# Wavelengths, Transition Probabilities, and Energy Levels for the Spectra of Sodium (Na I–Na XI)

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Energy levels, with classifications and uncertainties, have been compiled for the spectra of the neutral atom and all positive ions of sodium ($Z=11$). Wavelengths with classifications, intensities, and transition probabilities are also tabulated. In addition, ground states and ionization energies are listed. Where available, the hyperfine structure constants and the percentages of the leading components of the energy levels are included. For all ionization stages of sodium, at least some experimental data are available; however, for those for which only a few transitions have been measured, theoretical calculations or values obtained by isoelectronic fitting are reported. Similarly, theoretical or isoelectronically determined ionization energies are given when they are thought to be more accurate than the available experimental data would produce. © *2008 by the U.S. Secretary of Commerce on behalf of the United States. All rights reserved.*
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## 1. Introduction

Sodium is the sixth most abundant element on earth and the most abundant alkali metal. Sodium is also present in abundance in stars and its D lines (transitions between the $1s^22s^22p^63s\ ^2S$ and $1s^22s^22p^63p\ ^2P$ levels) are very prominent features in the solar spectrum. The element was long known in compounds but not isolated until 1807 when Davy used electrolysis to dissociate caustic soda (NaOH) [08DAV]. It is a very reactive, electropositive, alkaline element and it also has a very low ionization energy. It oxidizes rapidly, may ignite upon contact with water, and is not found free in nature. It appears silvery and is soft, with a melting point of 97.80 °C. Its atomic number is 11, the atomic weight is 22.989 770(2), its boiling point is 883 °C, and its specific gravity at 20 °C is 0.971. Although 17 isotopes of sodium are recognized, the only isotope with a measurable natural abundