6	+	423618.739(0.050)	423618.641(0.030)	6.4682	332.048	AND90a
1	9	3	6	−	1	8	3	5	−	423618.739(0.050)	423618.756(0.030)	6.4682	332.048	AND90a
1	9	−4	5		1	8	−4	4		423620.700(0.050)	423620.624(0.031)	5.8399	338.646	AND90a
1	9	2	8		1	8	2	7		423637.966(0.050)	423637.984(0.028)	6.9358	334.575	AND90a
1	9	−5	5		1	8	−5	4			423644.134(0.096)	5.0043	436.618	
1	9	−1	8		1	8	−1	7		423682.599(0.050)	423682.463(0.043)	7.1779	343.884	AND90a
1	9	0	9	+	1	8	0	8	+	423734.824(0.050)	423734.787(0.048)	7.2732	351.003	AND90a
1	9	5	4		1	8	5	3		423741.979(0.050)	423741.939(0.044)	5.0400	355.322	AND90a
1	9	4	6	−	1	8	4	5	−	423753.618(0.050)	423753.639(0.036)	5.8390	391.246	AND90a
1	9	4	5	+	1	8	4	4	+	423753.618(0.050)	423753.640(0.036)	5.8390	391.246	AND90a
0	9	0	9		0	8	0	8		423897.465(0.050)	423897.461(0.009)	7.2665	65.744	AND90a
1	9	1	8	−	1	8	1	7	−	423966.310(0.050)	423966.273(0.021)	7.1966	282.724	AND90a
0	9	−1	9		0	8	−1	8		424331.187(0.050)	424331.198(0.009)	7.1902	60.550	AND87
0	24	3	21		0	24	−2	23			424384.915(0.505)	4.8979	491.502	
1	5	0	5		1	4	1	4		424390.678(0.050)	424390.651(0.026)	1.7950	218.372	AND90a
0	9	−8	1		0	8	−8	0		424402.410(0.050)	424402.531(0.053)	1.5092	281.338	AND90a
0	9	8	1	+	0	8	8	0	+	424406.700(0.050)	424406.680(0.051)	1.5222	280.981	AND90a
0	9	8	2	−	0	8	8	1	−	424406.700(0.050)	424406.680(0.051)	1.5222	280.981	AND90a
0	9	0	9	+	0	8	0	8	+	424453.658(0.050)	424453.661(0.009)	7.2771	56.663	AND87
0	9	8	2		0	8	8	1		424459.582(0.050)*	424459.358(0.058)	1.5245	290.803	AND90a
0	9	7	2	−	0	8	7	1	−	424471.400(0.050)	424471.409(0.029)	2.8503	227.684	AND90a
0	9	7	3	+	0	8	7	2	+	424471.400(0.050)	424471.409(0.029)	2.8503	227.684	AND90a
0	9	7	3		0	8	7	2		424496.318(0.050)	424496.276(0.031)	2.8723	231.237	AND90a
0	9	−7	2		0	8	−7	1		424528.354(0.050)	424528.294(0.034)	2.8694	238.464	AND87
0	9	6	4		0	8	6	3		424540.615(0.050)	424540.587(0.022)	4.0207	181.647	AND90a
0	9	−6	3		0	8	−6	2		424577.089(0.050)	424577.011(0.020)	4.0467	188.695	AND90a
0	9	6	3	+	0	8	6	2	+	424580.670(0.050)	424580.680(0.020)	4.0336	191.998	AND90a
0	9	6	4	−	0	8	6	3	−	424580.670(0.050)	424580.680(0.020)	4.0336	191.998	AND90a
0	9	−5	4		0	8	−5	3		424613.504(0.050)	424613.498(0.016)	5.0166	143.351	AND90a
0	9	5	5		0	8	5	4		424622.143(0.050)	424622.164(0.015)	5.0179	151.727	AND90a
0	9	2	8	−	0	8	2	7	−	424629.604(0.050)	424629.646(0.010)	6.9610	82.948	AND87
0	9	5	4	−	0	8	5	3	−	424645.977(0.050)	424645.961(0.015)	5.0434	152.989	AND87
0	9	5	5	+	0	8	5	4	+	424645.977(0.050)	424645.961(0.015)	5.0434	152.989	AND87
0	9	−4	6		0	8	−4	5		424661.939(0.050)	424661.942(0.012)	5.8233	118.077	AND87
0	9	4	6	−	0	8	4	5	−	424696.845(0.050)	424696.833(0.012)	5.8344	112.825	AND90a
0	9	4	5	+	0	8	4	4	+	424696.845(0.050)	424696.899(0.012)	5.8344	112.825	AND90a
0	9	4	5		0	8	4	4		424699.434(0.050)	424699.363(0.012)	5.8610	123.696	AND90a
0	9	3	7	+	0	8	3	6	+	424719.898(0.050)	424719.924(0.010)	6.4490	91.463	AND87
0	9	3	6	−	0	8	3	5	−	424727.170(0.050)	424727.194(0.010)	6.4490	91.463	AND87
0	9	−3	7		0	8	−3	6		424733.828(0.050)	424733.844(0.010)	6.4991	100.426	AND87
0	9	3	6		0	8	3	5		424810.213(0.050)	424810.242(0.009)	6.4713	90.015	AND87
0	9	1	8		0	8	1	7		424827.273(0.050)	424827.284(0.009)	7.3598	71.322	AND87
0	9	2	7	+	0	8	2	6	+	424875.507(0.050)	424875.530(0.009)	6.9611	82.962	AND87
0	23	1	22	−	0	23	0	23	+		424890.693(0.612)	35.1915	433.233	
0	2	−2	1		0	2	−1	2		425039.480(0.050)	425039.409(0.023)	1.6746	8.619	AND87
0	9	2	7		0	8	2	6		425044.788(0.050)	425044.823(0.009)	6.8417	72.235	AND87
0	9	−2	8		0	8	−2	7		425061.311(0.050)	425061.359(0.008)	6.9253	74.771	AND87
0	3	−2	2		0	3	−1	3		425065.755(0.050)	425065.687(0.022)	2.9500	13.342	AND87
0	4	−2	3		0	4	−1	4		425128.769(0.050)	425128.739(0.021)	4.1316	19.639	AND87
0	9	6	4		0	10	5	6			425138.661(0.211)	0.9898	181.627	
0	5	−2	4		0	5	−1	5		425252.613(0.050)	425252.593(0.020)	5.2915	27.509	AND87
0	6	−2	5		0	6	−1	6		425467.345(0.050)	425467.338(0.019)	6.4580	36.952	AND87

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	7	−2	6		0	7	−1	7		425809.200(0.050)	425809.203(0.020)	7.6452	47.966	AND87
0	8	−2	7		0	8	−1	8		426320.661(0.050)	426320.704(0.021)	8.8607	60.550	AND87
1	21	2	20	−	1	20	1	19	−		426832.695(1.184)	11.9101	555.876	
0	21	1	20		0	20	3	17			426852.424(0.346)	0.0453	363.967	
0	18	2	16	+	0	18	1	17	−		426899.814(0.237)	19.1051	281.288	
0	9	−2	8		0	9	−1	9		427050.798(0.050)	427050.865(0.024)	10.1076	74.705	AND87
0	6	−5	1		0	7	−4	4			427430.283(0.114)	0.4255	105.485	
0	10	−2	9		0	10	−1	10		428055.516(0.050)	428055.516(0.029)	11.3851	90.427	AND90a
0	9	1	8	−	0	8	1	7	−	428182.910(0.050)*	428183.045(0.008)	7.1960	67.267	AND90a
0	5	2	3		0	4	0	4			428804.370(0.021)	0.0002	24.855	
0	23	3	20		0	23	−2	22			429303.280(0.411)	3.9152	453.555	
0	11	−2	10		0	11	−1	11			429397.667(0.035)	12.6884	107.716	
0	18	1	17	−	0	17	2	16	−		430535.122(0.155)	8.4634	266.927	
0	12	−2	11		0	12	−1	12			431147.904(0.044)	14.0079	126.571	
0	17	2	15	+	0	17	1	16	−		431966.266(0.182)	17.8778	252.780	
0	13	−2	12		0	13	−1	13			433384.700(0.057)	15.3285	146.989	
0	7	−2	6		0	6	1	5			433687.896(0.029)	0.0113	47.703	
0	22	3	19		0	22	−2	21			433782.804(0.331)	3.0422	417.196	
0	22	1	22	+	0	21	2	19	+		433810.021(0.499)	6.6104	389.983	
0	17	−1	17		0	16	2	14			433984.411(0.181)	0.3670	229.788	
0	12	−3	10		0	13	0	13			434314.671(0.066)	0.0373	152.045	
0	17	−8	9		0	18	−7	11			435485.544(5.134)	2.9955	450.756	
0	24	1	23	−	0	24	0	24	+		436172.870(0.749)	35.7583	470.782	
0	14	−2	13		0	14	−1	14			436194.492(0.074)	16.6284	168.969	
0	26	−2	25		0	26	0	26			436662.102(1.941)	0.0040	557.589	
0	16	2	14	+	0	16	1	15	−		436964.349(0.138)	16.6683	225.847	
0	19	−1	19		0	18	−2	17			437114.871(0.285)	3.9466	287.654	
0	13	0	13		0	12	1	11			437623.843(0.052)	6.0979	137.447	
0	21	3	18		0	21	−2	20			437796.829(0.265)	2.2899	382.426	
0	6	−3	4		0	7	−2	6		438934.553(0.050)	438934.645(0.044)	1.3340	62.169	AND87
1	17	2	16		1	16	3	14			439075.500(1.498)	0.8714	503.574	
0	6	0	6		0	5	−1	5		439265.373(0.050)	439265.390(0.018)	2.7278	27.509	AND87
0	15	−2	14		0	15	−1	15			439671.248(0.098)	17.8793	192.510	
0	23	3	21	+	0	22	4	18	+		440606.558(0.374)	7.4554	454.241	
0	20	3	17		0	20	−2	19			441333.425(0.211)	1.6644	349.246	
0	15	2	13	+	0	15	1	14	−		441857.112(0.104)	15.4792	200.492	
0	15	0	15	+	0	14	1	14	+		442194.717(0.079)	15.5491	173.942	
0	3	1	3	+	0	2	0	2	+	442534.073(0.050)	442534.030(0.023)	3.9582	4.724	AND87
0	11	4	7		0	12	3	9			442833.110(0.253)	2.8484	156.142	
0	5	3	2		0	6	0	6			443377.215(0.028)	0.0005	42.162	
0	2	2	0		0	1	−1	1			443413.235(0.021)	$0.2E-5$	5.470	
0	11	2	9		0	10	−2	9			443486.468(0.035)	0.0019	104.705	
0	16	−2	15		0	16	−1	16			443915.241(0.130)	19.0462	217.609	
0	4	3	2	+	0	3	2	1	+	444013.524(0.050)	444013.452(0.020)	4.8871	35.720	AND87
0	4	3	1	−	0	3	2	2	−	444023.858(0.050)	444023.843(0.020)	4.8868	35.720	AND87
0	23	3	20	−	0	22	4	19	−		444284.993(0.470)	7.5096	454.236	
0	19	3	16		0	19	−2	18			444396.760(0.167)	1.1649	317.655	
0	10	1	9		0	9	2	7		444430.280(0.050)	444430.277(0.026)	3.1894	86.413	AND90a
1	21	2	19	+	1	20	1	20	+		444444.346(1.455)	12.3103	555.241	
0	16	3	13		0	15	−3	13			444997.456(0.091)	$0.5E-6$	232.616	
0	14	2	12	+	0	14	1	13	−		446609.771(0.079)	14.3124	176.715	
0	18	3	15		0	18	−2	17			447006.536(0.132)	0.7833	287.654	
1	8	−2	6		1	9	−3	6			447786.540(7.330)	6.8343	295.136	
0	25	1	24	−	0	25	0	25	+		447972.639(0.909)	36.2317	509.875	
0	15	5	11	+	0	16	4	12	+		448419.813(1.475)	3.9649	270.199	
0	15	5	10	−	0	16	4	13	−		448430.270(1.476)	3.9649	270.198	
0	17	−2	16		0	17	−1	17			449030.723(0.173)	20.0898	244.264	
0	6	1	5		0	5	0	5		449094.814(0.050)	449094.820(0.016)	3.0975	32.723	AND87
0	17	3	14		0	17	−2	16			449195.453(0.104)	0.5050	259.242	
0	15	2	14	−	0	14	3	11	−		449902.733(0.107)	4.9641	200.062	
0	15	−3	13		0	16	−1	16			449923.044(0.135)	0.0001	217.609	
0	16	3	13		0	16	−2	15			451005.259(0.082)	0.3116	232.416	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	13	2	11	+	0	13	1	12	−		451189.759(0.060)	13.1688	154.518	
0	14	0	14		0	13	2	11			452191.172(0.077)	0.0058	158.890	
0	19	−2	18		0	18	3	15			452399.010(0.111)	0.3394	302.565	
0	9	2	7		0	8	1	7		452408.910(0.050)	452408.900(0.023)	5.2692	71.322	AND87
0	15	3	12		0	15	−2	14			452482.309(0.065)	0.1836	207.176	
0	21	−7	14		0	22	−6	16			453293.074(4.343)	5.0473	529.906	
0	14	3	11		0	14	−2	13			453673.556(0.052)	0.1030	183.519	
0	8	−2	7		0	7	2	5			453820.893(0.029)	0.0002	59.633	
0	13	3	10		0	13	−2	12			454623.553(0.043)	0.0548	161.445	
0	15	2	13	+	0	14	3	12	+		454939.329(0.100)	5.0716	200.056	
0	18	−2	17		0	18	−1	18			455122.372(0.229)	20.9701	272.473	
0	12	3	9		0	12	−2	11			455372.648(0.036)	0.0276	140.952	
0	12	2	10	+	0	12	1	11	−		455566.763(0.046)	12.0489	133.902	
0	11	3	8		0	11	−2	10			455956.201(0.031)	0.0130	122.039	
0	12	7	5	−	0	13	6	8	−		456313.445(1.170)	1.5908	278.528	
0	12	7	6	+	0	13	6	7	+		456313.445(1.170)	1.5908	278.528	
0	10	3	7		0	10	−2	9			456404.558(0.028)	0.0056	104.705	
0	9	3	6		0	9	−2	8			456743.446(0.026)	0.0022	88.950	
0	8	3	5		0	8	−2	7			456994.563(0.025)	0.0008	74.771	
0	7	3	4		0	7	−2	6			457176.184(0.024)	0.0002	62.169	
0	6	3	3		0	6	−2	5			457303.693(0.024)	0.0001	51.144	
0	5	3	2		0	5	−2	4			457390.012(0.024)	$0.1E-4$	41.694	
0	4	3	1		0	4	−2	3			457445.906(0.025)	$0.2E-5$	33.820	
0	3	3	0		0	3	−2	2			457480.184(0.026)	$0.1E-6$	27.521	
0	4	−2	3		0	3	0	3			457527.295(0.029)	0.0001	18.558	
1	1	1	1	+	1	2	2	0	+	457628.311(0.050)	457628.391(0.032)	2.7031	212.446	AND90a
1	1	1	0	−	1	2	2	1	−	457720.030(0.050)*	457720.177(0.032)	2.7026	212.446	AND90a
0	16	0	16		0	15	−2	14			458828.176(0.136)	0.0023	207.176	
0	13	−1	13		0	12	0	12			459279.181(0.044)	9.5604	131.669	
0	11	2	9	+	0	11	1	10	−		459712.751(0.036)	10.9522	114.868	
0	21	2	19		0	20	3	17			460045.429(0.350)	5.8454	363.967	
0	26	1	25	−	0	26	0	26	+		460276.628(1.096)	36.6131	550.512	
0	14	6	9	−	0	15	5	10	−		461409.030(0.904)	2.7484	285.156	
0	14	6	8	+	0	15	5	11	+		461409.049(0.904)	2.7484	285.156	
0	12	1	11		0	11	−2	10			461919.533(0.036)	0.1144	122.039	
0	21	−3	19		0	20	−4	17			462019.436(0.223)	7.0625	391.749	
0	19	−2	18		0	19	−1	19			462290.675(0.302)	21.6515	302.235	
0	7	5	3		0	8	4	4			462899.396(0.115)	0.6850	123.696	
0	18	−6	12		0	19	−5	14			462949.215(5.961)	4.6512	385.591	
0	25	−2	24		0	24	−3	22			463312.900(0.687)	7.1887	515.582	
0	3	1	2		0	2	−1	2			463584.295(0.024)	$0.9E-5$	8.619	
0	10	2	8	+	0	10	1	9	−	463602.088(0.050)	463601.969(0.029)	9.8776	97.417	AND90a
0	26	−4	23		0	25	−5	20			464101.874(0.548)	8.5187	597.744	
0	17	−1	17		0	16	1	15			465326.715(0.175)	0.0062	228.742	
0	9	2	7	+	0	9	1	8	−	467210.943(0.050)	467210.942(0.024)	8.8234	81.550	AND87
0	7	−3	5		0	8	2	6			467570.104(0.054)	0.0002	72.235	
0	10	1	10	+	0	9	1	9	+	467764.042(0.050)	467764.052(0.009)	8.0128	80.358	AND90a
0	23	1	23	+	0	22	2	20	+		468375.823(0.632)	6.7368	424.613	
1	14	1	14		1	13	0	13			469515.647(0.081)	6.9984	351.822	
1	10	1	10	+	1	9	1	9	+	470108.243(0.050)	470108.315(0.029)	8.0152	296.729	AND90a
1	10	6	4	+	1	9	6	3	+	470162.833(0.050)	470162.839(0.050)	5.1997	396.806	AND90a
1	10	6	5	−	1	9	6	4	−	470162.833(0.050)	470162.839(0.050)	5.1997	396.806	AND90a
1	10	7	3		1	9	7	2			470238.728(0.621)	3.9535	475.579	
1	10	9	1		1	9	9	0			470241.582(0.294)	1.5386	581.981	
1	10	3	8		1	9	3	7		470248.915(0.050)	470248.801(0.049)	7.3454	360.978	AND90a
1	10	−7	4		1	9	−7	3			470279.932(0.302)	4.1837	435.433	
1	10	−9	2		1	9	−9	1			470280.752(6.431)	1.7584	625.245	
1	10	−8	3		1	9	−8	2			470330.418(0.191)	2.9154	541.297	
1	10	−6	5		1	9	−6	4		470389.240(0.050)	470389.225(0.064)	5.0341	414.368	AND90a
1	10	7	3	−	1	9	7	2	−	470410.066(0.050)	470410.121(0.049)	4.1480	509.365	AND90a
1	10	7	4	+	1	9	7	3	+	470410.066(0.050)	470410.121(0.049)	4.1480	509.365	AND90a
1	10	8	2		1	9	8	1			470439.504(7.405)	3.0536	485.641	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	10	6	4		1	9	6	3			470456.388(7.587)	4.9517	483.018	
1	10	5	5	−	1	9	5	4	−	470466.881(0.050)	470466.836(0.039)	5.9752	363.501	AND90a
1	10	5	6	+	1	9	5	5	+	470466.881(0.050)	470466.836(0.039)	5.9752	363.501	AND90a
1	10	−2	8		1	9	−2	7		470503.258(0.050)	470503.255(0.029)	7.7785	324.200	AND90a
1	10	4	7		1	9	4	6		470508.950(0.050)	470508.953(0.036)	6.7350	323.596	AND90a
0	8	2	6	+	0	8	1	7	−	470518.386(0.050)	470518.457(0.021)	7.7871	67.267	AND87
1	10	−3	7		1	9	−3	6		470548.869(0.050)	470548.844(0.021)	7.3230	295.136	AND90a
1	10	2	8	+	1	9	2	7	+	470561.933(0.050)	470561.901(0.022)	7.7432	278.388	AND90a
1	10	0	10		1	9	0	9		470587.221(0.050)	470587.304(0.026)	8.0887	279.630	AND90a
1	10	2	9	−	1	9	2	8	−	470588.710(0.050)	470588.654(0.021)	7.7432	278.390	AND90a
1	10	1	10		1	9	1	9		470589.334(0.050)	470589.411(0.024)	7.9981	273.325	AND90a
0	20	−2	19		0	20	−1	20			470626.869(0.397)	22.1088	333.547	
1	10	3	8	+	1	9	3	7	+	470662.257(0.100)	470662.186(0.040)	7.3575	346.179	AND90a
1	10	3	7	−	1	9	3	6	−	470662.257(0.100)	470662.383(0.040)	7.3575	346.179	AND90a
1	10	−4	6		1	9	−4	5		470674.958(0.050)	470675.058(0.043)	6.7923	352.776	AND90a
1	10	2	9		1	9	2	8		470682.273(0.050)	470682.229(0.040)	7.7825	348.706	AND90a
1	10	−5	6		1	9	−5	5		470709.169(0.050)*	470709.419(0.152)	6.0321	450.749	AND90a
1	10	−1	9		1	9	−1	8		470729.721(0.050)	470729.617(0.053)	7.9943	358.017	AND90a
0	10	0	10		0	9	0	9		470745.719(0.050)	470745.720(0.010)	8.0719	79.884	AND90a
1	10	0	10	+	1	9	0	9	+	470787.454(0.050)	470787.405(0.060)	8.0813	365.137	AND90a
1	10	5	5		1	9	5	4		470864.691(0.050)	470864.630(0.060)	6.0759	369.456	AND90a
1	10	4	7	−	1	9	4	6	−	470874.168(0.050)	470874.183(0.052)	6.7910	405.381	AND90a
1	10	4	6	+	1	9	4	5	+	470874.168(0.050)	470874.184(0.052)	6.7910	405.381	AND90a
1	10	1	9	−	1	9	1	8	−	471021.907(0.050)	471021.945(0.032)	8.0151	296.866	AND90a
0	10	−1	10		0	9	−1	9		471345.237(0.050)	471345.230(0.010)	8.0077	74.705	AND90a
0	10	−9	1		0	9	−9	0			471419.368(0.101)	1.5263	352.351	
0	10	9	2		0	9	9	1			471437.489(0.157)	1.5136	356.544	
1	6	0	6		1	5	1	5		471454.217(0.050)	471454.251(0.026)	2.2511	226.224	AND90a
0	10	9	1	−	0	9	9	0	−		471486.386(0.096)	1.5327	363.073	
0	10	9	2	+	0	9	9	1	+		471486.386(0.096)	1.5327	363.073	
0	10	0	10	+	0	9	0	9	+	471511.811(0.050)	471511.802(0.010)	8.0855	70.821	AND90a
0	10	−8	2		0	9	−8	1		471517.391(0.050)	471517.544(0.058)	2.8765	295.494	AND90a
0	10	8	2	+	0	9	8	1	+	471528.592(0.050)*	471528.245(0.059)	2.9011	295.137	AND90a
0	10	8	3	−	0	9	8	2	−	471528.592(0.050)*	471528.245(0.059)	2.9011	295.137	AND90a
0	10	8	3		0	9	8	2		471582.907(0.050)	471582.856(0.059)	2.9055	304.962	AND90a
0	10	7	3	−	0	9	7	2	−	471596.092(0.050)	471596.161(0.034)	4.0884	241.843	AND90a
0	10	7	4	+	0	9	7	3	+	471596.092(0.050)	471596.161(0.034)	4.0884	241.843	AND90a
0	10	7	4		0	9	7	3		471629.214(0.050)	471629.165(0.037)	4.1199	245.397	AND90a
0	10	−7	3		0	9	−7	2		471658.252(0.050)	471658.324(0.036)	4.1158	252.624	AND90a
0	10	6	5		0	9	6	4		471676.606(0.050)	471676.656(0.027)	5.1466	195.809	AND90a
0	10	6	4	+	0	9	6	3	+	471715.760(0.050)	471715.757(0.024)	5.1631	206.160	AND90a
0	10	6	5	−	0	9	6	4	−	471715.760(0.050)	471715.757(0.024)	5.1631	206.160	AND90a
0	10	−6	4		0	9	−6	3		471719.488(0.050)	471719.481(0.025)	5.1798	202.858	AND90a
0	10	2	9	−	0	9	2	8	−	471740.858(0.050)	471740.838(0.012)	7.8104	97.112	AND90a
0	10	5	6		0	9	5	5		471761.911(0.050)*	471762.113(0.019)	6.0485	165.891	AND90a
0	10	−5	5		0	9	−5	4		471763.602(0.050)	471763.596(0.021)	6.0469	157.514	AND90a
0	10	5	6	+	0	9	5	5	+	471795.829(0.050)	471795.857(0.019)	6.0791	167.154	AND90a
0	10	5	5	−	0	9	5	4	−	471795.829(0.050)	471795.858(0.019)	6.0791	167.154	AND90a
0	10	−4	7		0	9	−4	6		471808.957(0.050)	471809.048(0.016)	6.7733	132.243	AND90a
0	10	4	6		0	9	4	5		471854.044(0.050)	471854.012(0.015)	6.8167	137.862	AND90a
0	10	4	7	−	0	9	4	6	−	471866.088(0.050)	471866.046(0.016)	6.7858	126.992	AND90a
0	10	4	6	+	0	9	4	5	+	471866.088(0.050)	471866.189(0.016)	6.7858	126.992	AND90a
0	10	3	8	+	0	9	3	7	+	471881.874(0.050)	471881.884(0.013)	7.3362	105.630	AND90a
0	10	−3	8		0	9	−3	7		471890.292(0.050)	471890.296(0.013)	7.3926	114.593	AND90a
0	10	3	7	−	0	9	3	6	−	471894.316(0.050)	471894.339(0.013)	7.3362	105.630	AND90a
0	10	3	7		0	9	3	6		472010.952(0.050)	472010.992(0.012)	7.3612	104.185	AND90a
0	10	1	9		0	9	1	8		472011.969(0.050)	472011.893(0.010)	8.1884	85.493	AND90a
0	10	2	8	+	0	9	2	7	+	472078.492(0.050)	472078.490(0.012)	7.8106	97.135	AND90a
0	10	2	8		0	9	2	7		472310.276(0.050)	472310.305(0.010)	7.6785	86.413	AND90a
0	10	−2	9		0	9	−2	8		472349.908(0.050)	472349.880(0.010)	7.7704	88.950	AND90a
0	8	6	3		0	9	5	5			472360.187(0.228)	0.6594	165.891	
0	22	1	21		0	21	3	18			472854.009(0.446)	0.0493	397.029	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	22	2	21	−	1	21	1	20	−		473042.274(1.502)	12.5221	588.806	
0	7	2	5	+	0	7	1	6	−	473505.495(0.050)	473505.540(0.019)	6.7654	54.570	AND87
0	5	−5	0		0	6	−4	3			474650.052(0.121)	0.1655	94.466	
0	10	1	9	−	0	9	1	8	−	475687.473(0.050)	475687.464(0.010)	8.0144	81.550	AND90a
0	6	2	4	+	0	6	1	5	−	476155.446(0.050)	476155.430(0.019)	5.7533	43.459	AND87
0	6	2	4		0	5	0	5			476217.564(0.020)	0.0004	32.723	
0	20	−1	20		0	19	−2	18			476423.936(0.371)	3.7302	317.655	
0	18	−1	18		0	17	2	15			476979.676(0.242)	0.5070	256.563	
0	5	2	3	+	0	5	1	4	−	478453.403(0.050)*	478453.548(0.020)	4.7438	33.933	AND87
0	11	−3	9		0	12	0	12			478997.715(0.058)	0.0250	131.669	
0	21	−2	20		0	21	−1	21			480208.356(0.516)	22.3309	366.408	
0	4	2	2	+	0	4	1	3	−	480387.405(0.050)	480387.469(0.021)	3.7247	25.995	AND87
0	8	−2	7		0	7	1	6			481036.482(0.029)	0.0206	58.725	
0	14	0	14		0	13	1	12			481506.346(0.072)	6.5964	157.912	
0	3	2	1	+	0	3	1	2	−	481946.866(0.050)	481946.890(0.023)	2.6720	19.644	AND87
0	16	−8	8		0	17	−7	10			482736.860(5.141)	2.5883	422.465	
0	2	2	0	+	0	2	1	1	−	483123.618(0.050)	483123.604(0.025)	1.5224	14.880	AND87
0	19	1	18	−	0	18	2	17	−		484724.632(0.194)	9.2180	295.202	
0	2	2	1	−	0	2	1	2	+	485505.576(0.050)	485505.598(0.025)	1.5134	14.801	AND87
0	7	0	7		0	6	−1	6		486188.242(0.050)	486188.222(0.019)	3.3845	36.952	AND87
0	5	−3	3		0	6	−2	5		486263.012(0.050)*	486263.195(0.046)	0.9340	51.144	AND87
0	3	2	2	−	0	3	1	3	+	486704.453(0.050)	486704.491(0.023)	2.6407	19.485	AND87
0	24	3	22	+	0	23	4	19	+		486751.944(0.474)	7.8190	490.409	
0	4	1	4	+	0	3	0	3	+	488153.503(0.050)	488153.479(0.022)	4.9570	9.447	AND87
1	18	2	17		1	17	3	15			488170.943(2.103)	0.9189	530.177	
0	4	2	3	−	0	4	1	4	+	488302.483(0.050)	488302.563(0.021)	3.6525	25.730	AND87
0	10	4	6		0	11	3	8			490247.141(0.256)	2.4198	137.249	
0	5	2	4	−	0	5	1	5	+	490299.365(0.050)	490299.382(0.020)	4.6070	33.536	AND87
0	4	3	1		0	5	0	5			490337.061(0.030)	0.0001	32.723	
0	3	2	1		0	2	−1	2			490631.560(0.021)	$0.2E-4$	8.619	
0	12	2	10		0	11	−2	10			490667.242(0.038)	0.0033	122.039	
0	22	−2	21		0	22	−1	22			491095.543(0.665)	22.3225	400.814	
0	5	3	3	+	0	4	2	2	+	491170.029(0.050)	491169.987(0.018)	5.2040	42.019	AND87
0	5	3	2	−	0	4	2	3	−	491201.279(0.050)	491201.267(0.018)	5.2033	42.018	AND87
0	11	1	10		0	10	2	8			491310.054(0.028)	3.5785	102.167	
0	24	3	21	−	0	23	4	20	−		491482.901(0.607)	7.8922	490.403	
1	22	2	20	+	1	21	1	21	+		492242.124(1.808)	12.9810	588.108	
0	6	2	5	−	0	6	1	6	+	492694.338(0.050)	492694.348(0.019)	5.5234	42.902	AND87
0	17	3	14		0	16	−3	14			492854.238(0.111)	$0.1E-5$	257.785	
0	16	0	16	+	0	15	1	15	+		494248.442(0.099)	16.8820	197.326	
0	15	0	15		0	14	2	12			494766.665(0.105)	0.0073	180.949	
1	7	−2	5		1	8	−3	5			494826.156(7.329)	6.3759	281.009	
0	14	−3	12		0	15	−1	15			494886.510(0.102)	0.0001	192.510	
0	7	2	6	−	0	7	1	7	+	495486.661(0.050)	495486.656(0.021)	6.4093	53.828	AND87
0	14	5	10	+	0	15	4	11	+		495785.386(1.501)	3.5306	245.024	
0	14	5	9	−	0	15	4	12	−		495791.669(1.501)	3.5306	245.023	
0	16	2	15	−	0	15	3	12	−		496157.696(0.137)	5.4229	223.665	
0	7	1	6		0	6	0	6		496571.196(0.050)	496571.194(0.017)	3.5439	42.162	AND87
0	8	2	7	−	0	8	1	8	+	498675.207(0.050)	498675.254(0.024)	7.2675	66.314	AND87
0	17	0	17		0	16	−2	15			498814.104(0.185)	0.0025	232.416	
0	10	2	8		0	9	1	8		499891.859(0.050)	499891.922(0.025)	5.5880	85.493	AND90a
0	20	−7	13		0	21	−6	15			500635.596(4.282)	4.6221	495.338	
0	9	−2	8		0	8	2	6			501096.579(0.031)	0.0005	72.235	
0	24	1	24	+	0	23	2	21	+		502141.745(0.792)	6.8343	460.814	
0	9	2	8	−	0	9	1	9	+	502258.792(0.050)	502258.794(0.029)	8.0988	80.358	AND90a
0	20	−2	19		0	19	3	16			502654.045(0.144)	0.4812	332.479	
0	16	2	14	+	0	15	3	13	+		502659.924(0.125)	5.5745	223.656	
0	23	−2	22		0	23	−1	23			503330.669(0.849)	22.1024	436.765	
0	11	7	4	−	0	12	6	7	−		503544.716(1.182)	1.2288	258.080	
0	11	7	5	+	0	12	6	6	+		503544.716(1.182)	1.2288	258.080	
0	5	−2	4		0	4	0	4			504834.397(0.028)	0.0002	24.855	
0	22	2	20		0	21	3	18			505737.380(0.446)	5.8940	397.029	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	10	2	9	−	0	10	1	10	+	506235.598(0.050)	506235.581(0.036)	8.9032	95.961	AND90a
0	14	−1	14		0	13	0	13			507380.068(0.057)	10.7239	152.045	
0	13	1	12		0	12	−2	11			508446.553(0.041)	0.1568	140.952	
0	13	6	8	−	0	14	5	9	−		508661.993(0.912)	2.3520	261.561	
0	13	6	7	+	0	14	5	10	+		508662.002(0.912)	2.3520	261.561	
0	18	−1	18		0	17	1	16			508984.026(0.236)	0.0081	255.495	
0	22	−3	20		0	21	−4	18			509188.843(0.279)	7.5629	424.751	
1	3	3	1		1	2	2	1			509930.612(0.072)	0.8294	282.755	
0	6	5	2		0	7	4	3			510125.215(0.124)	0.3907	111.102	
0	17	−6	11		0	18	−5	13			510138.038(6.014)	4.2161	355.717	
0	11	2	10	−	0	11	1	11	+		510603.512(0.045)	9.6800	113.122	
0	4	1	3		0	3	−1	3			510823.614(0.023)	0.2E−4	13.342	
0	11	1	11	+	0	10	1	10	+		514462.082(0.012)	8.8289	95.961	
0	21	−1	21		0	20	−2	19			514504.386(0.482)	3.4702	349.246	
0	6	−3	4		0	7	2	5			514964.561(0.055)	0.0001	59.633	
0	12	2	11	−	0	12	1	12	+		515360.025(0.057)	10.4286	131.840	
1	15	1	15		1	14	0	14			516462.394(0.106)	7.5189	373.787	
1	11	−10	2		1	10	−10	1			516914.709(6.968)	1.3004	636.506	
0	24	−2	23		0	24	−1	24			516938.601(1.073)	21.6995	474.259	
1	11	6	5	+	1	10	6	4	+		517044.193(0.076)	6.2778	412.489	
1	11	6	6	−	1	10	6	5	−		517044.193(0.076)	6.2778	412.489	
1	11	1	11	+	1	10	1	10	+		517057.734(0.042)	8.8321	312.410	
1	11	10	2	−	1	10	10	1	−		517116.626(0.359)	1.5490	648.202	
1	11	10	1	+	1	10	10	0	+		517116.627(0.359)	1.5490	648.202	
1	11	3	9		1	10	3	8			517134.484(0.075)	8.2161	376.664	
1	11	10	1		1	10	10	0			517159.792(3.317)	1.5968	723.169	
1	11	7	4		1	10	7	3			517208.547(0.701)	5.0740	491.265	
1	11	−7	5		1	10	−7	4			517223.162(0.395)	5.3688	451.120	
1	11	9	2		1	10	9	1			517228.608(0.324)	2.9447	597.667	
1	11	−9	3		1	10	−9	2			517249.553(6.927)	3.3600	640.932	
1	11	−8	4		1	10	−8	3			517324.499(0.216)	4.1964	556.985	
1	11	−6	6		1	10	−6	5			517375.856(0.079)	6.0786	430.058	
1	11	7	4	−	1	10	7	3	−		517409.964(0.070)	5.3236	525.056	
1	11	7	5	+	1	10	7	4	+		517409.964(0.070)	5.3236	525.056	
1	11	5	6	−	1	10	5	5	−		517462.558(0.051)	6.9533	379.194	
1	11	5	7	+	1	10	5	6	+		517462.558(0.051)	6.9533	379.194	
1	11	−2	9		1	10	−2	8			517480.122(0.043)	8.6178	339.894	
1	11	4	8		1	10	4	7			517505.897(0.048)	7.6536	339.291	
0	11	0	11		0	10	0	10			517521.857(0.014)	8.8768	95.586	
1	11	−3	8		1	10	−3	7			517549.796(0.030)	8.1936	310.832	
1	11	2	9	+	1	10	2	8	+		517560.343(0.031)	8.5792	294.085	
1	11	0	11		1	10	0	10			517587.952(0.037)	8.8975	295.327	
1	11	1	11		1	10	1	10			517592.519(0.035)	8.8134	289.022	
1	11	2	10	−	1	10	2	9	−		517595.987(0.031)	8.5792	294.087	
1	11	3	9	+	1	10	3	8	+		517697.749(0.056)	8.2321	361.878	
1	11	3	8	−	1	10	3	7	−		517698.067(0.056)	8.2321	361.878	
1	11	2	10		1	10	2	9			517718.038(0.058)	8.6228	364.407	
1	11	−4	7		1	10	−4	6			517724.860(0.060)	7.7186	368.476	
1	11	−1	10		1	10	−1	9			517767.702(0.069)	8.8092	373.718	
1	11	−5	7		1	10	−5	6			517772.580(0.230)	7.0193	466.450	
1	11	0	11	+	1	10	0	10	+		517830.845(0.079)	8.8895	380.841	
1	11	5	6		1	10	5	5			517999.238(0.085)	7.0713	385.163	
1	11	4	8	−	1	10	4	7	−		518005.508(0.080)	7.7169	421.087	
1	11	4	7	+	1	10	4	6	+		518005.510(0.080)	7.7169	421.087	
1	11	1	10	−	1	10	1	9	−		518061.311(0.047)	8.8319	312.578	
0	11	−1	11		0	10	−1	10			518317.769(0.014)	8.8234	90.427	
0	11	10	2		0	10	10	1			518387.640(0.236)	1.5273	432.926	
0	11	10	1	+	0	10	10	0	+		518436.804(0.386)	1.5178	440.398	
0	11	10	2	−	0	10	10	1	−		518436.804(0.386)	1.5178	440.398	
0	11	−10	1		0	10	−10	0			518462.302(0.171)	1.5381	442.843	
1	7	0	7		1	6	1	6		518508.684(0.050)	518508.667(0.026)	2.7115	235.645	AND90a
0	11	−9	2		0	10	−9	1			518516.568(0.120)	2.9211	368.075	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	11	9	3		0	10	9	2			518530.431(0.174)	2.8970	372.269	
0	11	0	11	+	0	10	0	10	+		518537.547(0.013)	8.8937	86.549	
0	23	1	22		0	22	3	19			518589.015(0.567)	0.0537	431.665	
0	11	9	2	−	0	10	9	1	−		518589.246(0.106)	2.9334	378.800	
0	11	9	3	+	0	10	9	2	+		518589.246(0.106)	2.9334	378.800	
0	11	−8	3		0	10	−8	2			518619.661(0.072)	4.1405	311.222	
0	11	8	3	+	0	10	8	2	+		518638.840(0.072)	4.1758	310.866	
0	11	8	4	−	0	10	8	3	−		518638.840(0.072)	4.1758	310.866	
0	11	8	4		0	10	8	3			518694.145(0.067)	4.1822	320.692	
0	11	7	4	−	0	10	7	3	−		518708.676(0.045)	5.2472	257.574	
0	11	7	5	+	0	10	7	4	+		518708.676(0.045)	5.2472	257.574	
0	11	7	5		0	10	7	4			518751.518(0.048)	5.2875	261.128	
0	11	−7	4		0	10	−7	3			518775.789(0.045)	5.2825	268.357	
0	26	−2	25		0	25	−3	23			518779.784(0.867)	7.3094	554.850	
0	11	6	6		0	10	6	5			518801.634(0.036)	6.2139	211.542	
0	11	2	10	−	0	10	2	9	−		518830.013(0.017)	8.6532	112.848	
0	11	6	5	+	0	10	6	4	+		518838.024(0.034)	6.2341	221.895	
0	11	6	6	−	0	10	6	5	−		518838.024(0.034)	6.2341	221.895	
0	11	−6	5		0	10	−6	4			518851.605(0.035)	6.2540	218.593	
0	11	5	7		0	10	5	6			518889.333(0.028)	7.0386	181.627	
0	11	−5	6		0	10	−5	5			518904.475(0.029)	7.0363	173.250	
0	11	5	7	+	0	10	5	6	+		518935.332(0.028)	7.0738	182.891	
0	11	5	6	−	0	10	5	5	−		518935.333(0.028)	7.0738	182.891	
0	11	−4	8		0	10	−4	7			518944.291(0.023)	7.6973	147.980	
0	11	4	7		0	10	4	6			518997.865(0.022)	7.7462	153.601	
0	11	4	8	−	0	10	4	7	−		519029.121(0.023)	7.7111	142.732	
0	11	4	7	+	0	10	4	6	+		519029.407(0.023)	7.7111	142.732	
0	11	3	9	+	0	10	3	8	+		519034.058(0.018)	8.2088	121.370	
0	11	−3	9		0	10	−3	8			519035.316(0.018)	8.2714	130.334	
0	11	3	8	−	0	10	3	7	−		519054.281(0.018)	8.2088	121.371	
0	11	1	10		0	10	1	9			519190.082(0.013)	9.0121	101.237	
0	11	3	8		0	10	3	7			519211.563(0.018)	8.2363	119.929	
1	23	2	22	−	1	22	1	21	−		519240.877(1.882)	13.1502	623.295	
0	11	2	9	+	0	10	2	8	+		519279.492(0.016)	8.6535	112.881	
0	2	−2	1		0	1	−1	1			519444.632(0.024)	2.9796	5.470	
0	19	−1	19		0	18	2	16			519519.183(0.322)	0.6743	284.906	
0	11	2	9		0	10	2	8			519577.798(0.013)	8.5091	102.167	
0	7	6	2		0	8	5	4			519587.814(0.244)	0.3707	151.727	
0	11	−2	10		0	10	−2	9			519659.920(0.014)	8.6087	104.705	
0	13	2	12	−	0	13	1	13	+		520502.038(0.073)	11.1483	152.113	
0	11	1	10	−	0	10	1	9	−		523168.710(0.012)	8.8310	97.417	
0	7	2	5		0	6	0	6			523786.783(0.020)	0.0006	42.162	
0	10	−3	8		0	11	0	11			524186.054(0.053)	0.0160	112.849	
0	15	0	15		0	14	1	13			524722.355(0.103)	7.0631	179.950	
0	26	−4	23		0	26	−3	24			525939.808(0.884)	22.9443	595.681	
0	14	2	13	−	0	14	1	14	+		526025.892(0.094)	11.8381	173.942	
0	25	−4	22		0	25	−3	23			526271.306(0.724)	22.1075	554.850	
0	24	−4	21		0	24	3	22			526577.601(0.590)	21.2637	515.582	
0	23	−4	20		0	23	−3	21			526860.823(0.479)	20.4126	477.876	
0	22	−4	19		0	22	−3	20			527122.780(0.387)	19.5539	441.736	
0	21	−4	18		0	21	−3	19			527365.034(0.311)	18.6874	407.160	
0	20	−4	17		0	20	−3	18			527588.946(0.250)	17.8129	374.150	
0	19	−4	16		0	19	−3	17			527795.722(0.200)	16.9301	342.707	
0	18	−4	15		0	18	−3	16			527986.441(0.160)	16.0387	312.831	
0	17	−4	14		0	17	−3	15			528162.074(0.128)	15.1384	284.524	
0	16	−4	13		0	16	−3	14			528323.505(0.103)	14.2288	257.785	
0	9	−2	8		0	8	1	7			528460.655(0.031)	0.0344	71.322	
0	15	−4	12		0	15	−3	13			528471.541(0.084)	13.3091	232.616	
0	14	−4	11		0	14	−3	12			528606.922(0.068)	12.3787	209.017	
0	13	−4	10		0	13	−3	11			528730.329(0.055)	11.4365	186.989	
0	12	−4	9		0	12	−3	10			528842.385(0.045)	10.4809	166.532	
0	11	−4	8		0	11	−3	9			528943.663(0.037)	9.5099	147.647	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	10	−4	7		0	10	−3	8		529034.728(0.050)	529034.688(0.031)	8.5204	130.334	AND90a
0	9	−4	6		0	9	−3	7		529115.969(0.050)	529115.936(0.028)	7.5081	114.593	AND87
0	8	−4	5		0	8	−3	6		529187.882(0.050)	529187.838(0.027)	6.4663	100.426	AND87
0	7	−4	4		0	7	−3	5		529250.778(0.050)	529250.781(0.029)	5.3847	87.831	AND87
0	6	−4	3		0	6	−3	4		529305.187(0.050)	529305.109(0.031)	4.2460	76.811	AND90a
0	5	−4	2		0	5	−3	3		529351.258(0.050)	529351.119(0.035)	3.0201	67.364	AND90a
0	4	−4	1		0	4	−3	2		529389.156(0.050)	529389.070(0.039)	1.6483	59.491	AND90a
0	18	3	15		0	18	2	16			529410.848(0.207)	19.4979	284.906	
0	17	3	14		0	17	2	15			529506.851(0.154)	18.4368	256.563	
0	19	3	16		0	19	2	17			529596.501(0.273)	20.4949	314.813	
0	16	3	13		0	16	2	14			529804.683(0.113)	17.3258	229.788	
0	15	−8	7		0	16	−7	9			529991.518(5.153)	2.1945	395.742	
0	20	3	17		0	20	2	18			530144.375(0.353)	21.4174	346.283	
0	15	3	12		0	15	2	13			530230.403(0.083)	16.1803	204.582	
0	14	3	11		0	14	2	12			530720.164(0.061)	15.0143	180.949	
0	21	3	18		0	21	2	19			531130.717(0.447)	22.2609	379.312	
0	13	3	10		0	13	2	11			531222.829(0.046)	13.8394	158.890	
1	26	1	26	+	1	26	2	25	−		531314.781(4.667)	19.4935	758.050	
0	12	3	9		0	12	2	10			531700.855(0.037)	12.6635	138.406	
0	15	2	14	−	0	15	1	15	+		531927.294(0.122)	12.4977	197.326	
0	25	−2	24		0	25	−1	25			531929.042(1.340)	21.1474	513.293	
0	11	3	8		0	11	2	9			532129.653(0.030)	11.4915	119.499	
0	10	3	7		0	10	2	8		532495.902(0.050)	532495.888(0.025)	10.3254	102.167	AND90a
0	22	3	19		0	22	2	20			532623.555(0.557)	23.0278	413.899	
0	25	3	23	+	0	24	4	20	+		532714.346(0.594)	8.1701	528.146	
0	9	3	6		0	9	2	7		532795.163(0.050)	532795.201(0.022)	9.1644	86.413	AND87
0	8	0	8		0	7	−1	7		532975.222(0.050)	532975.215(0.019)	4.0971	47.966	AND87
0	8	3	5		0	8	2	6		533029.767(0.050)	533029.783(0.021)	8.0055	72.235	AND87
1	25	1	25	+	1	25	2	24	−		533176.373(3.917)	19.0463	717.349	
0	7	3	4		0	7	2	5		533206.083(0.050)	533206.100(0.020)	6.8423	59.633	AND87
0	6	3	3		0	6	2	4		533332.993(0.050)	533332.967(0.022)	5.6644	48.608	AND87
0	5	1	5	+	0	4	0	4	+	533377.096(0.050)	533377.095(0.022)	5.9649	15.744	AND87
0	5	3	2		0	5	2	3		533420.080(0.050)	533420.040(0.024)	4.4538	39.158	AND87
0	4	3	1		0	4	2	2		533476.777(0.050)	533476.724(0.027)	3.1766	31.284	AND87
0	3	3	0		0	3	2	1		533511.538(0.050)	533511.447(0.029)	1.7594	24.985	AND87
0	4	−3	2		0	5	−2	4		533540.239(0.050)	533540.233(0.048)	0.5604	41.694	AND87
0	23	3	20		0	23	2	21			534680.612(0.682)	23.7265	450.040	
1	24	1	24	+	1	24	2	23	−		534916.869(3.266)	18.5677	678.203	
0	25	1	25	+	0	24	2	22	+		535089.826(0.981)	6.9028	498.586	
1	23	1	23	+	1	23	2	22			536541.559(2.703)	18.0582	640.615	
0	16	0	16		0	15	2	13			536576.270(0.147)	0.0091	204.582	
0	24	3	21		0	24	2	22			537349.109(0.823)	24.3690	487.734	
0	3	3	0		0	4	0	4			537413.249(0.032)	$0.3E-4$	24.855	
0	18	0	18		0	17	−2	16			537580.174(0.252)	0.0025	259.242	
0	9	4	5		0	10	3	7			537604.693(0.256)	1.9985	119.929	
1	19	2	18		1	18	3	16			537625.982(2.897)	0.9615	558.335	
0	13	2	11		0	12	−2	11			537761.727(0.043)	0.0054	140.952	
0	4	2	2		0	3	−1	3			537874.138(0.021)	0.0001	13.342	
1	22	1	22	+	1	22	2	21	−		538055.643(2.218)	17.5187	604.585	
0	12	1	11		0	11	2	9			538092.985(0.032)	3.9631	119.499	
0	16	2	15	−	0	16	1	16	+		538201.274(0.156)	13.1264	222.263	
0	6	3	4	+	0	5	2	3	+	538307.387(0.050)	538307.366(0.017)	5.5666	49.893	AND87
0	6	3	3	−	0	5	2	4	−	538380.667(0.050)	538380.628(0.017)	5.5648	49.891	AND87
0	25	3	22	−	0	24	4	21	−		538735.973(0.775)	8.2677	528.138	
0	20	1	19	−	0	19	2	18	−		539218.850(0.244)	10.0131	325.039	
1	21	1	21	+	1	21	2	20	−		539464.215(1.802)	16.9497	570.114	
1	23	2	21	+	1	22	1	22	+		540071.454(2.221)	13.6733	622.532	
0	13	−3	11		0	14	−1	14			540221.101(0.079)	0.0001	168.969	
0	25	3	22		0	25	2	23			540666.962(0.981)	24.9689	526.980	
1	20	1	20	+	1	20	2	19	−		540772.242(1.448)	16.3523	537.203	
0	18	3	15		0	17	−3	15			540854.239(0.136)	$0.2E-5$	284.524	
1	6	−2	4		1	7	−3	4			541866.556(7.327)	5.9380	268.450	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	19	1	19	+	1	19	2	18	−		541984.550(1.148)	15.7272	505.853	
0	17	2	16	−	0	16	3	13	−		542204.976(0.175)	5.8778	248.841	
1	18	1	18	+	1	18	2	17	−		543105.808(0.897)	15.0755	476.065	
0	13	5	9	+	0	14	4	10	+		543114.285(1.519)	3.1000	221.420	
0	13	5	8	−	0	14	4	11	−		543117.927(1.520)	3.1000	221.420	
1	17	1	17	+	1	17	2	16	−		544140.516(0.689)	14.3980	447.841	
0	8	1	7		0	7	0	7		544206.665(0.050)	544206.673(0.019)	3.9928	53.169	AND90a
0	26	3	23		0	26	2	24			544664.645(1.157)	25.5387	567.776	
0	17	2	16	−	0	17	1	17	+		544842.131(0.199)	13.7239	248.753	
1	16	1	16	+	1	16	2	15	−		545092.990(0.518)	13.6959	421.179	
1	15	1	15	+	1	15	2	14	−		545967.352(0.380)	12.9700	396.082	
0	17	0	17	+	0	16	1	16	+		546497.901(0.124)	18.2559	222.263	
1	14	1	14	+	1	14	2	13	−		546767.524(0.271)	12.2216	372.551	
0	11	2	9		0	10	1	9			547457.827(0.029)	5.8964	101.237	
1	13	1	13	+	1	13	2	12	−		547497.212(0.187)	11.4515	350.585	
0	19	−7	12		0	20	−6	14			547951.018(1.246)	4.2020	462.336	
1	12	1	12	+	1	12	2	11	−		548159.905(0.126)	10.6608	330.185	
0	26	−2	25		0	26	−1	26			548299.423(1.655)	20.4804	553.865	
0	10	−2	9		0	9	2	7			548401.635(0.032)	0.0010	86.413	
1	11	1	11		1	11	2	10	−		548758.864(0.083)	9.8504	311.352	
1	10	1	10	+	1	10	2	9	−	549297.084(0.050)	549297.117(0.058)	9.0211	294.087	AND90a
1	9	1	9	+	1	9	2	8	−	549777.483(0.050)	549777.456(0.045)	8.1734	278.390	AND90a
1	8	1	8	+	1	8	2	7	−	550202.507(0.050)	550202.430(0.039)	7.3077	264.261	AND90a
0	17	2	15	+	0	16	3	14	+		550475.777(0.157)	6.0870	248.827	
1	7	1	7	+	1	7	2	6	−		550574.341(0.036)	6.4235	251.702	
0	10	7	4	+	0	11	6	5	+		550782.239(1.194)	0.8922	239.202	
0	10	7	3	−	0	11	6	6	−		550782.240(1.193)	0.8922	239.202	
0	23	2	21		0	22	3	19			550860.147(0.555)	5.8979	431.665	
1	6	1	6	+	1	6	2	5	−	550895.050(0.050)*	550895.245(0.032)	5.5195	240.711	AND90a
1	5	1	5	+	1	5	2	4	−	551166.905(0.050)	551166.943(0.029)	4.5920	231.290	AND90a
0	22	−1	22		0	21	−2	20			551279.417(0.621)	3.1805	382.426	
1	4	1	4	+	1	4	2	3	−	551390.934(0.050)	551390.984(0.028)	3.6328	223.438	AND90a
1	3	1	3	+	1	3	2	2	−	551568.678(0.050)	551568.662(0.029)	2.6220	217.157	AND90a
1	2	1	2	+	1	2	2	1	−	551701.208(0.050)*	551701.012(0.032)	1.5007	212.446	AND90a
0	18	2	17	−	0	18	1	18	+		551843.402(0.252)	14.2900	276.794	
1	2	1	1	−	1	2	2	0	+		551976.988(0.032)	1.4999	212.446	
0	19	−1	19		0	18	1	17			552094.721(0.316)	0.0102	283.819	
1	3	1	2	−	1	3	2	1	+	552120.944(0.050)	552120.998(0.029)	2.6192	217.157	AND90a
0	6	−2	5		0	5	0	5			552246.839(0.027)	0.0003	32.723	
1	4	1	3	−	1	4	2	2	+	552312.328(0.050)	552312.396(0.028)	3.6265	223.438	AND90a
1	5	1	4	−	1	5	2	3	+	552550.702(0.050)	552550.657(0.028)	4.5800	231.290	AND90a
1	6	1	5	−	1	6	2	4	+	552835.145(0.050)	552835.122(0.030)	5.4993	240.710	AND90a
1	7	1	6	−	1	7	2	5	+		553164.999(0.034)	6.3921	251.701	
0	21	−2	20		0	20	3	17			553379.317(0.187)	0.6561	363.967	
1	8	1	7	−	1	8	2	6	+		553539.365(0.038)	7.2616	264.260	
1	9	1	8	−	1	9	2	7	+	553957.071(0.050)	553957.164(0.046)	8.1087	278.388	AND90a
1	10	1	9	−	1	10	2	8	+	554417.219(0.050)	554417.208(0.060)	8.9335	294.085	AND90a
0	14	1	13		0	13	−2	12			554759.188(0.049)	0.2055	161.445	
1	11	1	10	−	1	11	2	9	+		554918.176(0.088)	9.7352	311.349	
1	12	1	11	−	1	12	2	10	+		555458.617(0.132)	10.5128	330.180	
0	15	−1	15		0	14	0	14			555700.076(0.073)	11.9806	173.974	
0	12	6	7	−	0	13	5	8	−		555903.768(0.922)	1.9671	239.537	
0	12	6	6	+	0	13	5	9	+		555903.773(0.922)	1.9671	239.537	
1	13	1	12	−	1	13	2	11	+		556036.949(0.197)	11.2652	350.577	
0	23	−3	21		0	22	−4	19			556352.157(0.350)	8.0686	459.319	
1	14	1	13	−	1	14	2	12	+		556651.459(0.287)	11.9911	372.541	
1	4	3	2		1	3	2	2			556992.033(0.060)	0.8705	287.466	
1	15	1	14	−	1	15	2	13	+		557300.308(0.406)	12.6891	396.070	
0	16	−6	10		0	17	−5	12			557323.735(6.057)	3.7839	327.412	
0	5	5	1		0	6	4	2			557348.527(0.132)	0.1517	100.083	
1	16	1	15	−	1	16	2	14	+		557981.531(0.560)	13.3578	421.163	
0	5	1	4		0	4	−1	4			558088.812(0.022)	0.5E−4	19.639	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	17	1	16	−	1	17	2	15	+		558693.042(0.755)	13.9959	447.820	
0	19	2	18	−	0	19	1	19	+		559197.833(0.317)	14.8249	306.386	
1	18	1	17	−	1	18	2	16	+		559432.635(0.999)	14.6021	476.039	
1	19	1	18	−	1	19	2	17	+		560197.990(1.298)	15.1750	505.821	
0	10	3	7		0	10	1	9			560375.916(0.032)	0.0285	101.237	
0	9	3	6		0	9	1	8			560376.818(0.029)	0.0210	85.493	
0	8	3	5		0	8	1	7			560393.860(0.027)	0.0148	71.322	
0	11	3	8		0	11	1	10			560397.397(0.035)	0.0372	118.556	
0	7	3	4		0	7	1	6			560421.689(0.025)	0.0099	58.725	
0	12	3	9		0	12	1	11			560448.564(0.040)	0.0470	137.447	
0	6	3	3		0	6	1	5			560455.712(0.025)	0.0061	47.703	
0	5	3	2		0	5	1	4			560492.002(0.027)	0.0033	38.255	
0	4	3	1		0	4	1	3			560527.248(0.030)	0.0015	30.381	
0	13	3	10		0	13	1	12			560538.003(0.049)	0.0576	157.912	
0	3	3	0		0	3	1	2			560558.712(0.032)	0.0005	24.083	
0	14	3	11		0	14	1	13			560675.854(0.063)	0.0689	179.950	
0	15	3	12		0	15	1	14			560874.116(0.084)	0.0807	203.560	
1	20	1	19	−	1	20	2	18	+		560986.682(1.664)	15.7136	537.164	
0	12	1	12	+	0	11	1	11	+		561138.490(0.017)	9.6437	113.122	
0	16	3	13		0	16	1	15			561146.986(0.114)	0.0928	228.742	
0	17	3	14		0	17	1	16			561511.201(0.154)	0.1052	255.495	
0	20	−1	20		0	19	2	17			561623.677(0.424)	0.8642	314.813	
1	21	1	20	−	1	21	2	19	+		561796.181(2.106)	16.2165	570.066	
0	18	3	15		0	18	1	17			561986.386(0.206)	0.1181	283.819	
0	19	3	16		0	19	1	18			562595.374(0.270)	0.1315	313.713	
1	22	1	21	−	1	22	2	20	+		562623.864(2.635)	16.6828	604.528	
0	20	3	17		0	20	1	19			563364.482(0.350)	0.1458	345.175	
1	16	1	16		1	15	0	15			563392.806(0.138)	8.0503	397.317	
1	23	1	22	−	1	23	2	21	+		563467.028(3.266)	17.1114	640.547	
1	12	11	1		1	11	11	0			563748.091(5.783)	1.4100	738.077	
1	12	−10	3		1	11	−10	2			563848.970(7.424)	2.5016	653.748	
1	12	6	6	+	1	11	6	5	+		563888.316(0.116)	7.3115	429.736	
1	12	6	7	−	1	11	6	6	−		563888.316(0.116)	7.3115	429.736	
1	12	−11	2		1	11	−11	1			563940.095(0.788)	1.5616	726.504	
1	12	3	10		1	11	3	9			563981.690(0.112)	9.0750	393.913	
1	12	11	1	−	1	11	11	0	−		563989.467(3.525)	1.5919	812.498	
1	12	11	2	+	1	11	11	1	+		563989.467(3.525)	1.5919	812.498	
1	12	1	12	+	1	11	1	11	+		563989.652(0.059)	9.6477	329.657	
0	24	1	23		0	23	3	20			564014.764(0.710)	0.0585	467.875	
1	12	10	2		1	11	10	1			564086.004(0.402)	2.9752	665.451	
1	12	10	3	−	1	11	10	2	−		564086.004(0.402)	2.9752	665.451	
1	12	10	2		1	11	10	1			564107.543(3.288)	3.0599	740.420	
1	12	−7	6		1	11	−7	5			564142.391(0.510)	6.4926	468.373	
1	12	7	5		1	11	7	4			564162.944(0.788)	6.1368	508.517	
1	12	−9	4		1	11	−9	3			564201.477(7.388)	4.8426	658.186	
1	12	9	3		1	11	9	2			564205.027(0.359)	4.2515	614.920	
0	12	0	12		0	11	0	11			564223.655(0.019)	9.6815	112.849	
1	12	−8	5		1	11	−8	4			564307.444(0.246)	5.3989	574.242	
1	24	1	23	−	1	24	2	22	+		564322.890(4.012)	17.5015	678.123	
0	21	3	18		0	21	1	20			564323.723(0.445)	0.1614	378.205	
1	12	−6	7		1	11	−6	6			564347.562(0.103)	7.0805	447.316	
1	12	7	5	−	1	11	7	4	−		564398.042(0.103)	6.4387	542.315	
1	12	7	6	+	1	11	7	5	+		564398.042(0.103)	6.4387	542.315	
1	12	−2	10		1	11	−2	9			564436.073(0.061)	9.4521	357.155	
1	12	5	7	−	1	11	5	6	−		564443.809(0.069)	7.9012	396.455	
1	12	5	8	+	1	11	5	7	+		564443.809(0.069)	7.9012	396.455	
1	12	4	9		1	11	4	8			564487.450(0.064)	8.5528	356.553	
1	12	−3	9		1	11	−3	8			564535.358(0.042)	9.0534	328.096	
1	12	2	10	+	1	11	2	9	+		564542.309(0.044)	9.4103	311.349	
1	12	0	12		1	11	0	11			564572.030(0.051)	9.7063	312.592	
1	12	1	12		1	11	1	11			564579.696(0.048)	9.6274	306.287	
1	12	2	11	−	1	11	2	10	−		564588.610(0.045)	9.4103	311.352	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	12	3	10	+	1	11	3	9	+		564724.517(0.077)	9.0957	379.147	
1	12	3	9	−	1	11	3	8	−		564725.010(0.077)	9.0957	379.147	
1	12	2	11		1	11	2	10			564744.553(0.081)	9.4582	381.676	
1	12	−4	8		1	11	−4	7			564769.536(0.082)	8.6253	385.746	
1	12	−1	11		1	11	−1	10			564795.802(0.091)	9.6228	390.989	
1	12	−5	8		1	11	−5	7			564833.313(0.329)	7.9761	483.721	
1	12	0	12	+	1	11	0	11	+		564864.182(0.104)	9.6976	398.114	
1	12	1	11	−	1	11	1	10	−		565082.751(0.068)	9.6474	329.859	
1	12	5	7		1	11	5	6			565146.321(0.118)	8.0364	402.441	
1	12	4	9	−	1	11	4	8	−		565148.065(0.118)	8.6231	438.366	
1	12	4	8	+	1	11	4	7	+		565148.068(0.118)	8.6231	438.366	
1	25	1	24	−	1	25	2	23	+		565188.609(4.889)	17.8523	717.255	
0	12	−1	12		0	11	−1	11			565245.213(0.019)	9.6378	107.716	
0	12	11	1	−	0	11	11	0	−		565307.728(0.608)	1.5254	522.777	
0	12	11	2	+	0	11	11	1	+		565307.728(0.608)	1.5254	522.777	
0	12	11	2		0	11	11	1			565383.257(0.319)	1.5410	530.460	
0	12	−11	1		0	11	−11	0			565394.612(0.754)	1.5225	532.503	
1	24	2	23	−	1	23	1	22	−		565433.237(2.333)	13.7952	659.342	
0	12	10	3		0	11	10	2			565456.514(0.281)	2.9335	450.218	
0	12	10	2	+	0	11	10	1	+		565506.530(0.422)	2.9153	457.691	
0	12	10	3	−	0	11	10	2	−		565506.530(0.422)	2.9153	457.691	
0	22	3	19		0	22	1	21			565506.926(0.560)	0.1789	412.802	
0	12	0	12	+	0	11	0	11	+		565527.823(0.017)	9.7019	103.845	
0	12	−10	2		0	11	−10	1			565541.579(0.193)	2.9541	460.137	
1	8	0	8		1	7	1	7		565552.030(0.050)	565552.041(0.027)	3.1771	246.636	AND90a
0	12	−9	3		0	11	−9	2			565600.984(0.147)	4.2174	385.371	
0	12	9	4		0	11	9	3			565608.850(0.202)	4.1828	389.565	
0	12	9	3	−	0	11	9	2	−		565678.947(0.127)	4.2352	396.099	
0	12	9	4	+	0	11	9	3	+		565678.947(0.127)	4.2352	396.099	
0	12	−8	4		0	11	−8	3			565707.591(0.097)	5.3271	328.522	
0	12	8	4	+	0	11	8	3	+		565737.368(0.092)	5.3723	328.166	
0	12	8	5	−	0	11	8	4	−		565737.368(0.092)	5.3723	328.166	
0	12	8	5		0	11	8	4			565792.004(0.086)	5.3808	337.994	
0	12	7	5	−	0	11	7	4	−		565807.727(0.064)	6.3466	274.876	
0	12	7	6	+	0	11	7	5	+		565807.727(0.064)	6.3466	274.876	
0	12	7	6		0	11	7	5			565862.278(0.066)	6.3952	278.432	
0	12	−7	5		0	11	−7	4			565879.432(0.064)	6.3893	285.662	
0	12	2	11	−	0	11	2	10	−		565895.004(0.023)	9.4909	130.154	
0	12	6	7		0	11	6	6			565914.411(0.050)	7.2374	228.847	
0	12	6	6	+	0	11	6	5	+		565946.199(0.050)	7.2611	239.202	
0	12	6	7	−	0	11	6	6	−		565946.199(0.050)	7.2611	239.202	
0	12	−6	6		0	11	−6	5			565972.346(0.051)	7.2840	235.900	
0	12	5	8		0	11	5	7			566002.551(0.040)	7.9982	198.936	
0	12	−5	7		0	11	−5	6			566035.208(0.040)	7.9953	190.559	
1	26	1	25	−	1	26	2	24	+		566061.295(5.916)	18.1633	757.941	
0	12	5	8	+	0	11	5	7	+		566063.340(0.040)	8.0378	200.201	
0	12	5	7	−	0	11	5	6	−		566063.341(0.040)	8.0378	200.201	
0	12	−4	9		0	11	−4	8			566066.484(0.032)	8.6018	165.291	
0	12	4	8		0	11	4	7			566129.838(0.032)	8.6560	170.913	
0	12	−3	10		0	11	−3	9			566167.763(0.026)	9.1390	147.647	
0	12	3	10	+	0	11	3	9	+		566175.188(0.025)	9.0707	138.683	
0	12	4	9	−	0	11	4	8	−		566185.419(0.032)	8.6169	160.045	
0	12	4	8	+	0	11	4	7	+		566185.955(0.032)	8.6169	160.045	
0	12	3	9	−	0	11	3	8	−		566206.615(0.025)	9.0707	138.685	
0	12	1	11		0	11	1	10			566360.730(0.018)	9.8310	118.556	
0	12	3	9		0	11	3	8			566411.896(0.025)	9.1003	137.249	
0	12	2	10	+	0	11	2	9	+		566478.170(0.023)	9.4914	130.203	
0	3	−2	2		0	2	−1	2			566662.822(0.024)	3.2912	8.619	
0	6	6	1		0	7	5	3			566818.958(0.260)	0.1411	139.136	
0	12	2	10		0	11	2	9			566840.694(0.018)	9.3351	119.499	
0	20	2	19	−	0	20	1	20	+		566897.355(0.393)	15.3285	337.527	
0	23	3	20		0	23	1	22			566951.744(0.696)	0.1990	448.963	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	12	−2	11		0	11	−2	10			566995.449(0.019)	9.4418	122.039	
0	26	1	26	+	0	25	2	23	+		567204.415(1.203)	6.9430	537.928	
0	16	0	16		0	15	1	14			567219.982(0.147)	7.4888	203.560	
0	24	3	21		0	24	1	23			568699.524(0.855)	0.2226	486.688	
0	9	−3	7		0	10	0	10			569817.615(0.051)	0.0096	95.586	
0	12	1	11	−	0	11	1	10	−		570624.158(0.017)	9.6464	114.868	
0	25	3	22		0	25	1	24			570795.025(1.039)	0.2510	525.975	
0	8	2	6		0	7	0	7			571570.750(0.021)	0.0009	53.169	
0	26	3	23		0	26	1	25			573285.974(1.253)	0.2860	566.821	
0	21	2	20	−	0	21	1	21	+		574933.081(0.484)	15.8012	370.217	
0	19	0	19		0	18	−2	17			575036.261(0.338)	0.0025	287.654	
0	10	−2	9		0	9	1	8			575983.252(0.032)	0.0535	85.493	
0	14	−8	6		0	15	−7	8			577248.787(5.166)	1.8162	370.586	
0	17	0	17		0	16	2	14			577613.527(0.207)	0.0111	229.788	
0	6	1	6	+	0	5	0	5	+	578207.694(0.050)*	578207.552(0.022)	6.9847	23.615	AND90a
0	2	2	1	−	0	1	1	0	−		578330.323(0.027)	2.7245	11.705	
0	26	3	24	+	0	25	4	21	+		578471.185(0.735)	8.5080	567.452	
0	2	2	0	+	0	1	1	1	+		579127.086(0.027)	2.7191	11.678	
0	9	0	9		0	8	−1	8		579593.317(0.050)	579593.201(0.021)	4.8734	60.550	AND90a
0	3	−3	1		0	4	−2	3			580782.177(0.050)	0.2334	33.820	
0	22	2	21	−	0	22	1	22	+		583295.310(0.590)	16.2436	404.454	
0	14	2	12		0	13	−2	12			584714.878(0.049)	0.0084	161.445	
0	13	1	12		0	12	2	10			584774.760(0.038)	4.3488	138.406	
0	8	4	4		0	9	3	6			584916.322(0.255)	1.5875	104.185	
0	5	2	3		0	4	−1	4			585160.775(0.021)	0.0003	19.639	
0	7	3	5	+	0	6	2	4	+	585420.960(0.050)	585421.002(0.018)	5.9549	59.341	AND87
0	7	3	4	−	0	6	2	5	−	585568.161(0.050)	585568.140(0.017)	5.9511	59.337	AND87
0	12	−3	10		0	13	−1	13			585886.296(0.066)	0.0001	146.989	
0	26	3	23	−	0	25	4	22	−		586061.825(0.977)	8.6364	567.441	
0	23	−1	23		0	22	−2	21			586689.614(0.793)	2.8757	417.196	
1	20	2	19		1	19	3	17			587470.909(3.923)	0.9989	588.045	
1	24	2	22	+	1	23	1	23	+		587932.556(2.699)	14.3881	658.512	
0	18	2	17	−	0	17	3	14	−		588015.861(0.222)	6.3271	275.587	
1	5	−2	3		1	6	−3	3			588909.902(7.324)	5.5250	257.460	
0	19	3	16		0	18	−3	16			589014.974(0.169)	$0.3E-5$	312.831	
0	12	5	8	+	0	13	4	9	+		590412.118(1.532)	2.6748	199.389	
0	12	5	7	−	0	13	4	10	−		590414.144(1.532)	2.6748	199.389	
0	23	2	22	−	0	23	1	23	+		591973.541(0.712)	16.6561	440.236	
0	9	1	8		0	8	0	8			592052.951(0.022)	4.4432	65.744	
0	21	1	20	−	0	20	2	19	−		594003.747(0.304)	10.8524	356.437	
0	20	−1	20		0	19	1	18			594622.550(0.419)	0.0125	313.713	
0	12	2	10		0	11	1	10			595108.439(0.033)	6.2002	118.556	
0	18	−7	11		0	19	−6	13			595242.686(4.226)	3.7876	430.901	
0	24	2	22		0	23	3	20			595365.180(0.678)	5.8613	467.875	
0	11	−2	10		0	10	2	8			595751.250(0.035)	0.0018	102.167	
0	9	7	2	−	0	10	6	5	−		598024.102(1.205)	0.5879	221.895	
0	9	7	3	+	0	10	6	4	+		598024.102(1.205)	0.5879	221.895	
0	18	2	16	+	0	17	3	15	+		598398.447(0.194)	6.6101	275.567	
0	18	0	18	+	0	17	1	17	+		598920.437(0.155)	19.6722	248.753	
0	3	3	0		0	2	−2	1			599103.597(0.027)	$0.1E-7$	22.797	
0	7	−2	6		0	6	0	6			599816.700(0.027)	0.0005	42.162	
0	15	1	14		0	14	−2	13			600809.928(0.062)	0.2585	183.519	
0	24	2	23	−	0	24	1	24	+		600956.504(0.853)	17.0396	477.564	
0	11	6	6	−	0	12	5	7	−		603136.406(0.934)	1.5959	219.083	
0	11	6	5	+	0	12	5	8	+		603136.408(0.933)	1.5959	219.083	
0	21	−1	21		0	20	2	18			603315.336(0.550)	1.0688	346.283	
0	24	−3	22		0	23	−4	20			603509.850(0.439)	8.5796	495.451	
1	5	3	3		1	4	2	3			604024.939(0.051)	0.9275	293.748	
0	16	−1	16		0	15	0	15			604252.200(0.093)	13.3311	197.453	
0	15	−6	9		0	16	−5	11			604507.286(6.092)	3.3558	300.677	
0	22	−2	21		0	21	3	18			604578.131(0.240)	0.8631	397.029	
0	6	1	5		0	5	−1	5			605394.194(0.021)	0.0001	27.509	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	13	1	13	+	0	12	1	12	+		607791.644(0.024)	10.4574	131.840	
0	17	0	17		0	16	1	15			608955.830(0.207)	7.8650	228.742	
0	25	1	24		0	24	3	21			609084.864(0.878)	0.0641	505.658	
0	4	−3	2		0	5	2	3			609570.261(0.058)	0.2E−5	39.158	
0	25	2	24	−	0	25	1	25	+		610232.204(1.014)	17.3947	516.435	
1	17	1	17		1	16	0	16			610306.305(0.176)	8.5934	422.412	
1	13	12	1		1	12	12	0			610586.888(8.142)	1.5767	817.405	
1	13	11	2		1	12	11	1			610659.886(5.893)	2.7217	756.882	
1	13	6	7	+	1	12	6	6	+		610692.695(0.169)	8.3110	448.545	
1	13	6	8	−	1	12	6	7	−		610692.695(0.169)	8.3110	448.545	
1	13	−12	2		1	12	−12	1			610721.879(1.334)	1.5648	893.976	
1	13	−10	4		1	12	−10	3			610768.096(7.841)	3.6274	672.556	
1	13	3	11		1	12	3	10			610787.817(0.162)	9.9246	412.726	
0	13	0	13		0	12	0	12			610850.807(0.027)	10.4859	131.669	
1	13	−11	3		1	12	−11	2			610890.440(1.000)	3.0084	745.315	
1	13	1	13	+	1	12	1	12	+		610902.498(0.080)	10.4623	348.470	
1	13	11	2	−	1	12	11	1	−		610924.501(3.781)	3.0668	831.310	
1	13	11	3	+	1	12	11	2	+		610924.501(3.781)	3.0668	831.310	
1	13	−7	7		1	12	−7	6			611035.568(0.650)	7.5692	487.190	
1	13	10	3		1	12	10	2			611037.936(3.205)	4.4186	759.236	
1	13	10	3	+	1	12	10	2	+		611044.630(0.473)	4.3068	684.267	
1	13	10	4	−	1	12	10	3	−		611044.630(0.473)	4.3068	684.267	
1	13	7	6		1	12	7	5			611100.525(0.883)	7.1553	527.335	
0	20	0	20		0	19	−2	18			611103.397(0.449)	0.0024	317.655	
1	13	−9	5		1	12	−9	4			611135.019(7.812)	6.2323	677.005	
1	13	9	4		1	12	9	3			611169.879(0.401)	5.4819	633.740	
1	13	−8	6		1	12	−8	5			611278.236(0.283)	6.5410	593.065	
1	13	−6	8		1	12	−6	7			611302.990(0.137)	8.0496	466.140	
1	13	−2	11		1	12	−2	10			611369.251(0.086)	10.2825	375.983	
1	13	7	6	−	1	12	7	5	−		611373.282(0.147)	7.5074	561.142	
1	13	7	7	+	1	12	7	6	+		611373.282(0.147)	7.5074	561.142	
1	13	5	8	−	1	12	5	7	−		611409.402(0.135)	8.8259	415.283	
1	13	5	9	+	1	12	5	8	+		611409.402(0.135)	8.8259	415.283	
1	13	4	10		1	12	4	9			611452.226(0.085)	9.4371	375.382	
1	13	−3	10		1	12	−3	9			611504.141(0.057)	9.9047	346.927	
1	13	2	11	+	1	12	2	10	+		611506.315(0.059)	10.2377	330.180	
1	13	0	13		1	12	0	12			611538.046(0.069)	10.5151	331.424	
1	13	1	13		1	12	1	12			611549.501(0.066)	10.4405	325.120	
1	13	2	12	−	1	12	2	11	−		611565.191(0.063)	10.2377	330.185	
1	25	2	24		1	24	1	23	−		611624.282(2.866)	14.4576	696.947	
1	13	3	11	+	1	12	3	10	+		611741.671(0.104)	9.9508	397.984	
1	13	3	10	−	1	12	3	9	−		611742.409(0.105)	9.9508	397.984	
1	13	2	12		1	12	2	11			611760.916(0.109)	10.2899	400.514	
1	13	−4	9		1	12	−4	8			611808.581(0.111)	9.5170	404.585	
1	13	−1	12		1	12	−1	11			611813.000(0.120)	10.4355	409.829	
1	13	0	13	+	1	12	0	12	+		611886.488(0.137)	10.5058	416.956	
1	13	−5	9		1	12	−5	8			611891.272(0.450)	8.9096	502.562	
1	13	1	12	−	1	12	1	11	−		612084.647(0.094)	10.4619	348.708	
0	13	−1	13		0	12	−1	12			612124.206(0.026)	10.4511	126.571	
0	13	−12	1		0	12	−12	0			612177.434(1.491)	1.5208	621.883	
0	13	12	1	+	0	12	12	0	+		612245.348(0.630)	1.5415	626.332	
0	13	12	2	−	0	12	12	1	−		612245.348(0.630)	1.5415	626.332	
0	13	12	2		0	12	12	1			612301.926(1.240)	1.5280	632.432	
1	13	4	10	−	1	12	4	9	−		612302.008(0.167)	9.5142	457.217	
1	13	4	9	+	1	12	4	8	+		612302.013(0.167)	9.5142	457.217	
1	13	5	8		1	12	5	7			612306.123(0.162)	8.9784	421.292	
0	13	11	2	−	0	12	11	1	−		612344.267(0.708)	2.9386	541.634	
0	13	11	3	+	0	12	11	2	+		612344.267(0.708)	2.9386	541.634	
0	13	11	3		0	12	11	2			612435.483(0.362)	2.9685	549.319	
0	13	−11	2		0	12	−11	1			612439.934(0.815)	2.9332	551.363	
0	13	0	13	+	0	12	0	12	+		612479.632(0.024)	10.5099	122.709	
0	13	10	4		0	12	10	3			612510.438(0.340)	4.2463	469.079	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	13	10	3	+	0	12	10	2	+		612560.366(0.471)	4.2202	476.555	
0	13	10	4	−	0	12	10	3	−		612560.366(0.471)	4.2202	476.555	
1	9	0	9		1	8	1	8		612582.737(0.050)*	612582.459(0.030)	3.6486	259.196	AND90a
0	13	−10	3		0	12	−10	2			612606.858(0.228)	4.2762	479.002	
0	13	9	5		0	12	9	4			612671.424(0.244)	5.3934	408.432	
0	13	−9	4		0	12	−9	3			612671.451(0.183)	5.4377	404.238	
0	13	9	4	−	0	12	9	3	−		612754.172(0.193)	5.4608	414.968	
0	13	9	5	+	0	12	9	4	+		612754.172(0.193)	5.4608	414.968	
0	13	−8	5		0	12	−8	4			612780.041(0.132)	6.4542	347.392	
0	13	8	5	+	0	12	8	4	+		612822.731(0.120)	6.5087	347.037	
0	13	8	6	−	0	12	8	5	−		612822.731(0.120)	6.5087	347.037	
0	13	8	6		0	12	8	5			612875.210(0.116)	6.5191	356.867	
0	13	7	6	−	0	12	7	5	−		612892.089(0.088)	7.4002	293.749	
0	13	7	7	+	0	12	7	6	+		612892.089(0.088)	7.4002	293.749	
0	13	2	12	−	0	12	2	11	−		612933.657(0.032)	10.3246	149.030	
0	13	7	7		0	12	7	6			612960.390(0.090)	7.4566	297.307	
0	13	−7	6		0	12	−7	5			612967.993(0.091)	7.4501	304.537	
0	13	6	8		0	12	6	7			613013.875(0.068)	8.2272	247.724	
0	13	6	7	+	0	12	6	6	+		613038.998(0.071)	8.2544	258.080	
0	13	6	8	−	0	12	6	7	−		613038.998(0.071)	8.2544	258.080	
0	13	−6	7		0	12	−6	6			613080.668(0.071)	8.2801	254.778	
0	13	5	9		0	12	5	8			613100.492(0.055)	8.9344	217.816	
0	13	−5	8		0	12	−5	7			613154.872(0.055)	8.9307	209.440	
0	13	−4	10		0	12	−4	9			613174.442(0.043)	9.4914	184.172	
0	13	5	9	+	0	12	5	8	+		613178.835(0.056)	8.9782	219.083	
0	13	5	8	−	0	12	5	7	−		613178.837(0.056)	8.9782	219.083	
0	13	4	9		0	12	4	8			613248.849(0.044)	9.5507	189.797	
0	13	−3	11		0	12	−3	10			613286.498(0.036)	9.9980	166.532	
0	13	3	11	+	0	12	3	10	+		613303.946(0.034)	9.9242	157.569	
0	13	4	10	−	0	12	4	9	−		613334.287(0.044)	9.5076	178.930	
0	13	4	9	+	0	12	4	8	+		613335.238(0.044)	9.5076	178.930	
0	13	3	10	−	0	12	3	9	−		613351.033(0.034)	9.9242	157.571	
0	13	1	12		0	12	1	11			613522.469(0.025)	10.6456	137.447	
0	13	3	10		0	12	3	9			613611.908(0.034)	9.9559	156.142	
0	13	2	11	+	0	12	2	10	+		613674.085(0.031)	10.3253	149.098	
0	4	−2	3		0	3	−1	3			613904.956(0.023)	3.6718	13.342	
0	13	2	11		0	12	2	10			614089.934(0.025)	10.1575	138.406	
0	13	−2	12		0	12	−2	11			614361.002(0.027)	10.2706	140.952	
0	8	−3	6		0	9	0	9			615829.491(0.050)	0.0054	79.884	
0	18	0	18		0	17	2	15			617891.572(0.288)	0.0133	256.563	
0	13	1	12	−	0	12	1	11	−		618051.090(0.024)	10.4607	133.902	
0	9	2	7		0	8	0	8			619634.568(0.024)	0.0013	65.744	
0	26	2	25	−	0	26	1	26	+		619787.976(1.197)	17.7226	556.848	
0	24	−1	24		0	23	−2	22			620694.052(1.003)	2.5696	453.555	
0	7	1	7	+	0	6	0	6	+	622648.715(0.050)	622648.789(0.023)	8.0191	33.059	AND90a
0	11	−2	10		0	10	1	9			623631.279(0.035)	0.0781	101.237	
0	13	−8	5		0	14	−7	7			624507.906(5.180)	1.4560	347.000	
0	3	2	2	−	0	2	1	1	−		624744.289(0.026)	3.0274	14.880	
0	10	0	10		0	9	−1	9		626007.724(0.050)	626007.723(0.023)	5.7208	74.705	AND90a
0	3	2	1	+	0	2	1	2	+		627138.621(0.026)	3.0095	14.801	
0	14	1	13		0	13	2	11			631358.463(0.046)	4.7434	158.890	
0	15	2	13		0	14	−2	13			631453.641(0.060)	0.0123	183.519	
0	11	−3	9		0	12	−1	12			631842.739(0.058)	0.0001	126.571	
0	7	4	3		0	8	3	5			632191.564(0.253)	1.1914	90.015	
0	8	3	6	+	0	7	2	5	+	632505.461(0.050)	632505.472(0.019)	6.3592	70.365	AND90a
0	6	2	4		0	5	1	5			632516.939(0.021)	0.0010	27.509	
0	8	3	5	−	0	7	2	6	−	632771.456(0.050)	632771.534(0.019)	6.3520	70.356	AND87
0	19	2	18	−	0	18	3	15	−		633559.369(0.281)	6.7686	303.905	
1	25	2	23	+	1	24	1	24	+		635825.667(3.250)	15.1263	696.046	
1	4	−2	2		1	5	−3	2			635957.852(7.321)	5.1453	248.040	
0	21	−1	21		0	20	1	19			636535.443(0.549)	0.0152	345.175	
0	20	3	17		0	19	−3	17			637354.498(0.210)	0.6E−5	342.707	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	11	5	7	+	0	12	4	8	+		637684.016(1.540)	2.2568	178.930	
0	11	5	6	−	0	12	4	9	−		637685.089(1.540)	2.2568	178.930	
1	21	2	20		1	20	3	18			637734.150(5.232)	1.0308	619.305	
0	25	2	23		0	24	3	21			639212.927(0.816)	5.7883	505.658	
0	26	4	22	+	0	26	3	23	−		639648.618(1.152)	29.4511	586.990	
0	25	4	21	+	0	25	3	22	−		639874.000(0.944)	28.0420	546.108	
0	24	4	20	+	0	24	3	21	−		640035.924(0.769)	26.6642	506.797	
0	23	4	19	+	0	23	3	20	−		640147.445(0.620)	25.3159	469.056	
0	10	1	9		0	9	0	9			640167.384(0.025)	4.8929	79.884	
0	22	4	18	+	0	22	3	19	−		640220.086(0.496)	23.9950	432.885	
0	21	4	17	+	0	21	3	18	−		640263.823(0.393)	22.6996	398.284	
0	20	4	16	+	0	20	3	17	−		640287.125(0.307)	21.4278	365.254	
0	19	4	15	+	0	19	3	16	−		640297.029(0.238)	20.1775	333.794	
0	16	4	12	+	0	16	3	13	−		640297.332(0.102)	16.5364	248.841	
0	17	4	13	+	0	17	3	14	−		640298.210(0.137)	17.7339	275.587	
0	15	4	11	+	0	15	3	12	−		640298.994(0.076)	15.3521	223.665	
0	18	4	14	+	0	18	3	15	−		640299.233(0.182)	18.9469	303.905	
0	14	4	10	+	0	14	3	11	−		640304.744(0.057)	14.1788	200.062	
0	13	4	9	+	0	13	3	10	−		640315.406(0.044)	13.0136	178.030	
0	12	4	8	+	0	12	3	9	−		640331.201(0.035)	11.8535	157.571	
0	11	4	7	+	0	11	3	8	−		640351.860(0.029)	10.6946	138.685	
0	10	4	6	+	0	10	3	7	−	640376.804(0.050)	640376.734(0.025)	9.5322	121.371	AND90a
0	11	4	8	−	0	11	3	9	+		640398.548(0.029)	10.6937	138.683	
0	10	4	7	−	0	10	3	8	+	640403.398(0.050)	640403.485(0.025)	9.5317	121.370	AND90a
0	9	4	5	+	0	9	3	6	−	640404.935(0.050)	640404.884(0.023)	8.3600	105.630	AND90a
0	12	4	9	−	0	12	3	10	+		640408.779(0.035)	11.8518	157.569	
0	9	4	6	−	0	9	3	7	+	640419.427(0.050)	640419.323(0.023)	8.3598	105.630	AND90a
0	8	4	4	+	0	8	3	5	−	640435.017(0.050)*	640435.179(0.022)	7.1694	91.463	AND90a
0	13	4	10	−	0	13	3	11	+		640439.119(0.044)	13.0106	178.026	
0	8	4	5	−	0	8	3	6	+	640442.384(0.050)	640442.415(0.022)	7.1693	91.463	AND90a
0	7	4	3	+	0	7	3	4	−	640466.289(0.050)	640466.374(0.024)	5.9475	78.869	AND90a
0	7	4	4	−	0	7	3	5	+	640469.592(0.050)	640469.670(0.024)	5.9475	78.869	AND90a
0	14	4	11	−	0	14	3	12	+		640495.244(0.057)	14.1738	200.056	
0	6	4	2	+	0	6	3	3	−		640497.184(0.028)	4.6743	67.849	
0	6	4	3	−	0	6	3	4	+		640498.504(0.028)	4.6743	67.849	
0	5	4	1	+	0	5	3	2	−		640526.344(0.032)	3.3152	58.403	
0	5	4	2	−	0	5	3	3	+		640526.784(0.032)	3.3152	58.403	
0	4	4	0	+	0	4	3	1	−		640552.670(0.036)	1.8051	50.531	
0	4	4	1	−	0	4	3	2	+		640552.780(0.036)	1.8051	50.531	
0	15	4	12	−	0	15	3	13	+		640583.612(0.076)	15.3441	223.656	
0	16	4	13	−	0	16	3	14	+		640711.521(0.101)	16.5238	248.827	
0	17	4	14	−	0	17	3	15	+		640887.145(0.134)	17.7148	275.567	
0	18	4	15	−	0	18	3	16	+		641119.577(0.177)	18.9186	303.877	
0	19	4	16	−	0	19	3	17	+		641418.850(0.230)	20.1366	333.756	
0	20	4	17	−	0	20	3	18	+		641795.954(0.295)	21.3696	365.202	
0	21	4	18	−	0	21	3	19	+		642262.846(0.373)	22.6186	398.215	
0	17	−7	10		0	18	−6	12			642513.736(4.219)	3.3797	401.033	
0	22	4	19	−	0	22	3	20	+		642832.433(0.465)	23.8839	432.794	
0	13	2	11		0	12	1	11			642837.643(0.038)	6.5074	137.447	
0	12	−2	11		0	11	2	9			643168.901(0.040)	0.0031	119.499	
0	23	4	20	−	0	23	3	21	+		643518.558(0.575)	25.1658	468.938	
0	24	4	21	−	0	24	3	22	+		644335.957(0.703)	26.4644	506.645	
0	22	−1	22		0	21	2	19			644613.305(0.703)	1.2775	379.312	
0	8	7	1	−	0	9	6	4	−		645268.450(1.217)	0.3261	206.160	
0	8	7	2	+	0	9	6	3	+		645268.450(1.217)	0.3261	206.160	
0	25	4	22		0	25	3	23			645300.214(0.852)	27.7793	545.916	
0	21	0	21		0	20	−2	19			645717.505(0.587)	0.0023	349.246	
0	4	3	1		0	3	−2	2			646285.175(0.026)	$0.3E-6$	27.521	
0	26	4	23	−	0	26	3	24	+		646427.694(1.024)	29.1102	586.748	
0	19	2	17		0	18	3	16			646439.820(0.239)	7.1450	303.877	
0	16	1	15		0	15	−2	14			646544.037(0.083)	0.3126	207.176	
0	8	−2	7		0	7	0	7			647605.970(0.027)	0.0007	53.169	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	22	1	21	−	0	21	2	20	−		649063.269(0.379)	11.7394	389.394	
0	18	0	18		0	17	1	16			649895.922(0.287)	8.1844	255.495	
0	10	6	5	−	0	11	5	6	−		650361.723(0.944)	1.2417	200.201	
0	10	6	4	+	0	11	5	7	+		650361.724(0.944)	1.2417	200.201	
0	25	−3	23		0	24	−4	21			650662.660(0.548)	9.0957	533.146	
1	6	3	4		1	5	2	4			651014.339(0.049)	0.9919	301.600	
0	19	0	19	+	0	18	1	18	+		651492.519(0.191)	21.1319	276.794	
0	14	−6	8		0	15	−5	10			651689.558(6.118)	2.9332	275.512	
0	7	1	6		0	6	−1	6			652757.709(0.021)	0.0002	36.952	
0	17	−1	17		0	16	0	16			653042.576(0.118)	14.7745	222.481	
0	25	−1	25		0	24	−2	23			653269.420(1.257)	2.2734	491.502	
0	26	1	25		0	25	3	22			653749.597(1.074)	0.0705	545.015	
0	14	1	14	+	0	13	1	13	+		654419.987(0.033)	11.2702	152.113	
0	23	−2	22		0	22	3	19			656237.479(0.306)	1.0994	431.665	
0	3	−3	1		0	4	2	2			656812.994(0.060)	0.1E−6	31.284	
1	18	1	18		1	17	0	17			657202.370(0.221)	9.1491	449.070	
0	14	0	14		0	13	0	13			657404.972(0.038)	11.2904	152.045	
1	14	13	1		1	13	13	0			657435.282(1.384)	1.5623	980.858	
0	19	0	19		0	18	2	16			657440.573(0.395)	0.0158	284.906	
1	14	6	8	+	1	13	6	7	+		657455.179(0.238)	9.2836	468.916	
1	14	6	9	−	1	13	6	8	−		657455.179(0.238)	9.2836	468.916	
1	14	3	12		1	13	3	11			657550.654(0.230)	10.7669	433.100	
1	14	11	3		1	13	11	2			657555.552(5.934)	3.9573	777.251	
1	14	−12	3		1	13	−12	2			657632.667(1.444)	3.0223	914.347	
1	14	−10	5		1	13	−10	4			657670.824(8.219)	4.6948	692.929	
1	14	1	14	+	1	13	1	13	+		657794.712(0.105)	11.2761	368.847	
1	26	2	25	−	1	25	1	24	−		657819.124(3.493)	15.1382	736.108	
1	14	−11	4		1	13	−11	3			657830.071(1.328)	4.3649	765.692	
1	14	11	3	−	1	13	11	2	−		657844.161(4.033)	4.4497	851.688	
1	14	11	4	+	1	13	11	3	+		657844.161(4.033)	4.4497	851.688	
1	14	−7	8		1	13	−7	7			657900.691(0.815)	8.6086	507.572	
1	14	10	4		1	13	10	3			657949.547(3.087)	5.6939	779.618	
1	14	10	4	+	1	13	10	3	+		657991.608(0.581)	5.5643	704.649	
1	14	10	4	+	1	13	10	3	+		657991.608(0.581)	5.5643	704.649	
1	14	7	7		1	13	7	6			658019.902(0.987)	8.1388	547.719	
1	14	−9	6		1	13	−9	5			658048.676(8.199)	7.5478	697.391	
1	14	9	5		1	13	9	4			658122.202(0.453)	6.6522	654.126	
1	14	−8	7		1	13	−8	6			658235.859(0.328)	7.6356	613.455	
1	14	−6	9		1	13	−6	8			658240.793(0.180)	8.9930	486.531	
1	14	−2	12		1	13	−2	11			658277.813(0.118)	11.1098	396.376	
1	14	7	7	−	1	13	7	6	−		658334.613(0.203)	8.5395	581.535	
1	14	7	8	+	1	13	7	7	+		658334.613(0.203)	8.5395	581.535	
1	14	5	9	−	1	13	5	8	−		658358.347(0.438)	9.7318	435.677	
1	14	5	10	+	1	13	5	9	+		658358.347(0.438)	9.7318	435.677	
1	14	4	11		1	13	4	10			658398.843(0.110)	10.3097	395.778	
1	14	2	12	+	1	13	2	11	+		658450.877(0.078)	11.0621	350.577	
1	14	−3	11		1	13	−3	10			658454.758(0.077)	10.7494	367.324	
1	14	0	14		1	13	0	13			658484.508(0.091)	11.3238	351.822	
1	14	1	14		1	13	1	13			658500.498(0.087)	11.2528	345.519	
1	14	2	13	−	1	13	2	12	−		658524.400(0.084)	11.0621	350.585	
1	14	3	12	+	1	13	3	11	+		658748.389(0.137)	10.7992	418.389	
1	14	3	11	−	1	13	3	10	−		658749.458(0.138)	10.7992	418.389	
1	14	2	13		1	13	2	12			658766.261(0.143)	11.1186	420.920	
1	14	−1	13		1	13	−1	12			658818.375(0.155)	11.2474	430.237	
1	14	−4	10		1	13	−4	9			658841.472(0.145)	10.3969	424.992	
1	14	0	14	+	1	13	0	13	+		658896.835(0.177)	11.3139	437.366	
1	14	−5	10		1	13	−5	9			658946.064(0.593)	9.8248	522.972	
0	14	−1	14		0	13	−1	13			658951.694(0.035)	11.2636	146.989	
0	14	13	2		0	13	13	1			658996.768(3.295)	1.5141	730.134	
0	14	−13	1		0	13	−13	0			659040.537(1.350)	1.5398	730.828	
1	14	1	13	−	1	13	1	12	−		659065.387(0.126)	11.2757	369.125	
0	14	13	1	−	0	13	13	0	−		659147.394(1.829)	1.5334	739.833	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	14	13	2	+	0	13	13	1	+		659147.394(1.829)	1.5334	739.833	
0	14	−12	2		0	13	−12	1			659178.346(1.693)	2.9374	642.303	
0	14	12	2	+	0	13	12	1	+		659266.166(0.715)	2.9773	646.754	
0	14	12	3	−	0	13	12	2	−		659266.166(0.715)	2.9773	646.754	
0	14	12	3		0	13	12	2			659321.236(1.332)	2.9513	652.857	
0	14	11	4	+	0	13	11	3	+		659363.399(0.836)	4.2637	562.059	
0	14	11	3	−	0	13	11	2	−		659363.400(0.836)	4.2637	562.059	
0	14	0	14	+	0	13	0	13	+		659390.067(0.032)	11.3179	143.139	
1	14	4	11	−	1	13	4	10	−		659467.126(0.230)	10.3934	477.642	
1	14	4	10	+	1	13	4	9	+		659467.135(0.230)	10.3934	477.642	
0	14	−11	3		0	13	−11	2			659468.235(0.893)	4.2560	571.792	
0	14	11	4		0	13	11	3			659472.580(0.418)	4.3070	569.748	
1	14	5	9		1	13	5	8			659478.501(0.221)	9.9022	441.717	
0	14	10	5		0	13	10	4			659548.163(0.415)	5.4859	489.510	
0	14	10	4	+	0	13	10	3	+		659596.984(0.538)	5.4525	496.988	
0	14	10	5	−	0	13	10	4	−		659596.984(0.538)	5.4525	496.988	
1	10	0	10		1	9	1	9			659597.951(0.036)	4.1267	273.325	
0	14	−10	4		0	13	−10	3			659656.975(0.277)	5.5246	499.436	
0	14	9	6		0	13	9	5			659716.829(0.302)	6.5451	428.869	
0	14	−9	5		0	13	−9	4			659726.806(0.230)	6.5985	424.674	
0	14	9	5	−	0	13	9	4	−		659813.405(0.476)	6.6267	435.407	
0	14	9	6	+	0	13	9	5	+		659813.405(0.476)	6.6267	435.407	
0	14	−8	6		0	13	−8	5			659835.719(0.177)	7.5345	367.832	
0	14	8	6	+	0	13	8	5	+		659893.830(0.156)	7.5979	367.478	
0	14	8	7	−	0	13	8	6	−		659893.830(0.156)	7.5979	367.478	
0	14	8	7		0	13	8	6			659942.540(0.158)	7.6102	377.310	
0	14	2	13	−	0	13	2	12	−		659943.840(0.042)	11.1551	169.475	
0	14	7	7	−	0	13	7	6	−		659960.535(0.120)	8.4179	314.193	
0	14	7	8	+	0	13	7	7	+		659960.535(0.120)	8.4179	314.193	
0	14	−7	7		0	13	−7	6			660040.215(0.125)	8.4747	324.984	
0	14	7	8		0	13	7	7			660044.799(0.120)	8.4819	317.753	
0	14	6	9		0	13	6	8			660098.914(0.091)	9.1905	268.172	
0	14	6	8	+	0	13	6	7	+		660115.139(0.097)	9.2212	278.528	
0	14	6	9	−	0	13	6	8	−		660115.139(0.097)	9.2212	278.528	
0	14	−6	8		0	13	−6	7			660175.532(0.095)	9.2495	275.229	
0	14	5	10		0	13	5	9			660181.883(0.074)	9.8522	238.266	
0	14	−5	9		0	13	−5	8			660262.539(0.073)	9.8478	229.893	
0	14	−4	11		0	13	−4	10			660266.982(0.058)	10.3694	204.626	
0	14	5	10	+	0	13	5	9	+		660280.769(0.076)	9.9000	239.537	
0	14	5	9	−	0	13	5	8	−		660280.774(0.076)	9.9000	239.537	
0	14	4	10		0	13	4	9			660353.810(0.060)	10.4334	210.253	
0	14	−3	12		0	13	−3	11			660390.389(0.048)	10.8503	186.989	
0	14	3	12	+	0	13	3	11	+		660418.930(0.045)	10.7713	178.026	
0	14	4	11	−	0	13	4	10	−		660475.054(0.058)	10.3865	199.389	
0	14	4	10	+	0	13	4	9	+		660476.668(0.058)	10.3865	199.389	
0	14	3	11	−	0	13	3	10	−		660487.330(0.045)	10.7713	178.030	
0	14	1	13		0	13	1	12			660673.637(0.034)	11.4567	157.912	
0	14	3	11		0	13	3	10			660811.488(0.046)	10.8048	176.610	
0	14	2	12	+	0	13	2	11	+		660866.698(0.042)	11.1562	169.568	
0	5	−2	4		0	4	−1	4			661190.803(0.022)	4.0674	19.639	
0	14	2	12		0	13	2	11			661314.153(0.033)	10.9775	158.890	
0	14	−2	13		0	13	−2	12			661761.486(0.037)	11.0959	161.445	
0	7	−3	5		0	8	0	8			662159.849(0.050)	0.0028	65.744	
0	14	1	13	−	0	13	1	12	−		665446.685(0.033)	11.2742	154.518	
0	8	1	8	+	0	7	0	7	+	666706.035(0.050)	666706.044(0.024)	9.0708	44.075	AND9
0	10	2	8		0	9	0	9			668047.413(0.028)	0.0018	79.884	
0	4	2	3	−	0	3	1	2	−		670756.616(0.024)	3.4094	19.644	
0	12	−2	11		0	11	1	10			671436.645(0.038)	0.1082	118.556	
0	12	−8	4		0	13	−7	6			671768.080(5.194)	1.1174	324.984	
0	11	0	11		0	10	−1	10			672184.351(0.027)	6.6461	90.427	
0	3	3	0		0	2	2	0			675134.994(0.032)	4.9874	20.261	
0	4	2	2	+	0	3	1	3	+		675555.336(0.024)	3.3690	19.485	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	22	−1	22		0	21	1	20			677806.311(0.711)	0.0181	378.205	
0	15	1	14		0	14	2	12			677856.536(0.056)	5.1566	180.949	
0	16	2	14		0	15	−2	14			677886.340(0.080)	0.0172	207.176	
0	10	−3	8		0	11	−1	11			678052.636(0.053)	0.4E−4	107.716	
0	20	2	19	−	0	19	3	16	−		678802.158(0.354)	7.2000	333.794	
0	22	0	22		0	21	−2	20			678832.458(0.759)	0.0021	382.426	
0	6	4	2		0	7	3	4			679438.918(0.251)	0.8174	77.419	
0	9	3	7	+	0	8	2	6	+	679554.320(0.050)*	679554.483(0.023)	6.7743	82.962	AND90a
0	7	2	5		0	6	−1	6			679973.299(0.022)	0.0025	36.952	
0	9	3	6	−	0	8	2	7	−	680000.172(0.050)	680000.110(0.022)	6.7613	82.948	AND90a
0	26	2	24		0	25	3	22			682370.926(0.971)	5.6830	545.015	
1	3	−2	1		1	4	−3	1			683011.556(7.318)	4.8175	240.189	
1	26	2	24	+	1	25	1	25	+		683751.026(3.882)	15.8889	735.133	
0	26	−1	26		0	25	−2	24			684407.722(1.557)	1.9954	531.036	
0	10	5	6	+	0	11	4	7	+		684934.639(1.544)	1.8487	160.045	
0	10	5	5	−	0	11	4	8	−		684935.176(1.544)	1.8487	160.045	
0	23	−1	23		0	22	2	20			685530.365(0.886)	1.4791	413.899	
0	21	3	18		0	20	−3	18			685891.238(0.259)	0.1E−4	374.150	
1	22	2	21		1	21	3	19			688441.817(6.875)	1.0570	652.114	
0	11	1	10		0	10	0	10			688611.746(0.031)	5.3385	95.586	
0	16	−7	9		0	17	−6	11			689767.094(4.220)	2.9793	372.733	
0	19	0	19		0	18	1	17			690016.111(0.390)	8.4415	283.819	
0	14	2	12		0	13	1	12			690629.327(0.044)	6.8279	157.912	
0	13	−2	12		0	12	2	10			690689.209(0.047)	0.0052	138.406	
0	17	1	16		0	16	−2	15			691899.964(0.113)	0.3641	232.416	
0	7	7	0	−	0	8	6	3	−		692513.485(1.226)	0.1221	191.998	
0	7	7	1	+	0	8	6	2	+		692513.485(1.226)	0.1221	191.998	
1	3	1	3	+	1	2	2	0	+		692806.353(0.034)	0.3027	212.446	
1	3	1	2	−	1	2	2	1	−		693357.713(0.035)	0.3024	212.446	
0	5	3	2		0	4	−2	3			693452.076(0.026)	0.3E−5	33.820	
0	20	2	18	+	0	19	3	17	+		694611.939(0.291)	7.6930	333.756	
0	9	−2	8		0	8	0	8			695686.323(0.028)	0.0009	65.744	
0	20	0	20		0	19	2	17			696303.138(0.528)	0.0185	314.813	
0	9	6	3	+	0	10	5	6	+		697581.299(0.956)	0.9093	182.891	
0	9	6	4	−	0	10	5	5	−		697581.299(0.955)	0.9093	182.891	
0	26	−3	24		0	25	−4	22			697811.673(0.681)	9.6169	572.405	
1	7	3	5		1	6	2	5			697942.461(0.050)	1.0598	311.022	
0	13	−6	7		0	14	−5	9			698871.307(6.138)	2.5177	251.917	
0	8	1	7		0	7	−1	7			700200.883(0.022)	0.0003	47.966	
0	15	1	15	+	0	14	1	14	+		701022.039(0.044)	12.0823	173.942	
0	18	−1	18		0	17	0	17			702069.887(0.148)	16.3082	249.055	
0	3	3	0		0	2	1	1			702187.988(0.035)	0.0005	19.358	
0	15	0	15		0	14	0	14			703889.646(0.051)	12.0950	173.974	
1	19	1	19		1	18	0	18			704080.530(0.275)	9.7180	477.291	
1	15	6	9	+	1	14	6	8	+		704174.040(0.326)	10.2347	490.846	
1	15	6	10	−	1	14	6	9	−		704174.040(0.326)	10.2347	490.846	
0	20	0	20	+	0	19	1	19	+		704189.878(0.235)	22.6360	306.386	
1	15	3	13		1	14	3	12			704268.447(0.319)	11.6030	455.033	
1	15	13	2		1	14	13	1			704320.095(1.506)	3.0244	1002.790	
0	23	1	22	−	0	22	2	21	−		704379.151(0.469)	12.6781	423.910	
1	15	11	4		1	14	11	3			704433.854(5.911)	5.1331	799.185	
1	15	−12	4		1	14	−12	3			704528.375(1.561)	4.3939	936.284	
1	15	−10	6		1	14	−10	5			704555.891(8.560)	5.7165	714.867	
1	15	1	15	+	1	14	1	14	+		704664.738(0.135)	12.0893	390.789	
1	15	−7	9		1	14	−7	8			704735.822(1.007)	9.6182	529.518	
1	15	11	4	−	1	14	11	3	−		704747.268(4.281)	5.7590	873.632	
1	15	11	5	+	1	14	11	4	+		704747.268(4.281)	5.7590	873.632	
1	15	−11	5		1	14	−11	4			704758.164(1.766)	5.6493	787.635	
1	15	10	5		1	14	10	4			704840.959(2.970)	6.9009	801.565	
1	15	7	8		1	14	7	7			704919.689(1.102)	9.0944	569.669	
1	15	10	5	+	1	14	10	4	+		704926.041(0.726)	6.7625	726.598	
1	15	10	6	−	1	14	10	5	−		704926.041(0.726)	6.7625	726.598	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	15	−9	7		1	14	−9	6			704940.955(8.550)	8.8027	719.341	
1	15	9	6		1	14	9	5			705061.038(0.516)	7.7746	676.079	
1	15	−6	10		1	14	−6	9			705159.622(0.231)	9.9160	508.488	
1	15	−2	13		1	14	−2	12			705159.938(0.158)	11.9347	418.334	
1	15	−8	8		1	14	−8	7			705179.296(0.381)	8.6923	635.411	
1	15	7	8	−	1	14	7	7	−		705280.961(0.270)	9.5423	603.494	
1	15	7	9	+	1	14	7	8	+		705280.961(0.270)	9.5423	603.494	
1	15	5	10	−	1	14	5	9	−		705290.270(1.652)	10.6206	457.638	
1	15	5	11	+	1	14	5	10	+		705290.270(1.652)	10.6206	457.638	
0	26	−3	24		0	26	−2	25			705303.195(1.105)	19.3462	572.155	
1	15	4	12		1	14	4	11			705325.922(0.141)	11.1730	417.740	
1	15	2	13	+	1	14	2	12	+		705371.516(0.101)	11.8842	372.541	
1	15	−3	12		1	14	−3	11			705385.824(0.100)	11.5888	389.288	
1	15	0	15		1	14	0	14			705409.930(0.118)	12.1326	373.787	
1	15	1	15		1	14	1	14			705431.255(0.112)	12.0646	367.484	
1	15	2	14	−	1	14	2	13	−		705464.910(0.110)	11.8842	372.551	
0	15	−1	15		0	14	−1	14			705724.979(0.047)	12.0753	168.969	
1	15	3	13	+	1	14	3	12	+		705743.837(0.177)	11.6422	440.363	
1	15	3	12	−	1	14	3	11	−		705745.346(0.179)	11.6422	440.363	
1	15	2	14		1	14	2	13			705759.717(0.183)	11.9450	442.894	
0	15	14	1	+	0	14	14	0	+		705767.203(6.480)	1.5067	847.329	
0	15	14	2	−	0	14	14	1	−		705767.203(6.480)	1.5067	847.329	
1	15	−1	14		1	14	−1	13			705811.003(0.196)	12.0588	452.213	
1	15	−4	11		1	14	−4	10			705867.668(0.187)	11.2673	446.969	
1	15	0	15	+	1	14	0	14	+		705894.290(0.224)	12.1221	459.345	
0	15	13	3		0	14	13	2			705960.363(3.657)	2.9312	752.116	
1	15	−5	11		1	14	−5	10			705997.234(0.758)	10.7253	544.952	
0	15	−13	2		0	14	−13	1			706022.272(1.567)	2.9806	752.811	
1	15	1	14	−	1	14	1	13	−		706023.365(0.165)	12.0888	391.109	
0	15	13	2	−	0	14	13	1	−		706138.517(1.957)	2.9684	761.820	
0	15	13	3	+	0	14	13	2	+		706138.517(1.957)	2.9684	761.820	
0	15	−12	3		0	14	−12	2			706159.291(1.948)	4.2707	664.291	
0	15	0	15	+	0	14	0	14	+		706256.332(0.042)	12.1258	165.134	
0	15	12	3	+	0	14	12	2	+		706270.319(0.818)	4.3285	668.745	
0	15	12	4	−	0	14	12	3	−		706270.319(0.818)	4.3285	668.745	
0	15	12	4		0	14	12	3			706322.550(1.442)	4.2910	674.849	
0	15	11	4	−	0	14	11	3	−		706363.780(0.995)	5.5182	584.053	
0	15	11	5	+	0	14	11	4	+		706363.780(0.995)	5.5182	584.053	
0	15	−11	4		0	14	−11	3			706478.203(0.993)	5.5086	593.789	
0	15	11	5		0	14	11	4			706493.382(0.491)	5.5742	591.745	
0	15	10	6		0	14	10	5			706568.440(0.506)	6.6669	511.511	
1	11	0	11		1	10	1	10			706596.491(0.048)	4.6121	289.022	
0	15	10	5	+	0	14	10	4	+		706615.058(0.627)	6.6268	518.989	
0	15	10	6	−	0	14	10	5	−		706615.058(0.627)	6.6268	518.989	
1	15	4	12	−	1	14	4	11	−		706642.791(0.310)	11.2632	499.639	
1	15	4	11	+	1	14	4	10	+		706642.805(0.310)	11.2632	499.639	
1	15	5	10		1	14	5	9			706662.855(0.299)	10.8117	463.715	
0	15	10	5		0	14	10	4			706690.764(0.341)	6.7140	521.440	
0	15	9	7		0	14	9	6			706743.741(0.377)	7.6497	450.874	
0	15	−9	6		0	14	−9	5			706765.885(0.286)	7.7116	446.680	
0	15	9	6	−	0	14	9	5	−		706854.517(1.672)	7.7443	457.416	
0	15	9	7	+	0	14	9	6	+		706854.517(1.672)	7.7443	457.416	
0	15	−8	7		0	14	−8	6			706873.331(0.232)	8.5775	389.841	
0	15	2	14	−	0	14	2	13	−		706923.442(0.054)	11.9830	191.489	
0	15	8	7	+	0	14	8	6	+		706949.568(0.199)	8.6492	389.490	
0	15	8	8	−	0	14	8	7	−		706949.568(0.199)	8.6492	389.490	
0	15	8	8		0	14	8	7			706992.767(0.210)	8.6636	399.323	
0	15	7	8	−	0	14	7	7	−		707011.840(0.157)	9.4068	336.207	
0	15	7	9	+	0	14	7	8	+		707011.840(0.157)	9.4068	336.207	
0	15	−7	8		0	14	−7	7			707094.838(0.168)	9.4704	347.000	
0	15	7	9		0	14	7	8			707114.449(0.156)	9.4781	339.770	
0	15	6	10		0	14	6	9			707168.417(0.118)	10.1326	290.191	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	15	6	9	+	0	14	6	8	+		707173.337(0.129)	10.1668	300.547	
0	15	6	10	−	0	14	6	9	−		707173.337(0.129)	10.1668	300.547	
0	15	5	11		0	14	5	10			707245.448(0.097)	10.7554	260.288	
0	15	−6	9		0	14	−6	8			707255.899(0.125)	10.1975	297.250	
0	15	−4	12		0	14	−4	11			707342.923(0.074)	11.2381	226.650	
0	15	−5	10		0	14	−5	9			707357.281(0.094)	10.7500	251.917	
0	15	5	11	+	0	14	5	10	+		707368.092(0.099)	10.8070	261.561	
0	15	5	10	−	0	14	5	9	−		707368.102(0.099)	10.8070	261.561	
0	15	4	11		0	14	4	10			707443.637(0.078)	11.3066	232.280	
0	15	−3	13		0	14	−3	12			707478.304(0.062)	11.6972	209.017	
0	15	3	13	+	0	14	3	12	+		707518.662(0.058)	11.6133	200.056	
0	15	4	12	−	0	14	4	11	−		707607.031(0.075)	11.2558	221.420	
0	15	4	11	+	0	14	4	10	+		707609.667(0.075)	11.2558	221.420	
0	15	3	12	−	0	14	3	11	−		707615.417(0.059)	11.6132	200.062	
0	15	1	14		0	14	1	13			707812.226(0.045)	12.2651	179.950	
0	15	3	12		0	14	3	11			708010.488(0.059)	11.6484	198.652	
0	15	2	13	+	0	14	2	12	+		708055.354(0.054)	11.9846	191.612	
0	24	−2	23		0	23	3	20			708329.373(0.387)	1.3613	467.875	
0	15	2	13		0	14	2	12			708500.249(0.044)	11.7956	180.949	
0	6	−2	5		0	5	−1	5			708546.213(0.022)	4.4573	27.509	
0	6	−3	4		0	7	0	7			708749.638(0.050)	0.0013	53.169	
0	15	−2	14		0	14	−2	13			709201.735(0.048)	11.9182	183.519	
0	9	1	9	+	0	8	0	8	+		710385.894(0.025)	10.1424	56.663	
0	23	0	23		0	22	−2	21			710421.693(0.967)	0.0019	417.196	
0	15	1	14	−	0	14	1	13	−		712808.013(0.044)	12.0870	176.715	
0	25	−3	23		0	25	−2	24			713927.361(0.896)	19.0169	531.036	
0	5	2	4	−	0	4	1	3	−		716365.064(0.023)	3.8263	25.995	
0	11	2	9		0	10	0	10			716879.490(0.035)	0.0025	95.586	
0	12	0	12		0	11	−1	11			718090.237(0.033)	7.6550	107.716	
0	4	−4	1		0	3	−3	1			718209.190(0.041)	6.3846	53.193	
0	23	−1	23		0	22	1	21			718413.736(0.909)	0.0211	412.802	
0	11	−8	3		0	12	−7	5			719028.482(5.210)	0.8053	304.537	
0	13	−2	12		0	12	1	11			719436.918(0.045)	0.1427	137.447	
0	24	−3	22		0	24	−2	23			721885.563(0.718)	18.7047	491.502	
0	4	3	1		0	3	2	1			722316.438(0.030)	5.2216	24.985	
0	21	2	20	−	0	20	3	17	−		723708.435(0.445)	7.6189	365.254	
0	17	2	15		0	16	−2	15			723904.314(0.110)	0.0227	232.416	
0	16	1	15		0	15	2	13			724292.131(0.069)	5.5998	204.582	
0	5	2	3	+	0	4	1	4	+		724382.935(0.023)	3.7508	25.730	
0	9	−3	7		0	10	−1	10			724480.109(0.050)	0.3E−4	90.427	
0	24	−1	24		0	23	2	21			726071.384(1.100)	1.6631	450.040	
0	3	3	0		0	3	0	3			726168.210(0.034)	0.0001	18.558	
0	4	3	1		0	4	0	4			726218.240(0.031)	0.0003	24.855	
0	5	3	2		0	5	0	5			726343.231(0.029)	0.0011	32.723	
0	10	3	8	+	0	9	2	7	+		726560.837(0.029)	7.1971	97.135	
0	6	3	3		0	6	0	6			726584.515(0.027)	0.0029	42.162	
0	5	4	1		0	6	3	3			726665.832(0.248)	0.4770	66.398	
0	7	3	4		0	7	0	7			726991.177(0.027)	0.0062	53.169	
0	10	3	7	−	0	9	2	8	−		727264.803(0.029)	7.1755	97.112	
0	8	2	6		0	7	−1	7			727564.960(0.024)	0.0056	47.966	
0	8	3	5		0	8	0	8			727619.527(0.028)	0.0119	65.744	
0	9	3	6		0	9	0	9			728532.308(0.030)	0.0212	79.884	
0	23	−3	21		0	23	−2	22			729147.543(0.569)	18.3898	453.555	
0	20	0	20		0	19	1	18			729302.011(0.521)	8.6327	313.713	
0	10	3	7		0	10	0	10			729797.580(0.035)	0.0351	95.586	
1	2	−2	0		1	3	−3	0			730071.654(7.315)	4.5863	233.908	
0	11	3	8		0	11	0	11			731487.286(0.041)	0.0550	112.849	
0	9	5	5	+	0	10	4	6	+		732168.189(1.545)	1.4541	142.732	
0	9	5	4	−	0	10	4	7	−		732168.440(1.545)	1.4541	142.732	
0	12	3	9		0	12	0	12			733675.527(0.052)	0.0822	131.669	
0	21	0	21		0	20	2	18			734528.455(0.692)	0.0215	346.283	
0	22	3	19		0	21	−3	19			734643.791(0.318)	0.2E−4	407.160	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	22	−3	20		0	22	−2	21			735692.889(0.445)	18.0509	417.196	
0	13	3	10		0	13	0	13			736436.628(0.068)	0.1178	152.045	
0	18	1	17		0	17	−2	16			736810.801(0.152)	0.4090	259.242	
0	15	−7	8		0	16	−6	10			737005.470(4.228)	2.5876	346.003	
0	12	1	11		0	11	0	11			737450.618(0.038)	5.7755	112.849	
0	14	−2	13		0	13	2	11			738360.761(0.058)	0.0080	158.890	
0	15	2	13		0	14	1	13			738455.939(0.053)	7.1730	179.950	
1	23	2	22		1	22	3	20			739617.358(8.911)	1.0773	686.471	
1	4	1	4	+	1	3	2	1	+		739702.250(0.034)	0.6835	217.157	
0	14	3	11		0	14	0	14			739843.144(0.091)	0.1624	173.974	
0	24	0	24		0	23	−2	22			740477.925(1.217)	0.0016	453.555	
0	6	3	3		0	5	−2	4			740597.312(0.025)	$0.2E-4$	41.694	
1	4	1	3	−	1	3	2	2	−		740620.410(0.034)	0.6824	217.157	
0	21	−3	19		0	21	−2	20			741513.973(0.345)	17.6676	382.426	
0	21	2	19	+	0	20	3	18	+		742926.801(0.353)	8.2557	365.202	
0	15	3	12		0	15	0	15			743963.987(0.125)	0.2165	197.453	
0	10	−2	9		0	9	0	9			744138.742(0.031)	0.0012	79.884	
1	8	3	6		1	7	2	6			744788.797(0.052)	1.1292	322.014	
0	8	6	3	−	0	9	5	4	−		744796.476(0.966)	0.6054	167.154	
0	8	6	2	+	0	9	5	5	+		744796.477(0.967)	0.6054	167.154	
0	12	−6	6		0	13	−5	8			746053.178(6.153)	2.1116	229.893	
0	20	−3	18		0	20	−2	19			746618.334(0.264)	17.2220	349.246	
0	16	1	16	+	0	15	1	15	+		747596.401(0.058)	12.8937	197.326	
0	9	1	8		0	8	−1	8			747748.692(0.024)	0.0004	60.550	
0	16	3	13		0	16	0	16			748862.847(0.170)	0.2795	222.481	
0	4	3	1		0	3	1	2			749363.703(0.032)	0.0014	24.083	
0	16	0	16		0	15	0	15			750309.853(0.067)	12.9000	197.453	
1	16	6	10	+	1	15	6	9	+		750848.019(0.436)	11.1681	514.335	
1	16	6	11	−	1	15	6	10	−		750848.019(0.436)	11.1681	514.335	
1	16	3	14		1	15	3	13			750939.958(0.434)	12.4342	478.525	
1	20	1	20		1	19	0	19			750940.366(0.338)	10.3009	507.074	
0	19	−3	17		0	19	−2	18			751029.733(0.201)	16.7018	317.655	
1	16	13	3		1	15	13	2			751189.419(1.663)	4.4050	1026.280	
1	16	11	5		1	15	11	4			751293.556(5.829)	6.2613	822.682	
0	19	−1	19		0	18	0	18			751325.347(0.184)	17.9285	277.173	
1	16	−12	5		1	15	−12	4			751407.923(1.690)	5.6958	959.784	
1	16	−10	7		1	15	−10	6			751422.038(8.864)	6.7018	738.368	
1	16	1	16	+	1	15	1	15	+		751511.031(0.170)	12.9019	414.294	
1	16	−7	10		1	15	−7	9			751539.097(1.227)	10.6034	553.025	
1	16	11	5	−	1	15	11	4	−		751632.640(4.528)	7.0086	897.140	
1	16	11	6	+	1	15	11	5	+		751632.640(4.528)	7.0086	897.140	
1	16	−11	6		1	15	−11	5			751673.894(2.310)	6.8750	811.143	
1	16	10	6		1	15	10	5			751710.758(2.910)	8.0512	825.076	
1	16	7	9		1	15	7	8			751798.504(1.228)	10.0271	593.182	
1	16	−9	8		1	15	−9	7			751810.370(8.865)	10.0072	742.855	
1	16	10	6	+	1	15	10	5	+		751847.031(0.910)	7.9125	750.111	
1	16	10	7	−	1	15	10	6	−		751847.031(0.910)	7.9125	750.111	
1	16	9	7		1	15	9	6			751985.430(0.593)	8.8580	699.597	
1	16	−2	14		1	15	−2	13			752013.828(0.209)	12.7574	441.855	
1	16	−6	11		1	15	−6	10			752058.133(0.292)	10.8223	532.010	
1	16	−8	9		1	15	−8	8			752107.527(0.445)	9.7181	658.934	
1	16	5	11		1	15	5	10	−		752207.415(7.678)	11.4833	481.164	
1	16	5	12	+	1	15	5	11	+		752207.415(7.678)	11.4833	481.164	
1	16	7	9	−	1	15	7	8	−		752211.250(0.349)	10.5214	627.020	
1	16	7	10	+	1	15	7	9	+		752211.250(0.349)	10.5214	627.020	
1	16	4	13		1	15	4	12			752232.089(0.176)	12.0287	441.267	
1	16	2	14	+	1	15	2	13	+		752275.758(0.127)	12.7043	396.070	
1	16	−3	13		1	15	−3	12			752295.961(0.127)	12.4240	412.817	
1	16	0	16		1	15	0	15			752312.832(0.149)	12.9413	397.317	
1	16	1	16		1	15	1	15			752340.342(0.142)	12.8759	391.014	
1	16	2	15	−	1	15	2	14	−		752385.394(0.141)	12.7043	396.082	
0	16	−1	16		0	15	−1	15			752441.770(0.061)	12.8865	192.510	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	16	14	2	+	0	15	14	1	+		752693.741(7.056)	2.9229	870.871	
0	16	14	3	−	0	15	14	2	−		752693.741(7.056)	2.9229	870.871	
1	16	3	14	+	1	15	3	13	+		752727.178(0.224)	12.4809	463.904	
1	16	3	13	−	1	15	3	12	−		752729.257(0.226)	12.4809	463.904	
1	16	2	15		1	15	2	14			752740.407(0.230)	12.7696	466.436	
1	16	−1	15		1	15	−1	14			752789.954(0.245)	12.8697	475.756	
1	16	0	16	+	1	15	0	15	+		752877.917(0.278)	12.9302	482.891	
1	16	−4	12		1	15	−4	11			752886.606(0.238)	12.1301	470.514	
0	16	13	4		0	15	13	3			752901.628(4.105)	4.2697	775.664	
1	16	1	15	−	1	15	1	14	−		752956.981(0.212)	12.9013	414.659	
0	16	−13	3		0	15	−13	2			752984.828(1.833)	4.3411	776.361	
1	16	−5	12		1	15	−5	11			753044.255(0.947)	11.6140	568.502	
0	16	0	16	+	0	15	0	15	+		753075.765(0.055)	12.9335	188.692	
0	16	13	3	−	0	15	13	2	−		753110.845(2.108)	4.3236	785.374	
0	16	13	4	+	0	15	13	3	+		753110.845(2.108)	4.3236	785.374	
0	16	−12	4		0	15	−12	3			753118.831(2.263)	5.5364	687.846	
0	16	12	4	+	0	15	12	3	+		753256.617(0.943)	5.6110	692.303	
0	16	12	5	−	0	15	12	4	−		753256.617(0.943)	5.6110	692.303	
0	16	12	5		0	15	12	4			753304.568(1.578)	5.5627	698.410	
0	16	11	5	−	0	15	11	4	−		753344.061(1.188)	6.7155	607.615	
0	16	11	6	+	0	15	11	5	+		753344.061(1.188)	6.7155	607.615	
0	16	−11	5		0	15	−11	4			753468.526(1.122)	6.7042	617.355	
0	16	11	6		0	15	11	5			753496.728(0.580)	6.7835	615.311	
0	16	10	7		0	15	10	6			753570.018(0.614)	7.8002	535.079	
1	12	0	12		1	11	1	11			753576.002(0.064)	5.1055	306.287	
0	16	10	6	+	0	15	10	5	+		753613.260(0.742)	7.7539	542.559	
0	16	10	7	−	0	15	10	6	−		753613.260(0.742)	7.7539	542.559	
0	10	1	10	+	0	9	0	9	+		753696.284(0.028)	11.2366	70.821	
0	16	−10	6		0	15	−10	5			753707.061(0.421)	7.8554	545.013	
0	16	9	8		0	15	9	7			753750.834(0.469)	8.7159	474.449	
0	16	−9	7		0	15	−9	6			753787.524(0.354)	8.7859	470.256	
1	16	4	13	−	1	15	4	12	−		753827.901(0.408)	12.1252	523.210	
1	16	4	12	+	1	15	4	11	+		753827.924(0.408)	12.1252	523.210	
1	16	5	11		1	15	5	10			753858.074(0.398)	11.7095	487.286	
0	16	2	15	−	0	15	2	14	−		753870.380(0.069)	12.8087	215.069	
0	16	9	7	−	0	15	9	6	−		753872.763(7.685)	8.8182	480.994	
0	16	9	8	+	0	15	9	7	+		753872.763(7.685)	8.8182	480.994	
0	16	−8	8		0	15	−8	7			753891.584(0.298)	9.5901	413.420	
0	16	8	8	+	0	15	8	7	+		753988.845(0.250)	9.6699	413.071	
0	16	8	9	−	0	15	8	8	−		753988.845(0.250)	9.6699	413.071	
0	16	8	9		0	15	8	8			754024.668(0.273)	9.6862	422.906	
0	16	7	9	−	0	15	7	8	−		754044.775(0.201)	10.3725	359.790	
0	16	7	10	+	0	15	7	9	+		754044.775(0.201)	10.3725	359.790	
0	16	−7	9		0	15	−7	8			754130.600(0.218)	10.4427	370.586	
0	16	7	10		0	15	7	9			754168.281(0.198)	10.4508	363.357	
0	16	6	10	+	0	15	6	9	+		754212.309(0.166)	11.0952	324.136	
0	16	6	11	−	0	15	6	10	−		754212.309(0.166)	11.0952	324.136	
0	16	6	11		0	15	6	10			754221.272(0.150)	11.0575	313.779	
0	16	5	12		0	15	5	11			754289.915(0.124)	11.6467	283.879	
0	16	−6	10		0	15	−6	9			754320.728(0.159)	11.1281	320.841	
0	16	−4	13		0	15	−4	12			754401.087(0.094)	12.0992	250.244	
0	16	−5	11		0	15	−5	10			754438.171(0.119)	11.6403	275.512	
0	16	5	12	+	0	15	5	11	+		754439.754(0.127)	11.7018	285.156	
0	16	5	11	−	0	15	5	10	−		754439.771(0.127)	11.7018	285.156	
0	16	4	12		0	15	4	11			754517.240(0.100)	12.1720	255.878	
0	16	−3	14		0	15	−3	13			754549.123(0.079)	12.5396	232.616	
0	17	3	14		0	17	0	17			754597.061(0.230)	0.3507	249.055	
0	16	3	14	+	0	15	3	13	+		754601.592(0.073)	12.4512	223.656	
0	16	4	13	−	0	15	4	12	−		754729.501(0.095)	12.1175	245.023	
0	16	4	12	+	0	15	4	11	+		754733.665(0.095)	12.1175	245.024	
0	16	3	13	−	0	15	3	12	−		754735.327(0.074)	12.4511	223.665	
0	18	−3	16		0	18	−2	17			754787.332(0.151)	16.1014	287.654	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	16	1	15		0	15	1	14			754935.843(0.058)	13.0718	203.560	
0	16	3	13		0	15	3	12			755208.713(0.075)	12.4877	222.269	
0	16	2	14	+	0	15	2	13	+		755239.257(0.069)	12.8109	215.231	
0	5	−3	3		0	6	0	6			755544.017(0.052)	0.0005	42.162	
0	16	2	14		0	15	2	13			755634.434(0.058)	12.6128	204.582	
0	7	−2	6		0	6	−1	6			756003.215(0.022)	4.8298	36.952	
0	16	−2	15		0	15	−2	14			756685.763(0.062)	12.7380	207.176	
0	21	0	21	+	0	20	1	20	+		756987.692(0.285)	24.1848	337.527	
0	14	−5	9		0	14	−4	11			757481.560(0.092)	13.2085	226.650	
0	13	−5	8		0	13	−4	10			757486.004(0.087)	12.0772	204.626	
0	15	−5	10		0	15	−4	12			757495.918(0.104)	14.3320	250.244	
0	12	−5	7		0	12	−4	9			757505.574(0.085)	10.9347	184.172	
0	16	−5	11		0	16	−4	13			757533.003(0.123)	15.4505	275.408	
0	11	−5	6		0	11	−4	8			757536.850(0.087)	9.7762	165.291	
0	10	−5	5		0	10	−4	7			757576.666(0.090)	8.5954	147.980	
0	17	−5	12		0	17	−4	14			757596.979(0.151)	16.5663	302.142	
0	9	−5	4		0	9	−4	6			757622.118(0.096)	7.3834	132.243	
0	8	−5	3		0	8	−4	5			757670.563(0.101)	6.1274	118.077	
0	18	−5	13		0	18	−4	15			757692.250(0.189)	17.6812	330.443	
0	7	−5	2		0	7	−4	4			757719.619(0.108)	4.8075	105.485	
0	6	−5	1		0	6	−4	3			757767.172(0.116)	3.3919	94.466	
0	5	−5	0		0	5	−4	2			757811.369(0.123)	1.8250	85.021	
0	19	−5	14		0	19	−4	16			757823.445(0.238)	18.7967	360.312	
0	17	−3	15		0	17	−2	16			757942.948(0.114)	15.4224	259.242	
0	20	−5	15		0	20	−4	17			757995.408(0.299)	19.9141	391.749	
0	21	−5	16		0	21	−4	18			758213.186(0.374)	21.0345	424.751	
0	24	−1	24		0	23	1	22			758342.517(1.149)	0.0244	448.963	
0	22	−5	17		0	22	−4	19			758482.017(0.464)	22.1589	459.319	
0	23	−5	18		0	23	−4	20			758807.305(0.570)	23.2883	495.451	
0	24	−5	19		0	24	−4	21			759194.608(0.695)	24.4233	533.146	
0	25	−5	20		0	25	−4	22			759649.608(0.838)	25.5647	572.405	
0	24	1	23	−	0	23	2	22	−		759930.743(0.578)	13.6724	459.982	
0	16	1	15	−	0	15	1	14	−		760132.021(0.058)	12.8992	200.492	
0	26	−5	21		0	26	−4	23			760178.087(1.003)	26.7133	613.225	
0	16	−3	14		0	16	−2	15			760556.927(0.087)	14.6721	232.416	
0	25	−2	24		0	24	3	21			760813.547(0.483)	1.6453	505.658	
0	18	3	15		0	18	0	18			761217.013(0.307)	0.4284	277.173	
0	6	2	5	−	0	5	1	4	−		761567.423(0.022)	4.2644	33.933	
0	15	−3	13		0	15	−2	14			762693.567(0.068)	13.8610	207.176	
0	13	0	13		0	12	−1	12			763695.831(0.044)	8.7520	126.571	
0	14	−3	12		0	14	−2	13			764416.997(0.057)	13.0008	183.519	
0	5	−4	2		0	4	−3	2			765367.701(0.037)	6.5603	59.491	
0	13	−3	11		0	13	−2	12			765788.094(0.050)	12.1024	161.445	
0	12	2	10		0	11	0	11			766198.327(0.044)	0.0032	112.849	
0	25	−1	25		0	24	2	22			766233.614(1.348)	1.8212	487.734	
0	10	−8	2		0	11	−7	4			766288.253(5.227)	0.5260	285.662	
0	12	−3	10		0	12	−2	11			766862.598(0.046)	11.1749	140.952	
0	14	−2	13		0	13	1	12			767675.935(0.056)	0.1802	157.912	
0	11	−3	9		0	11	−2	10			767690.285(0.044)	10.2248	122.039	
0	21	0	21		0	20	1	19			767748.562(0.683)	8.7566	345.175	
0	22	2	21	−	0	21	3	18	−		768239.881(0.558)	8.0225	398.284	
0	10	−3	8		0	10	−2	9			768314.889(0.043)	9.2565	104.705	
0	19	3	16		0	19	0	19			768766.045(0.403)	0.5105	306.836	
0	9	−3	7		0	9	−2	8			768774.473(0.042)	8.2716	88.950	
0	25	0	25		0	24	−2	23			769011.082(1.512)	0.0014	491.502	
0	8	−3	6		0	8	−2	7			769101.988(0.043)	7.2697	74.771	
0	7	−3	5		0	7	−2	6			769325.862(0.044)	6.2470	62.169	
0	18	2	16		0	17	−2	16			769386.339(0.153)	0.0286	259.242	
0	6	−3	4		0	6	−2	5			769470.522(0.045)	5.1961	51.144	
0	5	3	2		0	4	2	2			769482.894(0.027)	5.5483	31.284	
0	5	−3	3		0	5	−2	4			769556.814(0.047)	4.1022	41.694	
0	4	−3	2		0	4	−2	3			769602.297(0.049)	2.9357	33.820	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	3	−3	1		0	3	−2	2			769621.446(0.052)	1.6304	27.521	
0	17	1	16		0	16	2	14			770699.387(0.083)	6.0851	229.788	
0	8	−3	6		0	9	−1	9			771091.494(0.049)	0.2E−4	74.705	
0	22	0	22		0	21	2	19			772166.346(0.888)	0.0248	379.312	
0	11	3	9	+	0	10	2	8	+		773516.405(0.039)	7.6263	112.881	
0	6	2	4	+	0	5	1	5	+		773629.025(0.022)	4.1384	33.536	
0	4	4	0		0	5	3	2			773878.701(0.245)	0.1909	56.951	
0	11	3	8	−	0	10	2	9	−		774578.245(0.039)	7.5918	112.848	
0	9	2	7		0	8	−1	8			775330.308(0.026)	0.0117	60.550	
0	20	3	17		0	20	0	20			777280.833(0.523)	0.5947	338.040	
0	8	5	4	+	0	9	4	5	+		779388.417(1.544)	1.0781	126.992	
0	8	5	3	−	0	9	4	6	−		779388.525(1.544)	1.0781	126.992	
0	19	1	18		0	18	−2	17			781206.932(0.203)	0.4440	287.654	
0	23	3	20		0	22	−3	20			783630.674(0.389)	0.3E−4	441.736	
0	14	−7	7		0	15	−6	9			784231.360(4.241)	2.2061	320.841	
0	15	−2	14		0	14	2	12			786248.343(0.074)	0.0117	180.949	
0	16	2	14		0	15	1	14			786278.147(0.064)	7.5549	203.560	
1	5	1	5	+	1	4	2	2	+		786547.401(0.034)	1.0984	223.438	
0	13	1	12		0	12	0	12			786749.433(0.050)	6.1984	131.669	
0	21	3	18		0	21	0	21			786792.067(0.668)	0.6783	370.784	
0	7	3	4		0	6	−2	5			787712.061(0.025)	0.0001	51.144	
1	5	1	4	−	1	4	2	3	−		787922.987(0.034)	1.0956	223.438	
0	22	2	20	+	0	21	3	19	+		791396.136(0.423)	8.8346	398.215	
1	9	3	7		1	8	2	7			791530.202(0.057)	1.1986	334.575	
0	7	6	1	+	0	8	5	4	+		792008.362(0.977)	0.3401	152.989	
0	7	6	2	−	0	8	5	3	−		792008.362(0.977)	0.3401	152.989	
0	11	−2	10		0	10	0	10			793052.942(0.035)	0.0015	95.586	
0	11	−6	5		0	12	−5	7			793235.703(6.162)	1.7177	209.440	
0	17	1	17	+	0	16	1	16	+		794141.750(0.073)	13.7046	222.263	
0	10	1	9		0	9	−1	9			795429.387(0.028)	0.0007	74.705	
0	26	0	26		0	25	−2	24			796045.043(1.856)	0.0011	531.036	
0	5	3	2		0	4	1	3			796533.418(0.030)	0.0027	30.381	
0	11	1	11	+	0	10	0	10	+		796646.564(0.032)	12.3560	86.549	
0	17	0	17		0	16	0	16			796671.691(0.085)	13.7054	222.481	
0	22	3	19		0	22	0	22			797325.306(0.841)	0.7589	405.069	
1	17	6	11	+	1	16	6	10	+		797476.364(0.572)	12.0871	539.381	
1	17	6	18	−	1	16	6	11	−		797476.364(0.572)	12.0871	539.381	
1	17	3	15		1	16	3	14			797564.501(0.578)	13.2611	503.574	
0	25	−1	25		0	24	1	23			797584.029(1.436)	0.0279	486.688	
1	21	1	21		1	20	0	20			797781.506(0.411)	10.8986	538.418	
1	17	13	4		1	16	13	3			798042.217(1.862)	5.7185	1051.340	
1	17	11	6		1	16	11	5			798133.428(5.702)	7.3512	847.743	
1	17	−10	8		1	16	−10	7			798268.005(9.133)	7.6579	763.433	
1	17	−12	6		1	16	−12	5			798270.232(1.832)	6.9403	984.848	
1	17	−7	11		1	16	−7	10			798308.734(1.475)	11.5684	578.094	
1	17	1	17	+	1	16	1	16	+		798332.056(0.212)	13.7141	439.362	
1	17	11	6	−	1	16	11	5	−		798499.100(4.775)	8.2090	922.211	
1	17	11	7	+	1	16	11	6	+		798499.100(4.775)	8.2090	922.211	
1	17	10	7		1	16	10	6			798557.535(2.986)	9.1535	850.151	
1	17	−11	7		1	16	−11	6			798576.431(2.959)	8.0524	836.216	
1	17	7	10		1	16	7	9			798654.967(1.368)	10.9410	618.259	
1	17	−9	9		1	16	−9	8			798655.442(9.146)	11.1690	767.933	
1	17	10	7	+	1	16	10	6	+		798753.681(1.133)	9.0229	775.190	
1	17	10	8	−	1	16	10	7	−		798753.681(1.133)	9.0229	775.190	
1	17	−2	15		1	16	−2	14			798837.715(0.272)	13.5784	466.940	
1	17	9	8		1	16	9	7			798894.426(0.684)	9.9093	724.680	
1	17	−6	12		1	16	−6	11			798934.980(0.363)	11.7151	557.095	
1	17	−8	10		1	16	−8	9			799019.533(0.520)	10.7186	684.021	
0	17	−1	17		0	16	−1	16			799100.229(0.077)	13.6971	217.609	
1	17	4	14		1	16	4	13			799115.977(0.217)	12.8782	466.359	
1	17	7	10	−	1	16	7	9	−		799124.403(0.440)	11.4809	652.111	
1	17	7	11	+	1	16	7	10	+		799124.403(0.440)	11.4809	652.111	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	17	2	15	+	1	16	2	14	+		799153.132(0.157)	13.5230	421.163	
1	17	−3	14		1	16	−3	13			799183.791(0.160)	13.2557	437.911	
1	17	0	17		1	16	0	16			799191.737(0.186)	13.7501	422.412	
1	17	1	17		1	16	1	16			799226.331(0.176)	13.6868	416.110	
1	17	2	16	−	1	16	2	15	−		799284.530(0.176)	13.5229	421.179	
0	17	14	3	+	0	16	14	2	+		799596.069(7.749)	4.2647	895.978	
0	17	14	4	−	0	16	14	3	−		799596.069(7.749)	4.2647	895.978	
1	17	3	15	+	1	16	3	14	+		799697.560(0.278)	13.3160	489.012	
1	17	3	14	−	1	16	3	13	−		799700.367(0.281)	13.3160	489.012	
1	17	2	16		1	16	2	15			799707.447(0.283)	13.5926	491.544	
1	17	−1	16		1	16	−1	15			799754.295(0.301)	13.6801	500.866	
0	17	13	5		0	16	13	4			799819.054(4.654)	5.5433	800.778	
0	17	0	17	+	0	16	0	16	+		799845.859(0.069)	13.7412	213.812	
1	17	0	17	+	1	16	0	16	+		799846.776(0.341)	13.7384	508.004	
1	17	1	16	−	1	16	1	15	−		799864.643(0.268)	13.7135	439.775	
1	17	−4	13		1	16	−4	12			799897.691(0.298)	12.9865	495.628	
0	17	−13	4		0	16	−13	3			799926.922(2.153)	5.6354	801.478	
0	17	−12	5		0	16	−12	4			800055.522(2.644)	6.7463	712.967	
0	17	13	4	−	0	16	13	3	−		800063.124(2.290)	5.6131	810.495	
0	17	13	5	+	0	16	13	4	+		800063.124(2.290)	5.6131	810.495	
1	17	−5	13		1	16	−5	12			800086.518(1.158)	12.4928	593.621	
0	17	12	5	+	0	16	12	4	+		800223.870(1.092)	6.8368	717.429	
0	17	12	6	−	0	16	12	5	−		800223.870(1.092)	6.8368	717.429	
0	17	12	6		0	16	12	5			800265.983(1.748)	6.7785	723.537	
0	17	11	6	−	0	16	11	5	−		800302.891(1.416)	7.8655	632.744	
0	17	11	7	+	0	16	11	6	+		800302.892(1.416)	7.8655	632.744	
0	17	−11	6		0	16	−11	5			800437.890(1.285)	7.8528	642.488	
0	17	11	7		0	16	11	6			800481.454(0.689)	7.9452	640.445	
1	13	0	13		1	12	1	12			800534.352(0.085)	5.6079	325.120	
0	17	10	8		0	16	10	7			800551.646(0.742)	8.8943	560.216	
0	17	10	7	+	0	16	10	6	+		800590.262(0.883)	8.8422	567.697	
0	17	10	8	−	0	16	10	7	−		800590.262(0.883)	8.8422	567.697	
0	17	−10	7		0	16	−10	6			800704.701(0.517)	8.9573	570.153	
0	17	9	9		0	16	9	8			800736.783(0.579)	9.7507	499.591	
0	17	2	16	−	0	16	2	15	−		800782.607(0.085)	13.6325	240.216	
0	17	−9	8		0	16	−9	7			800790.558(0.433)	9.8283	495.399	
0	20	−1	20		0	19	0	19			800793.221(0.225)	19.6308	306.836	
0	17	−8	9		0	16	−8	8			800889.184(0.375)	10.5778	438.567	
0	17	8	9	+	0	16	8	8	+		801010.562(0.310)	10.6652	438.222	
0	17	8	10	−	0	16	8	9	−		801010.562(0.310)	10.6652	438.222	
1	17	4	14	−	1	16	4	13	−		801020.852(0.529)	12.9810	548.355	
1	17	4	13	+	1	16	4	12	+		801020.888(0.529)	12.9810	548.355	
0	17	8	10		0	16	8	9			801037.014(0.347)	10.6836	448.058	
0	17	7	10	−	0	16	7	9	−		801058.115(0.253)	11.3190	384.943	
0	17	7	11	+	0	16	7	10	+		801058.115(0.253)	11.3190	384.943	
1	17	5	12		1	16	5	11			801062.498(0.522)	12.5979	512.432	
0	17	−7	10		0	16	−7	9			801146.242(0.277)	11.3957	395.742	
0	17	7	11		0	16	7	10			801205.238(0.247)	11.4040	388.513	
0	17	6	11	+	0	16	6	10	+		801230.771(0.209)	12.0095	349.294	
0	17	6	12	−	0	16	6	11	−		801230.771(0.209)	12.0095	349.294	
0	17	6	12		0	16	6	11			801256.367(0.187)	11.9683	338.937	
0	17	5	13		0	16	5	12			801314.012(0.154)	12.5282	309.039	
0	17	−6	11		0	16	−6	10			801368.976(0.199)	12.0445	346.003	
0	17	−4	14		0	16	−4	13			801440.302(0.117)	12.9541	275.408	
0	17	5	13	+	0	16	5	12	+		801494.699(0.158)	12.5867	310.322	
0	17	5	12	−	0	16	5	11	−		801494.729(0.158)	12.5867	310.322	
0	17	−5	12		0	16	−5	11			801504.279(0.148)	12.5207	300.677	
0	17	4	13		0	16	4	12			801573.529(0.125)	13.0311	281.046	
0	17	−3	15		0	16	−3	14			801601.733(0.099)	13.3784	257.785	
0	17	3	15	+	0	16	3	14	+		801666.092(0.091)	13.2858	248.827	
0	17	4	14	−	0	16	4	13	−		801841.717(0.118)	12.9729	270.198	
0	17	3	14	−	0	16	3	13	−		801847.229(0.093)	13.2856	248.841	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	17	4	13	+	0	16	4	12	+		801848.107(0.118)	12.9729	270.199	
0	17	1	16		0	16	1	15			802041.691(0.072)	13.8779	228.742	
0	17	3	14		0	16	3	13			802405.906(0.093)	13.3234	247.460	
0	17	2	15	+	0	16	2	14	+		802417.445(0.085)	13.6354	240.423	
0	4	−3	2		0	5	0	5			802493.452(0.054)	0.0002	32.723	
0	17	2	15		0	16	2	14			802703.738(0.073)	13.4298	229.788	
0	8	−2	7		0	7	−1	7			803600.179(0.022)	5.1762	47.966	
0	17	−2	16		0	16	−2	15			804215.712(0.077)	13.5558	232.416	
0	22	0	22		0	21	1	20			805359.352(0.881)	8.8136	378.205	
0	26	−1	26		0	25	2	23			806008.342(1.634)	1.9482	526.980	
0	7	2	6	−	0	6	1	5	−		806361.542(0.022)	4.7186	43.459	
0	17	1	16	−	0	16	1	15	−		807415.527(0.073)	13.7108	225.847	
0	23	3	20		0	23	0	23			808901.870(1.045)	0.8339	440.893	
0	14	0	14		0	13	−1	13			808976.597(0.059)	9.9402	146.989	
0	23	0	23		0	22	2	20			809262.445(1.116)	0.0284	413.899	
0	22	0	22	+	0	21	1	21	+		809860.770(0.342)	25.7785	370.217	
0	23	2	22	−	0	22	3	19	−		812355.580(0.697)	8.4077	432.885	
0	6	−4	3		0	5	−3	3			812512.436(0.034)	6.8275	67.364	
0	9	−8	1		0	10	−7	3			813546.498(5.240)	0.2887	268.357	
0	26	−2	25		0	25	3	22			813640.803(0.595)	1.9481	545.015	
0	19	2	17		0	18	−2	17			814205.805(0.208)	0.0342	287.654	
0	25	1	24	−	0	24	2	23	−		815694.868(0.709)	14.7264	497.610	
0	13	2	11		0	12	0	12			816064.606(0.056)	0.0042	131.669	
0	15	−2	14		0	14	1	13			816204.033(0.074)	0.2184	179.950	
0	6	3	3		0	5	2	3			816627.340(0.025)	5.9159	39.158	
0	18	1	17		0	17	2	15			817122.198(0.099)	6.6249	256.563	
0	7	−3	5		0	8	−1	8			817855.589(0.048)	$0.1E-4$	60.550	
0	12	3	10	+	0	11	2	9	+		820412.102(0.051)	8.0608	130.203	
0	24	3	21		0	24	0	24			821539.642(1.283)	0.9013	478.254	
0	12	3	9	−	0	11	2	10	−		821954.847(0.052)	8.0081	130.154	
0	7	2	5	+	0	6	1	6	+		823303.075(0.022)	4.5236	42.902	
0	10	2	8		0	9	−1	9			823309.415(0.031)	0.0227	74.705	
0	20	1	19		0	19	−2	18			825019.748(0.264)	0.4664	317.655	
0	7	5	3	+	0	8	4	4	+		826598.629(1.541)	0.7290	112.825	
0	7	5	2	−	0	8	4	5	−		826598.671(1.541)	0.7290	112.825	
0	4	4	1	−	0	3	3	0	−		829355.636(0.038)	6.9749	44.233	
0	4	4	0	+	0	3	3	1	+		829355.652(0.038)	6.9749	44.233	
0	13	−7	6		0	14	−6	8			831447.044(4.255)	1.8368	297.250	
0	24	3	21		0	23	−3	21			832870.025(0.471)	$0.5E-4$	477.876	
1	6	1	6	+	1	5	2	3	+		833339.823(0.036)	1.5333	231.290	
0	17	2	15		0	16	1	15			834046.041(0.078)	7.9854	228.742	
0	16	−2	15		0	15	2	13			834433.857(0.098)	0.0163	204.582	
0	23	−3	21		0	23	2	21			834524.875(0.828)	2.8859	450.040	
0	22	−3	20		0	22	2	20			834533.640(0.668)	2.3255	413.899	
0	26	5	22		0	26	4	22			834586.666(0.960)	22.5020	618.942	
0	8	3	5		0	7	−2	6			834785.540(0.026)	0.0002	62.169	
0	21	−3	19		0	21	2	19			834847.861(0.531)	1.8121	379.312	
0	24	−3	22		0	24	2	22			834849.756(1.010)	3.4750	487.734	
0	25	3	22		0	25	0	25			835253.723(1.557)	0.9592	517.153	
1	6	1	5	−	1	5	2	4	−		835262.634(0.036)	1.5278	231.290	
0	25	5	21		0	25	4	21			835301.268(0.801)	21.6515	578.110	
0	20	−3	18		0	20	2	18			835429.283(0.414)	1.3611	346.283	
0	25	−3	23		0	25	2	23			835527.981(1.216)	4.0740	526.980	
0	24	5	20		0	24	4	20			835948.776(0.664)	20.7933	538.840	
0	26	−1	26		0	25	1	24			836136.405(1.776)	0.0317	525.975	
0	19	−3	17		0	19	2	17			836229.474(0.317)	0.9827	314.813	
0	23	5	19		0	23	4	19			836533.642(0.548)	19.9273	501.135	
0	14	1	13		0	13	0	13			836572.263(0.067)	6.6007	152.045	
0	26	−3	24		0	26	2	24			836573.072(1.448)	4.6651	567.776	
0	22	5	18		0	22	4	18			837060.194(0.448)	19.0532	464.993	
0	18	−3	16		0	18	2	16			837191.644(0.238)	0.6804	284.906	
0	21	5	17		0	21	4	17			837532.627(0.365)	18.1709	430.417	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	20	5	16		0	20	4	16			837954.993(0.295)	17.2799	397.408	
1	10	3	8		1	9	2	8			838141.019(0.075)	1.2672	348.706	
0	17	−3	15		0	17	2	15			838254.345(0.177)	0.4509	256.563	
0	19	5	15		0	19	4	15			838331.196(0.237)	16.3801	365.965	
0	18	5	14		0	18	4	14			838664.980(0.191)	15.4708	336.090	
0	17	5	13		0	17	4	13			838959.925(0.154)	14.5513	307.784	
0	6	6	0	+	0	7	5	3	+		839217.824(0.987)	0.1294	140.398	
0	6	6	1	−	0	7	5	2	−		839217.824(0.987)	0.1294	140.398	
0	16	5	12		0	16	4	12			839219.443(0.126)	13.6210	281.046	
0	12	1	12	+	0	11	0	11	+		839247.508(0.039)	13.5030	103.845	
0	16	−3	14		0	16	2	14			839356.350(0.131)	0.2854	229.788	
0	15	5	11		0	15	4	11			839446.767(0.107)	12.6785	255.878	
0	14	5	10		0	14	4	10			839644.956(0.095)	11.7226	232.280	
0	13	5	9		0	13	4	9			839816.884(0.090)	10.7511	210.253	
0	12	5	8		0	12	4	8			839965.241(0.089)	9.7615	189.797	
0	23	2	21	+	0	22	3	20	+		*840031.162(0.505)*	*9.4315*	*432.794*	
0	11	5	7		0	11	4	7			840092.528(0.091)	8.7501	170.913	
0	10	5	6		0	10	4	6			840201.060(0.097)	7.7117	153.601	
0	9	5	5		0	9	4	5			840292.959(0.103)	6.6388	137.862	
0	8	5	4		0	8	4	4			840370.158(0.110)	5.5202	123.696	
0	10	−6	4		0	11	−5	6			840419.307(6.169)	1.3399	190.559	
0	7	5	3		0	7	4	3			840434.395(0.118)	4.3387	111.102	
0	15	−3	13		0	15	2	13			840441.661(0.099)	0.1721	204.582	
0	6	5	2		0	6	4	2			840487.218(0.126)	3.0659	100.083	
0	5	5	1		0	5	4	1			840529.981(0.133)	1.6518	90.637	
0	18	1	18	+	0	17	1	17	+		840656.842(0.091)	14.5149	248.753	
0	14	−3	12		0	14	2	12			841463.605(0.078)	0.0987	180.949	
0	23	0	23		0	22	1	21			842145.815(1.120)	8.8060	412.802	
0	13	−3	11		0	13	2	11			842387.370(0.066)	0.0536	158.890	
0	12	−2	11		0	11	0	11			842526.534(0.043)	0.0019	112.849	
0	18	0	18		0	17	0	17			842981.782(0.107)	14.5113	249.055	
0	12	−3	10		0	12	2	10			843190.805(0.060)	0.0274	138.406	
0	11	1	10		0	10	−1	10			843274.239(0.033)	0.0010	90.427	
0	6	3	3		0	5	1	4			843699.303(0.028)	0.0045	38.255	
0	11	−3	9		0	11	2	9			843863.737(0.056)	0.0131	119.499	
1	18	6	12	+	1	17	6	11	+		844058.837(0.736)	12.9940	565.982	
1	18	6	13	−	1	17	6	12	−		844058.837(0.736)	12.9940	565.982	
1	18	3	16		1	17	3	15			844141.959(0.757)	14.0846	530.177	
0	10	−3	8		0	10	2	8			844406.219(0.054)	0.0058	102.167	
1	22	1	22		1	21	0	21			844603.625(0.495)	11.5119	571.322	
0	9	−3	7		0	9	2	7			844826.228(0.054)	0.0023	86.413	
1	18	13	5		1	17	13	4			844877.457(2.112)	6.9762	1077.960	
1	18	11	7		1	17	11	6			844952.243(5.548)	8.4102	874.366	
1	18	−7	12		1	17	−7	11			845043.052(1.751)	12.5165	604.722	
1	18	−10	9		1	17	−10	8			845092.537(9.371)	8.5905	790.061	
1	18	−12	7		1	17	−12	6			845114.219(1.992)	8.1369	1011.480	
1	18	1	18	+	1	17	1	17	+		845126.287(0.261)	14.5259	465.991	
0	8	−3	6		0	8	2	6			845137.208(0.054)	0.0008	72.235	
1	18	11	8	+	1	17	11	7	+		845345.466(5.024)	9.3685	948.846	
1	18	11	7	−	1	17	11	6	−		845345.467(5.024)	9.3685	948.846	
0	7	−3	5		0	7	2	5			845355.778(0.055)	0.0003	59.633	
1	18	10	8		1	17	10	7			845379.885(3.275)	10.2147	876.788	
1	18	−11	8		1	17	−11	7			845464.945(3.714)	9.1896	862.854	
1	18	−9	10		1	17	−9	9			845474.702(9.396)	12.2942	794.573	
1	18	7	11		1	17	7	10			845487.705(1.521)	11.8391	644.900	
0	6	−3	4		0	6	2	4			845499.797(0.056)	0.0001	48.608	
0	5	−3	3		0	5	2	3			845586.842(0.057)	0.1E−4	39.158	
1	18	−2	16		1	17	−2	15			845629.863(0.351)	14.3979	493.586	
0	4	−3	2		0	4	2	2			845633.115(0.059)	0.2E−5	31.284	
1	18	10	8	+	1	17	10	7	+		845645.088(1.396)	10.1004	801.834	
1	18	10	9	−	1	17	10	8	−		845645.088(1.396)	10.1004	801.834	
0	3	−3	1		0	3	2	1			845652.708(0.061)	0.1E−6	24.985	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	18	−1	18		0	17	−1	17			845699.002(0.096)	14.5073	244.264	
1	18	9	9		1	17	9	8			845787.078(0.791)	10.9339	751.329	
1	18	−6	13		1	17	−6	12			845788.823(0.444)	12.5966	583.745	
0	24	0	24		0	23	2	21			845855.258(1.379)	0.0324	450.040	
1	18	−8	11		1	17	−8	10			845914.289(0.606)	11.6978	710.674	
1	18	4	15		1	17	4	14			845976.226(0.265)	13.7226	493.014	
1	18	2	16	+	1	17	2	15	+		846005.176(0.191)	14.3403	447.820	
1	18	7	11	−	1	17	7	10	−		846019.340(0.544)	12.4241	678.767	
1	18	7	12	+	1	17	7	11	+		846019.340(0.544)	12.4241	678.767	
1	18	0	18		1	17	0	17			846045.174(0.229)	14.5587	449.070	
1	18	−3	15		1	17	−3	14			846047.943(0.197)	14.0845	464.569	
1	18	1	18		1	17	1	17			846087.801(0.217)	14.4973	442.769	
1	18	2	17	−	1	17	2	16	−		846160.995(0.218)	14.3403	447.841	
0	18	14	5	−	0	17	14	4	−		846472.647(8.584)	5.5446	922.649	
0	18	14	4	+	0	17	14	3	+		846472.648(8.584)	5.5446	922.649	
0	18	0	18	+	0	17	0	17	+		846561.287(0.086)	14.5487	240.492	
1	18	3	16	+	1	17	3	15	+		846654.125(0.341)	14.1481	515.687	
1	18	3	15	−	1	17	3	14	−		846657.847(0.346)	14.1481	515.688	
1	18	2	17		1	17	2	16			846659.944(0.344)	14.4145	518.220	
1	18	−1	17		1	17	−1	16			846703.084(0.364)	14.4903	527.543	
0	18	13	6		0	17	13	5			846711.126(5.317)	6.7631	827.457	
1	18	1	17	−	1	17	1	16	−		846744.768(0.336)	14.5252	466.456	
1	18	0	18	+	1	17	0	17	+		846799.926(0.412)	14.5465	534.684	
0	18	−13	5		0	17	−13	4			846847.270(2.530)	6.8745	828.161	
1	18	−4	14		1	17	−4	13			846900.299(0.370)	13.8377	522.309	
0	18	−12	6		0	17	−12	5			846967.918(3.097)	7.9099	739.654	
0	18	13	5	−	0	17	13	4	−		846994.101(2.511)	6.8479	837.182	
0	18	13	6	+	0	17	13	5	+		846994.101(2.511)	6.8479	837.182	
1	18	−5	14		1	17	−5	13			847123.318(1.392)	13.3636	620.309	
0	18	12	6	+	0	17	12	5	+		847170.884(1.267)	8.0155	744.122	
0	18	12	7	−	0	17	12	6	−		847170.884(1.267)	8.0155	744.122	
0	18	12	7		0	17	12	6			847205.482(1.956)	7.9477	750.231	
0	18	11	7	−	0	17	11	6	−		847238.921(1.683)	8.9763	659.439	
0	18	11	8	+	0	17	11	7	+		847238.921(1.683)	8.9763	659.439	
0	18	−11	7		0	17	−11	6			847384.983(1.484)	8.9624	669.187	
0	18	11	8		0	17	11	7			847446.398(0.817)	9.0670	667.146	
1	14	0	14		1	13	1	13			847469.359(0.113)	6.1198	345.519	
0	18	10	9		0	17	10	8			847512.074(0.888)	9.9557	586.919	
0	18	10	8	+	0	17	10	7	+		847544.737(1.053)	9.8982	594.402	
0	18	10	9	−	0	17	10	8	−		847544.737(1.053)	9.8982	594.402	
0	18	2	17	−	0	17	2	16	−		847658.114(0.104)	14.4545	266.927	
0	18	−10	8		0	17	−10	7			847682.522(0.631)	10.0263	596.862	
0	18	9	10		0	17	9	9			847700.258(0.708)	10.7593	526.301	
0	18	−9	9		0	17	−9	8			847773.823(0.523)	10.8441	522.111	
0	18	−8	10		0	17	−8	9			847864.838(0.463)	11.5447	465.282	
0	18	8	10	+	0	17	8	9	+		848013.620(0.379)	11.6394	464.940	
0	18	8	11	−	0	17	8	10	−		848013.620(0.379)	11.6394	464.940	
0	18	8	11		0	17	8	10			848028.575(0.433)	11.6599	474.777	
0	18	7	11	−	0	17	7	10	−		848050.633(0.311)	12.2495	411.663	
0	18	7	12	+	0	17	7	11	+		848050.633(0.311)	12.2495	411.663	
0	18	−7	11		0	17	−7	10			848140.500(0.344)	12.3326	422.465	
1	18	4	15	−	1	17	4	14	−		848219.526(0.675)	13.8315	575.074	
1	18	4	14	+	1	17	4	13	+		848219.578(0.675)	13.8315	575.074	
0	18	7	12		0	17	7	11			848224.261(0.303)	12.3410	415.239	
0	18	6	13	−	0	17	6	12	−		848227.437(0.258)	12.9120	376.020	
0	18	6	12	+	0	17	6	11	+		848227.438(0.258)	12.9120	376.020	
0	18	6	13		0	17	6	12			848272.591(0.229)	12.8672	365.664	
1	18	5	13		1	17	5	12			848273.903(0.677)	13.4784	539.153	
0	18	5	14		0	17	5	13			848316.466(0.189)	13.4017	335.768	
0	18	−6	12		0	17	−6	11			848399.599(0.245)	12.9489	372.733	
0	18	−4	15		0	17	−4	14			848459.402(0.143)	13.8040	302.142	
0	18	5	14	+	0	17	5	13	+		848531.870(0.195)	13.4634	337.057	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	18	5	13	−	0	17	5	12	−		848531.920(0.195)	13.4634	337.057	
0	18	−5	13		0	17	−5	12			848554.673(0.180)	13.3928	327.412	
0	18	4	14		0	17	4	13			848611.411(0.153)	13.8847	307.784	
0	18	−3	16		0	17	−3	15			848635.035(0.121)	14.2141	284.524	
0	18	3	16	+	0	17	3	15	+		848710.463(0.112)	14.1176	275.567	
0	18	4	15	−	0	17	4	14	−		848942.895(0.143)	13.8230	296.945	
0	18	3	15	−	0	17	3	14	−		848951.429(0.114)	14.1173	275.587	
0	18	4	14	+	0	17	4	13	+		848952.452(0.143)	13.8230	296.946	
0	18	1	17		0	17	1	16			849126.548(0.090)	14.6845	255.495	
0	3	−3	1		0	4	0	4			849554.510(0.056)	$0.3E-4$	24.855	
0	18	2	16	+	0	17	2	15	+		849588.762(0.104)	14.4585	267.188	
0	18	3	15		0	17	3	14			849601.733(0.114)	14.1562	274.225	
0	18	2	16		0	17	2	15			849697.736(0.092)	14.2477	256.563	
0	26	3	23		0	26	0	26			850056.870(1.872)	1.0061	557.589	
0	21	−1	21		0	20	0	20			850451.794(0.273)	21.4095	338.040	
0	8	2	7	−	0	7	1	6	−		850745.373(0.025)	5.1872	54.570	
0	9	−2	8		0	8	−1	8			851382.063(0.024)	5.4894	60.550	
0	18	−2	17		0	17	−2	16			851790.651(0.096)	14.3722	259.242	
0	15	0	15		0	14	−1	14			853914.549(0.079)	11.2212	168.969	
0	18	1	17	−	0	17	1	16	−		854655.214(0.091)	14.5219	252.780	
0	24	2	23	−	0	23	3	20	−		856011.986(0.867)	8.7714	469.056	
0	20	2	18		0	19	−2	18			858239.856(0.277)	0.0389	317.655	
0	7	−4	4		0	6	−3	4			859641.998(0.031)	7.1469	76.811	
0	8	−8	0		0	9	−7	2			860802.291(5.253)	0.1067	252.624	
0	23	0	23	+	0	22	1	22	+		862783.768(0.408)	27.4169	404.454	
0	19	1	18		0	18	2	16			863611.244(0.119)	7.2302	284.906	
0	7	3	4		0	6	2	4			863741.335(0.024)	6.3013	48.608	
1	25	−2	23		1	25	−3	22			863817.201(9.213)	16.7394	734.032	
0	6	−3	4		0	7	−1	7			864743.848(0.048)	$0.8E-5$	47.966	
1	24	−2	22		1	24	−3	21			864987.152(8.489)	16.5146	694.894	
0	16	−2	15		0	15	1	14			865077.570(0.099)	0.2545	203.560	
1	23	−2	21		1	23	−3	20			866021.985(7.984)	16.2421	657.313	
0	14	2	12		0	13	0	13			866527.953(0.071)	0.0053	152.045	
1	22	−2	20		1	22	−3	19			866931.068(7.649)	15.9221	621.289	
0	13	3	11	+	0	12	2	10	+		867237.878(0.067)	8.5005	149.098	
1	21	−2	19		1	21	−3	18			867723.752(7.441)	15.5551	586.824	
0	3	3	0		0	2	0	2			867763.659(0.036)	$0.4E-4$	13.835	
0	21	1	20		0	20	−2	19			868185.849(0.339)	0.4752	349.246	
1	20	−2	18		1	20	−3	17			868409.306(7.322)	15.1416	553.919	
1	19	−2	17		1	19	−3	16			868996.856(7.262)	14.6824	522.574	
0	13	3	10	−	0	12	2	11	−		869410.876(0.070)	8.4225	149.030	
1	18	−2	16		1	18	−3	15			869495.331(7.239)	14.1787	492.790	
1	17	−2	15		1	17	−3	14			869913.410(7.239)	13.6314	464.569	
1	16	−2	14		1	16	−3	13			870259.486(7.250)	13.0418	437.911	
1	15	−2	13		1	15	−3	12			870541.618(7.267)	12.4111	412.817	
1	14	−2	12		1	14	−3	11			870767.504(7.284)	11.7408	389.288	
1	13	−2	11		1	13	−3	10			870944.449(7.300)	11.0321	367.324	
1	12	−2	10		1	12	−3	9			871079.339(7.313)	10.2862	346.927	
1	11	−2	9		1	11	−3	8			871178.624(7.323)	9.5039	328.096	
1	10	−2	8		1	10	−3	7			871248.298(7.329)	8.6860	310.832	
1	9	−2	7		1	9	−3	6			871293.886(7.333)	7.8322	295.136	
1	3	−2	1		1	3	−3	0			871309.594(7.320)	1.6034	233.908	
1	4	−2	2		1	4	−3	1			871319.882(7.323)	2.8754	240.189	
1	8	−2	6		1	8	−3	5			871320.433(7.334)	6.9415	281.009	
1	5	−2	3		1	5	−3	2			871328.912(7.327)	3.9978	248.040	
1	7	−2	5		1	7	−3	4			871332.496(7.333)	6.0108	268.450	
1	6	−2	4		1	6	−3	3			871334.136(7.330)	5.0339	257.460	
0	11	2	9		0	10	−1	10			871541.984(0.037)	0.0414	90.427	
0	26	1	25	−	0	25	2	24	−		871645.715(0.866)	15.8441	536.790	
0	8	2	6	+	0	7	1	7	+		873416.354(0.023)	4.9019	53.828	
0	6	5	2	+	0	7	4	3	+		873801.691(1.538)	0.4165	100.233	
0	6	5	1	−	0	7	4	4	−		873801.705(1.538)	0.4165	100.233	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	5	4	2	−	0	4	3	1	−		876523.774(0.034)	7.1625	50.531	
0	5	4	1	+	0	4	3	2	+		876523.885(0.034)	7.1625	50.531	
0	12	−3	10		0	11	3	8			877901.846(0.059)	0.2E−7	137.249	
0	24	0	24		0	23	1	22			878126.390(1.403)	8.7375	448.963	
0	12	−7	5		0	13	−6	7			878654.582(4.271)	1.4823	275.229	
1	7	1	7	+	1	6	2	4	+		880077.442(0.038)	1.9828	240.710	
0	13	1	13	+	0	12	0	12	+		881511.328(0.048)	14.6802	122.709	
0	18	2	16		0	17	1	16			881702.086(0.097)	8.4755	255.495	
0	9	3	6		0	8	−2	7			881804.805(0.027)	0.0007	74.771	
0	25	0	25		0	24	2	22			881975.275(1.679)	0.0370	487.734	
0	25	3	22		0	24	−3	22			882379.242(0.567)	0.0001	515.582	
1	7	1	6	−	1	6	2	5	−		882636.251(0.037)	1.9734	240.711	
0	17	−2	16		0	16	2	14			883015.135(0.131)	0.0216	229.788	
1	11	3	9		1	10	2	9			884593.274(0.126)	1.3341	364.407	
0	15	1	14		0	14	0	14			886979.517(0.093)	6.9752	173.974	
0	19	1	19	+	0	18	1	18	+		887140.507(0.111)	15.3249	276.794	
0	9	−6	3		0	10	−5	5			887604.301(6.172)	0.9836	173.250	
0	24	2	22	+	0	23	3	21	+		888842.325(0.598)	10.0485	468.938	
0	19	0	19		0	18	0	18			889246.737(0.133)	15.3178	277.173	
1	19	6	13	+	1	18	6	12	+		890595.703(0.933)	13.8906	594.136	
1	19	6	14	−	1	18	6	13	−		890595.703(0.933)	13.8906	594.136	
1	19	3	17		1	18	3	16			890672.767(0.974)	14.9050	558.335	
0	7	3	4		0	6	1	5			890864.080(0.027)	0.0068	47.703	
0	12	1	11		0	11	−1	11			891317.200(0.041)	0.0015	107.716	
1	23	1	23		1	22	0	22			891406.441(0.592)	12.1415	605.785	
1	19	13	6		1	18	13	5			891694.101(2.416)	8.1868	1106.140	
1	19	−7	13		1	18	−7	12			891740.478(2.057)	13.4502	632.910	
1	19	11	8		1	18	11	7			891748.775(5.395)	9.4440	902.550	
1	19	1	19	+	1	18	1	18	+		891892.214(0.320)	15.3374	494.182	
1	19	−10	10		1	18	−10	9			891894.380(9.579)	9.5040	818.250	
1	19	−12	8		1	18	−12	7			891938.804(2.171)	9.2932	1039.670	
1	19	11	8	−	1	18	11	7	−		892170.562(5.280)	10.4934	977.044	
1	19	11	9	+	1	18	11	8	+		892170.562(5.280)	10.4934	977.044	
1	19	10	9		1	18	10	8			892176.409(3.821)	11.2401	904.986	
0	19	−1	19		0	18	−1	18			892237.243(0.118)	15.3172	272.473	
1	19	−9	11		1	18	−9	10			892266.690(9.619)	13.3875	822.775	
1	19	7	12		1	18	7	11			892295.349(1.688)	12.7239	673.102	
1	19	−11	9		1	18	−11	8			892338.601(4.578)	10.2928	891.055	
1	19	−2	17		1	18	−2	16			892388.576(0.448)	15.2161	521.793	
1	19	10	9	+	1	18	10	8	+		892520.352(1.701)	11.1502	830.042	
1	19	10	10	−	1	18	10	9	−		892520.352(1.701)	11.1502	830.042	
1	19	−6	14		1	18	−6	13			892618.320(0.536)	13.4687	611.958	
1	19	9	10		1	18	9	9			892662.447(0.916)	11.9361	779.541	
0	13	2	12		0	12	0	12			892663.882(0.055)	0.0022	131.669	
1	19	−8	12		1	18	−8	11			892790.773(0.705)	12.6593	738.890	
1	19	4	16		1	18	4	15			892811.481(0.320)	14.5626	521.233	
1	19	2	17	+	1	18	2	16	+		892830.428(0.231)	15.1565	476.039	
1	19	0	19		1	18	0	18			892871.682(0.280)	15.3674	477.291	
1	19	−3	16		1	18	−3	15			892887.050(0.241)	14.9108	492.790	
1	19	7	12	−	1	18	7	11	−		892894.979(0.662)	13.3534	706.987	
1	19	7	13	+	1	18	7	12	+		892894.979(0.662)	13.3534	706.987	
1	19	1	19		1	18	1	18			892923.334(0.264)	15.3076	470.992	
1	19	2	18	−	1	18	2	17	−		893013.472(0.267)	15.1565	476.065	
0	19	0	19	+	0	18	0	18	+		893228.923(0.105)	15.3562	268.731	
0	19	14	5	+	0	18	14	4	+		893321.931(9.585)	6.7723	950.885	
0	19	14	6	−	0	18	14	5	−		893321.931(9.585)	6.7723	950.885	
0	19	13	7		0	18	13	6			893576.328(6.105)	7.9375	855.701	
1	19	1	18	−	1	18	1	17	−		893595.784(0.416)	15.3365	494.700	
1	19	3	17	+	1	18	3	16	+		893596.000(0.414)	14.9777	543.929	
1	19	2	18		1	18	2	17			893596.997(0.412)	15.2353	546.461	
1	19	3	16	−	1	18	3	15	−		893600.854(0.420)	14.9777	543.929	
1	19	−1	18		1	18	−1	17			893635.373(0.436)	15.3001	555.786	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	19	0	19	+	1	18	0	18	+		893736.416(0.492)	15.3547	562.930	
0	19	−13	6		0	18	−13	5			893744.589(2.967)	8.0672	856.409	
0	19	−12	7		0	18	−12	6			893854.571(3.625)	9.0344	767.906	
1	19	−4	15		1	18	−4	14			893893.768(0.456)	14.6846	550.559	
0	19	13	6	−	0	18	13	5	−		893902.520(2.779)	8.0366	865.435	
0	19	13	7	+	0	18	13	6	+		893902.520(2.779)	8.0366	865.435	
0	19	12	7	+	0	18	12	6	+		894096.471(1.470)	9.1544	772.380	
0	19	12	8	−	0	18	12	7	−		894096.471(1.470)	9.1544	772.380	
0	19	12	8		0	18	12	7			894121.738(2.208)	9.0777	778.491	
0	19	11	8	−	0	18	11	7	−		894150.798(1.989)	10.0540	687.700	
0	19	11	9	+	0	18	11	8	+		894150.798(1.989)	10.0540	687.700	
1	19	5	15		1	18	−5	14			894153.845(1.649)	14.2276	648.566	
0	19	−11	8		0	18	−11	7			894308.490(1.724)	10.0390	697.453	
1	15	0	15		1	14	1	14			894378.791(0.147)	6.6420	367.484	
0	19	11	9		0	18	11	8			894390.396(0.966)	10.1554	695.414	
0	19	10	10		0	18	10	9			894450.048(1.056)	10.9896	615.189	
0	19	10	9	+	0	18	10	8	+		894475.355(1.252)	10.9270	622.673	
0	19	10	10	−	0	18	10	9	−		894475.355(1.252)	10.9270	622.673	
0	19	2	18	−	0	18	2	17	−		894494.938(0.126)	15.2750	295.202	
0	19	10	9		0	18	−10	8			894639.361(0.761)	11.0677	625.138	
0	19	9	11		0	18	9	10			894639.932(0.856)	11.7458	554.577	
0	9	2	8	−	0	8	1	7	−		894717.023(0.029)	5.6699	67.267	
0	19	−9	10		0	18	−9	9			894736.153(0.626)	11.8375	550.389	
0	19	−8	11		0	18	−8	10			894817.251(0.563)	12.4941	493.564	
0	19	8	11	+	0	18	8	10	+		894996.919(0.456)	12.5959	493.227	
0	19	8	12	−	0	18	8	11	−		894996.919(0.456)	12.5959	493.227	
0	19	8	12		0	18	8	11			894998.120(0.530)	12.6185	503.065	
0	19	7	12	−	0	18	7	11	−		895021.102(0.378)	13.1664	439.951	
0	19	7	13	+	0	18	7	12	+		895021.102(0.378)	13.1664	439.951	
0	19	−7	12		0	18	−7	11			895112.112(0.420)	13.2560	450.756	
0	19	6	14	−	0	18	6	13	−		895201.024(0.314)	13.8047	404.314	
0	19	6	13	+	0	18	6	12	+		895201.025(0.314)	13.8047	404.314	
0	19	7	13		0	18	7	12			895224.289(0.366)	13.2644	443.532	
0	19	6	14		0	18	6	13			895268.834(0.277)	13.7563	393.960	
0	19	5	15		0	18	5	14			895296.009(0.229)	14.2684	364.065	
0	19	−6	13		0	18	−6	12			895411.551(0.296)	13.8433	401.033	
1	19	4	16	−	1	18	4	15	−		895421.301(0.851)	14.6777	603.368	
1	19	4	15	+	1	18	4	14	+		895421.378(0.851)	14.6777	603.368	
0	19	−4	16		0	18	−4	15			895457.228(0.172)	14.6496	330.443	
1	19	5	14		1	18	5	13			895489.517(0.865)	14.3523	567.448	
0	19	5	15	+	0	18	5	14	+		895550.205(0.236)	14.3330	365.361	
0	19	5	14	−	0	18	5	13	−		895550.288(0.236)	14.3330	365.361	
0	19	−5	14		0	18	−5	13			895588.422(0.217)	14.2581	355.717	
0	19	4	15		0	18	4	14			895629.793(0.185)	14.7339	336.090	
0	19	−3	17		0	18	−3	16			895647.946(0.146)	15.0473	312.831	
0	19	3	17	+	0	18	3	16	+		895732.937(0.135)	14.9472	303.877	
0	19	4	16	−	0	18	4	15	−		896032.209(0.172)	14.6687	325.263	
0	19	4	15	+	0	18	4	14	+		896046.175(0.172)	14.6687	325.264	
0	19	3	16	−	0	18	3	15	−		896048.379(0.138)	14.9468	303.905	
0	19	1	18		0	18	1	17			896186.782(0.109)	15.4925	283.819	
0	20	6	15		0	20	5	16			896188.135(0.349)	18.7186	425.359	
0	19	6	14		0	19	5	15			896195.524(0.283)	17.6609	393.929	
0	21	6	16		0	21	5	17			896203.776(0.431)	19.7694	458.355	
0	18	6	13		0	18	5	14			896222.699(0.234)	16.5954	364.065	
0	22	6	17		0	22	5	18			896245.842(0.531)	20.8144	492.915	
0	17	6	12		0	17	5	13			896266.573(0.198)	15.5204	335.768	
0	23	6	18		0	23	5	19			896317.880(0.651)	21.8543	529.038	
0	16	6	11		0	16	5	12			896324.218(0.176)	14.4345	309.039	
0	15	6	10		0	15	5	11			896392.862(0.165)	13.3353	283.879	
0	24	6	19		0	24	5	20			896423.586(0.792)	22.8897	566.725	
0	14	6	9		0	14	5	10			896469.893(0.164)	12.2202	260.288	
0	13	6	8		0	13	5	9			896552.861(0.168)	11.0855	238.266	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	25	6	20		0	25	5	21			896566.799(0.957)	23.9214	605.972	
0	19	2	17		0	18	2	16			896610.117(0.112)	15.0673	284.906	
0	12	6	7		0	12	5	8			896639.479(0.177)	9.9266	217.816	
0	11	6	6		0	11	5	7			896727.619(0.190)	8.7370	198.936	
0	26	6	21		0	26	5	22			896751.503(1.147)	24.9497	646.781	
0	19	2	17	+	0	18	2	16	+		896751.837(0.126)	15.2803	295.528	
0	19	3	16		0	18	3	15			896795.770(0.138)	14.9864	302.565	
0	10	6	5		0	10	5	6			896815.317(0.202)	7.5079	181.627	
0	9	6	4		0	9	5	5			896900.774(0.218)	6.2267	165.891	
0	8	6	3		0	8	5	4			896982.351(0.233)	4.8748	151.727	
0	7	6	2		0	7	5	3			897058.576(0.247)	3.4234	139.136	
0	6	6	1		0	6	5	2			897128.138(0.261)	1.8258	128.118	
0	16	0	16		0	15	−1	15			898499.423(0.107)	12.5952	192.510	
0	25	2	24	−	0	24	3	21	−		899162.897(1.076)	9.1101	506.797	
0	10	−2	9		0	9	−1	9			899400.745(0.028)	5.7623	74.705	
0	19	−2	18		0	18	−2	17			899405.546(0.116)	15.1879	287.654	
0	22	−1	22		0	21	0	21			900274.654(0.325)	23.2585	370.784	
0	21	2	19		0	20	−2	19			901378.855(0.357)	0.0421	349.246	
0	19	1	18	−	0	18	1	17	−		901847.624(0.112)	15.3326	281.288	
0	8	−4	5		0	7	−3	5			906754.941(0.030)	7.4992	87.831	
0	20	1	19		0	19	2	17			910219.489(0.142)	7.9102	314.813	
0	22	1	21		0	21	−2	20			910650.838(0.427)	0.4709	382.426	
0	8	3	5		0	7	2	5			910815.456(0.023)	6.6921	59.633	
0	3	−3	1		0	2	−2	1			911244.859(0.053)	4.6404	22.797	
0	5	−3	3		0	6	−1	6			911730.532(0.049)	$0.4E-5$	36.952	
0	25	0	25		0	24	1	23			913325.691(1.736)	8.6131	486.688	
0	14	3	12	+	0	13	2	11	+		913982.723(0.088)	8.9454	169.568	
0	17	−2	16		0	16	1	15			914357.438(0.133)	0.2859	228.742	
0	4	3	1		0	3	0	3			914973.201(0.034)	0.0002	18.558	
0	24	0	24	+	0	23	1	23	+		915731.413(0.482)	29.0993	440.236	
0	14	3	11	−	0	13	2	12	−		916964.549(0.093)	8.8335	169.475	
0	15	2	13		0	14	0	14			917623.230(0.095)	0.0066	173.974	
0	26	0	26		0	25	2	23			917645.663(2.017)	0.0422	526.980	
0	12	2	10		0	11	−1	11			920064.909(0.046)	0.0718	107.716	
0	5	5	1	+	0	6	4	2	+		921000.029(1.534)	0.1620	89.214	
0	5	5	0	−	0	6	4	3	−		921000.033(1.534)	0.1620	89.214	
0	14	1	14	+	0	13	0	13	+		923451.682(0.062)	15.8897	143.139	
0	6	4	3	−	0	5	3	2	−		923684.975(0.031)	7.4460	58.403	
0	6	4	2	+	0	5	3	3	+		923685.420(0.030)	7.4460	58.403	
0	9	2	7	+	0	8	1	8	+		923981.864(0.027)	5.2699	66.314	
0	13	−3	11		0	12	3	9			924776.449(0.065)	$0.5E-7$	156.142	
0	11	−7	4		0	12	−6	6			925855.819(4.289)	1.1460	254.778	
0	4	3	2	+	0	3	4	−1	+		925960.342(0.030)	$0.6E-6$	19.644	
1	8	1	8	+	1	7	2	5	+		926758.089(0.040)	2.4445	251.701	
0	10	3	7		0	9	−2	8			928754.438(0.031)	0.0019	88.950	
0	19	2	17		0	18	1	17			929185.655(0.120)	9.0343	283.819	
1	8	1	7	−	1	7	2	6	−		930040.445(0.039)	2.4297	251.702	
1	12	3	10		1	11	2	10			930856.926(0.219)	1.3986	381.676	
0	18	−2	17		0	17	2	15			932102.048(0.175)	0.0271	256.563	
0	26	3	23		0	25	−3	23			932174.552(0.678)	0.0001	554.850	
0	20	1	20	+	0	19	1	19	+		933591.647(0.135)	16.1344	306.386	
0	8	−6	2		0	9	−5	4			934790.886(6.173)	0.6563	157.514	
0	20	0	20		0	19	0	19			935472.682(0.161)	16.1249	306.836	
1	20	6	15	−	1	19	6	14	−		937087.679(1.166)	14.7783	623.843	
1	20	6	14	+	1	19	6	13	+		937087.686(1.166)	14.7783	623.843	
1	20	3	18		1	19	3	17			937157.869(1.233)	15.7230	588.045	
0	25	2	23	+	0	24	3	22	+		937839.029(0.704)	10.6875	506.645	
0	16	1	15		0	15	0	15			938025.715(0.131)	7.3146	197.453	
0	8	3	5		0	7	1	6			938031.046(0.027)	0.0097	58.725	
1	24	1	24		1	23	0	23			938189.714(0.701)	12.7882	641.806	
0	10	2	9	−	0	9	1	8	−		938274.817(0.037)	6.1674	81.550	
1	20	−7	14		1	19	−7	13			938399.560(2.391)	14.3717	662.655	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	20	13	7		1	19	13	6			938491.116(2.779)	9.3575	1135.880	
1	20	11	9		1	19	11	8			938521.807(5.286)	10.4571	932.296	
1	20	1	20	+	1	19	1	19	+		938628.338(0.390)	16.1486	523.932	
1	20	−10	11		1	19	−10	10			938672.286(9.763)	10.4021	848.000	
0	20	−1	20		0	19	−1	19			938714.611(0.143)	16.1269	302.235	
1	20	−12	9		1	19	−12	8			938742.902(2.373)	10.4152	1069.420	
1	20	10	10		1	19	10	9			938945.712(4.625)	12.2339	934.746	
1	20	11	9	−	1	19	11	8	−		938973.207(5.546)	11.5889	1006.800	
1	20	11	10	+	1	19	11	9	+		938973.207(5.546)	11.5889	1006.800	
1	20	−9	12		1	19	−9	11			939029.955(9.817)	14.4528	852.538	
1	20	7	13		1	19	7	12			939076.535(1.871)	13.5971	702.866	
1	20	−2	18		1	19	−2	17			939112.202(0.566)	16.0332	551.560	
1	20	−11	10		1	19	−11	9			939196.558(5.555)	11.3672	920.821	
1	20	10	10	+	1	19	10	9	+		939378.566(2.049)	12.1764	859.813	
1	20	10	11	−	1	19	10	10	−		939378.566(2.049)	12.1764	859.813	
1	20	−6	15		1	19	−6	14			939422.135(0.640)	14.3328	641.732	
1	20	9	11		1	19	9	10			939519.602(1.060)	12.9193	809.317	
0	13	1	12		0	12	−1	12			939594.457(0.053)	0.0022	126.571	
1	20	4	17		1	19	4	16			939620.397(0.383)	15.3990	551.014	
1	20	2	18	+	1	19	2	17	+		939627.438(0.277)	15.9718	505.821	
1	20	−8	13		1	19	−8	12			939647.956(0.817)	13.6056	768.671	
1	20	0	20		1	19	0	19			939669.802(0.341)	16.1761	507.074	
1	20	−3	17		1	19	−3	16			939699.753(0.291)	15.7350	522.574	
1	20	1	20		1	19	1	19			939731.517(0.318)	16.1176	500.776	
1	20	7	13	−	1	19	7	12	−		939750.235(0.795)	14.2712	736.771	
1	20	7	14	+	1	19	7	13	+		939750.235(0.795)	14.2712	736.771	
0	20	0	20	+	0	19	0	19	+		939837.867(0.127)	16.1635	298.526	
1	20	2	19	−	1	19	2	18	−		939840.646(0.324)	15.9718	505.853	
0	20	13	8		0	19	13	7			940413.138(7.026)	9.0734	885.507	
1	20	1	19	−	1	19	1	18	−		940416.130(0.512)	16.1476	524.507	
1	20	2	19		1	19	2	18			940517.694(0.489)	16.0553	576.268	
1	20	3	18	+	1	19	3	17	+		940522.298(0.497)	15.8052	573.736	
1	20	3	17	−	1	19	3	16	−		940528.537(0.505)	15.8052	573.736	
1	20	−1	19		1	19	−1	18			940550.202(0.516)	16.1097	585.595	
0	20	−13	7		0	19	−13	6			940617.597(3.466)	9.2203	886.221	
1	20	0	20	+	1	19	0	19	+		940655.295(0.582)	16.1629	592.742	
0	20	−12	8		0	19	−12	7			940714.030(4.232)	10.1258	797.722	
0	20	13	7	−	0	19	13	6	−		940787.128(3.101)	9.1862	895.253	
0	20	13	8	+	0	19	13	7	+		940787.128(3.101)	9.1862	895.253	
1	20	−4	16		1	19	−4	15			940877.391(0.558)	15.5276	580.376	
0	20	12	9	−	0	19	12	8	−		940999.437(1.701)	10.2596	802.204	
0	20	12	8	+	0	19	12	7	+		940999.438(1.701)	10.2596	802.204	
0	20	12	9		0	19	12	8			941013.415(2.506)	10.1744	808.316	
0	20	11	9		0	19	11	8			941037.167(2.337)	11.1036	717.526	
0	20	11	10	+	0	19	11	9	+		941037.167(2.337)	11.1036	717.526	
1	20	−5	16		1	19	−5	15			941177.167(1.925)	15.0858	678.392	
0	20	−11	9		0	19	−11	8			941207.098(2.006)	11.0878	727.284	
1	16	0	16		1	15	1	15			941260.367(0.190)	7.1754	391.014	
0	20	2	19	−	0	19	2	18	−		941291.169(0.150)	16.0941	325.039	
0	20	11	10		0	19	11	9			941312.286(1.136)	11.2154	725.248	
0	20	10	11		0	19	10	10			941364.317(1.244)	12.0001	645.025	
0	20	10	10	+	0	19	10	9	+		941380.789(1.481)	11.9328	652.510	
0	20	10	11	−	0	19	10	10	−		941380.789(1.481)	11.9328	652.510	
0	20	9	12		0	19	9	11			941554.474(1.024)	12.7137	584.419	
0	20	−10	10		0	19	−10	9			941574.055(0.910)	12.0854	654.980	
0	20	−9	11		0	19	−9	10			941676.384(0.741)	12.8119	580.235	
0	20	−8	12		0	19	−8	11			941745.129(0.675)	13.4287	523.412	
0	26	2	25	−	0	25	3	22	−		941759.489(1.329)	9.4202	546.108	
0	20	8	13		0	19	8	12			941944.414(0.640)	13.5621	532.918	
0	20	8	12	+	0	19	8	11	+		941959.358(0.544)	13.5373	523.081	
0	20	8	13	−	0	19	8	12	−		941959.358(0.544)	13.5373	523.081	
0	20	7	13	−	0	19	7	12	−		941968.296(0.452)	14.0720	469.806	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

v_t'	J'	K_a'	K_c'	P'	v_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	20	7	14	+	0	19	7	13	+		941968.296(0.452)	14.0720	469.806	
0	20	−7	13		0	19	−7	12			942059.813(0.506)	14.1680	480.614	
0	20	6	15	−	0	19	6	14	−		942150.246(0.377)	14.6890	434.175	
0	20	6	14	+	0	19	6	13	+		942150.247(0.377)	14.6890	434.175	
0	20	7	14		0	19	7	13			942204.259(0.438)	14.1763	473.394	
0	20	6	15		0	19	6	14			942243.984(0.330)	14.6369	423.823	
0	20	5	16		0	19	5	15			942251.372(0.273)	15.1293	393.929	
0	20	−6	14		0	19	−6	13			942403.780(0.354)	14.7292	430.901	
0	20	−4	17		0	19	−4	16			942432.630(0.205)	15.4916	360.312	
0	20	5	16	+	0	19	5	15	+		942548.638(0.282)	15.1966	395.233	
0	20	5	15	−	0	19	5	14	−		942548.770(0.282)	15.1966	395.233	
0	20	−5	15		0	19	−5	14			942604.592(0.259)	15.1175	385.591	
1	20	4	17	−	1	19	4	16	−		942623.099(1.060)	15.5201	633.236	
1	20	4	16	+	1	19	4	15	+		942623.207(1.059)	15.5201	633.236	
0	20	4	16		0	19	4	15			942627.575(0.222)	15.5793	365.965	
0	20	−3	18		0	19	−3	17			942639.406(0.175)	15.8782	342.707	
1	20	5	15		1	19	5	14			942706.072(1.090)	15.2206	597.319	
0	17	0	17		0	16	−1	16			942729.344(0.142)	14.0608	217.609	
0	20	3	18	+	0	19	3	17	+		942731.676(0.161)	15.7750	333.756	
0	20	4	17	−	0	19	4	16	−		943108.781(0.205)	15.5106	355.151	
0	20	4	16	+	0	19	4	15	+		943128.776(0.205)	15.5106	355.152	
0	20	3	17	−	0	19	3	16	−		943138.680(0.166)	15.7744	333.794	
0	20	1	19		0	19	1	18			943218.362(0.132)	16.3028	313.713	
0	20	2	18		0	19	2	17			943439.597(0.135)	15.8897	314.813	
0	22	2	20		0	21	−2	20			943534.209(0.450)	0.0438	382.426	
0	14	−2	13		0	13	0	13			943574.560(0.072)	0.0026	152.045	
0	20	2	18	+	0	19	2	17	+		943905.056(0.150)	16.1011	325.440	
0	20	3	17		0	19	3	16			943987.470(0.164)	15.8146	332.479	
0	20	−2	19		0	19	−2	18			947050.805(0.139)	16.0035	317.655	
0	11	−2	10		0	10	−1	10			947715.436(0.034)	5.9883	90.427	
0	26	0	26		0	25	1	24			947773.726(2.124)	8.4384	525.975	
0	20	1	19	−	0	19	1	18	−		948989.155(0.136)	16.1428	311.370	
0	23	−1	23		0	22	0	22			950232.116(0.384)	25.1711	405.069	
0	23	1	22		0	22	−2	21			952371.819(0.529)	0.4552	417.196	
0	9	−4	6		0	8	−3	6			953849.780(0.031)	7.8734	100.426	
0	21	1	20		0	20	2	18			956996.798(0.171)	8.6713	346.283	
0	9	3	6		0	8	2	6			957840.025(0.024)	7.0804	72.235	
0	4	−3	2		0	3	−2	2			958441.566(0.051)	4.8659	27.521	
0	4	−3	2		0	5	−1	5			958792.826(0.051)	0.2E−5	27.509	
0	15	3	13	+	0	14	2	12	+		960634.687(0.113)	9.3961	191.612	
0	5	3	2		0	4	0	4			962224.410(0.032)	0.0006	24.855	
0	18	−2	17		0	17	1	16			964106.398(0.176)	0.3103	255.495	
0	15	3	12	−	0	14	2	13	−		964636.126(0.122)	9.2392	191.489	
0	15	1	15	+	0	14	0	14	+		965083.654(0.081)	17.1339	165.134	
0	25	0	25	+	0	24	1	24	+		968678.733(0.565)	30.8250	477.564	
0	13	2	11		0	12	−1	12			968909.631(0.058)	0.1186	126.571	
0	16	2	14		0	15	0	15			969368.018(0.131)	0.0081	197.453	
0	7	4	4	−	0	6	3	3	−		970839.686(0.027)	7.7821	67.849	
0	7	4	3	+	0	6	3	4	+		970841.024(0.027)	7.7821	67.849	
0	14	−3	12		0	13	3	10			971554.930(0.075)	0.1E−6	176.610	
0	10	−7	3		0	11	−6	5			973052.376(4.306)	0.8328	235.900	
1	9	1	9	+	1	8	2	6	+		973379.506(0.043)	2.9177	264.260	
0	10	2	8	+	0	9	1	9	+		975014.248(0.032)	5.6251	80.358	
0	11	3	8		0	10	−2	9			975616.121(0.037)	0.0044	104.705	
0	20	2	18		0	19	1	18			976438.470(0.149)	9.6684	313.713	
1	13	3	11		1	12	2	11			976900.189(0.365)	1.4600	400.514	
1	9	1	8	−	1	8	2	7	−		977471.530(0.043)	2.8957	264.261	
0	21	1	21	+	0	20	1	20	+		980009.231(0.161)	16.9436	337.527	
0	11	2	10	−	0	10	1	9	−		981417.366(0.047)	6.6807	97.417	
0	21	0	21		0	20	0	20			981664.913(0.194)	16.9324	338.040	
0	19	−2	18		0	18	2	16			981809.858(0.230)	0.0323	284.906	
0	7	−6	1		0	8	−5	3			981979.153(6.173)	0.3694	143.351	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
1	21	6	16	−	1	20	6	15	−		983535.891(1.437)	15.6585	655.101	
1	21	6	16	−	1	20	6	15	−		983535.891(1.437)	15.6585	655.101	
1	21	6	15	+	1	20	6	14	+		983535.901(1.437)	15.6585	655.101	
1	21	3	19		1	20	3	18			983598.641(1.538)	16.5389	619.305	
0	23	2	21		0	22	−2	21			984642.951(0.555)	0.0438	417.196	
1	25	1	25		1	24	0	24			984953.239(0.825)	13.4527	679.383	
1	21	−7	15		1	20	−7	14			985018.977(2.753)	15.2825	693.957	
0	21	−1	21		0	20	−1	20			985131.255(0.172)	16.9362	333.547	
0	9	3	6		0	8	1	7			985204.102(0.029)	0.0132	71.322	
1	21	13	8		1	20	13	7			985267.465(3.205)	10.4939	1167.190	
1	21	11	10		1	20	11	9			985270.125(5.272)	11.4533	963.602	
1	21	1	21	+	1	20	1	20	+		985333.177(0.474)	16.9595	555.241	
1	21	−10	12		1	20	−10	11			985425.009(9.927)	11.2875	879.311	
1	21	−12	10		1	20	−12	9			985525.431(2.601)	11.5079	1100.730	
1	21	10	11		1	20	10	10			985686.405(5.667)	13.1997	966.066	
1	21	11	11	+	1	20	11	10	+		985752.223(5.826)	12.6593	1038.120	
1	21	11	10	−	1	20	11	9	−		985752.224(5.826)	12.6593	1038.120	
1	21	−9	13		1	20	−9	12			985763.056(9.997)	15.4932	883.860	
1	21	−2	19		1	20	−2	18			985799.140(0.710)	16.8493	582.886	
1	21	7	14		1	20	7	13			985829.904(2.070)	14.4604	734.190	
1	21	−11	11		1	20	−11	10			986037.973(6.648)	12.4168	952.149	
1	21	−6	16		1	20	−6	15			986198.931(0.755)	15.1902	673.068	
1	21	10	12	−	1	20	10	11	−		986218.822(2.441)	13.1827	891.147	
1	21	10	11	+	1	20	10	10	+		986218.823(2.441)	13.1827	891.147	
1	21	9	12		1	20	9	11			986357.628(1.229)	13.8863	840.656	
0	21	0	21	+	0	20	0	20	+		986389.460(0.152)	16.9707	329.875	
1	21	2	19	+	1	20	2	18	+		986394.760(0.330)	16.7864	537.164	
1	21	4	18		1	20	4	17			986401.639(0.455)	16.2322	582.356	
1	21	0	21		1	20	0	20			986438.087(0.413)	16.9847	538.418	
1	21	−3	18		1	20	−3	17			986484.694(0.350)	16.5575	553.919	
1	21	−8	14		1	20	−8	13			986484.809(0.942)	14.5390	800.014	
1	21	1	21		1	20	1	20			986510.942(0.382)	16.9275	532.122	
1	21	7	14	−	1	20	7	13	−		986584.018(0.945)	15.1788	768.118	
1	21	7	15	+	1	20	7	14	+		986584.018(0.945)	15.1788	768.118	
0	18	0	18		0	17	−1	17			986610.898(0.186)	15.6156	244.264	
1	21	2	20	−	1	20	2	19	−		986641.204(0.390)	16.7863	537.203	
0	26	2	24	+	0	25	3	23	+		987029.359(0.823)	11.3506	545.916	
1	21	1	20	−	1	20	1	19	−		987204.259(0.625)	16.9584	555.876	
0	21	13	9		0	20	13	8			987220.031(8.087)	10.1764	916.876	
0	3	−3	1		0	2	2	0			987276.256(0.062)	0.1E−7	20.261	
1	21	2	20		1	20	2	19			987421.110(0.575)	16.8747	607.641	
1	21	3	19	+	1	20	3	18	+		987432.116(0.592)	16.6307	605.108	
1	21	3	18	−	1	20	3	17	−		987440.030(0.603)	16.6307	605.109	
1	21	−1	20		1	20	−1	19			987446.600(0.605)	16.9191	616.968	
0	21	−13	8		0	20	−13	7			987465.012(4.032)	10.3396	917.597	
0	21	−12	9		0	20	−12	8			987544.840(4.922)	11.1888	829.101	
1	21	0	21	+	1	20	0	20	+		987555.603(0.680)	16.9711	624.119	
0	21	13	8		0	20	13	7	−		987646.669(3.482)	10.3022	926.634	
0	21	13	9	+	0	20	13	8	+		987646.669(3.482)	10.3022	926.634	
1	21	−4	17		1	20	−4	16			987850.416(0.679)	16.3675	611.760	
0	21	12	9	+	0	20	12	8	+		987878.593(1.963)	11.3357	833.593	
0	21	12	10	−	0	20	12	9	−		987878.593(1.963)	11.3357	833.593	
0	21	12	10		0	20	12	9			987879.155(2.852)	11.2425	839.704	
0	21	11	10	−	0	20	11	9	−		987896.672(2.727)	12.1291	748.915	
0	21	11	11	+	0	20	11	10	+		987896.672(2.727)	12.1291	748.915	
0	21	2	20	−	0	20	2	19	−		988044.957(0.178)	16.9118	356.437	
0	21	−11	10		0	20	−11	9			988079.490(2.331)	12.1127	758.679	
1	17	0	17		1	16	1	16			988111.762(0.243)	7.7207	416.110	
0	14	1	13		0	13	−1	13			988143.888(0.069)	0.0032	146.989	
1	21	−5	17		1	20	−5	16			988192.229(2.221)	15.9392	709.786	
0	21	11	11		0	20	11	10			988210.905(1.328)	12.2510	756.647	
0	21	10	12		0	20	10	11			988253.628(1.454)	12.9906	676.425	

Table 5. Microwave transitions of $^{13}CH_3OH$ in order of frequency. An asterisk after a measured frequency indicates that the transition was not included in the fit—Continued

ν_t'	J'	K_a'	K_c'	P'	ν_t''	J''	K_a''	K_c''	P''	Observed frequency (unc.) (MHz)	Calculated frequency (unc.) (MHz)	Line str.	Energy lower st. (cm^{-1})	Ref.
0	21	10	11	+	0	20	10	10	+		988259.709(1.742)	12.9189	683.911	
0	21	10	12	−	0	20	10	11	−		988259.709(1.742)	12.9189	683.911	
0	21	9	13		0	20	9	12			988442.550(1.212)	13.6655	615.826	
0	21	−10	11		0	20	−10	10			988485.446(1.077)	13.0830	686.387	
0	21	−9	12		0	20	−9	11			988593.350(0.869)	13.7699	611.645	
0	21	−8	13		0	20	−8	12			988647.177(0.800)	14.3506	554.825	
0	21	8	14		0	20	8	13			988866.219(0.764)	14.4928	564.338	
0	21	7	14	−	0	20	7	13	−		988890.991(0.535)	14.9679	501.226	
0	21	7	15	+	0	20	7	14	+		988890.991(0.535)	14.9679	501.226	
0	21	8	13	+	0	20	8	12	+		988899.837(0.642)	14.4658	554.501	
0	21	8	14	−	0	20	8	13	−		988899.837(0.642)	14.4658	554.501	
0	21	−7	14		0	20	−7	13			988982.335(0.602)	15.0701	512.037	
0	21	6	16	−	0	20	6	15	−		989073.818(0.446)	15.5661	465.601	
0	21	6	15	+	0	20	6	14	+		989073.821(0.446)	15.5661	465.601	
0	21	7	15		0	20	7	14			989163.108(0.517)	15.0781	504.822	
0	21	5	17		0	20	5	16			989181.292(0.322)	15.9853	425.359	
0	21	6	16		0	20	6	15			989196.933(0.390)	15.5103	455.253	
0	26	4	22		0	26	3	23			989254.015(1.151)	25.3211	585.944	
0	21	−6	15		0	20	−6	14			989375.234(0.419)	15.6077	462.336	
0	21	−4	18		0	20	−4	17			989384.470(0.241)	16.3305	391.749	
0	21	5	17	+	0	20	5	16	+		989526.097(0.334)	16.0552	426.673	
0	21	5	16	−	0	20	5	15	−		989526.304(0.334)	16.0552	426.673	
0	21	−5	16		0	20	−5	15			989602.248(0.305)	15.9718	417.033	
0	21	4	17		0	20	4	16			989603.659(0.262)	16.4213	397.408	
0	21	−3	19		0	20	−3	18			989608.382(0.206)	16.7071	374.150	
0	21	3	19	+	0	20	3	18	+		989704.785(0.190)	16.6012	365.202	
0	17	1	16		0	16	0	16			989757.552(0.183)	7.6120	222.481	
1	21	4	18	−	1	20	4	17	−		989821.448(1.303)	16.3595	664.678	
1	21	4	17	+	1	20	4	16	+		989821.600(1.303)	16.3595	664.678	
1	21	5	16		1	20	5	15			989919.876(1.354)	16.0842	628.764	
0	21	4	18	−	0	20	4	17	−		990171.677(0.241)	16.3493	386.610	
0	21	2	19		0	20	2	18			990189.804(0.160)	16.7158	346.283	
0	21	4	17	+	0	20	4	16	+		990199.774(0.241)	16.3493	386.612	
0	21	1	20		0	20	1	19			990216.906(0.157)	17.1161	345.175	
0	21	3	18	−	0	20	3	17	−		990223.076(0.197)	16.6004	365.254	
0	21	2	19	+	0	20	2	18	+		991046.538(0.177)	16.9208	356.925	
0	21	3	18		0	20	3	17			991176.147(0.193)	16.6409	363.967	
0	25	4	21		0	25	3	22			992169.744(0.927)	24.3322	545.015	
0	24	1	23		0	23	−2	22			993318.044(0.648)	0.4306	453.555	
0	5	−5	0		0	4	−4	1			993789.999(0.124)	8.9125	77.193	
0	21	−2	20		0	20	−2	19			994712.743(0.165)	16.8197	349.246	
0	24	4	20		0	24	3	21			994780.756(0.734)	23.3375	505.658	
0	15	−2	14		0	14	0	14			995371.324(0.096)	0.0029	173.974	
0	21	1	20	−	0	20	1	19			996076.066(0.163)	16.9526	343.025	
0	12	−2	11		0	11	−1	11			996393.116(0.043)	6.1604	107.716	
0	23	4	19		0	23	3	20			997104.383(0.570)	22.3376	467.875	
0	22	4	18		0	22	3	19			999158.832(0.434)	21.3332	431.665	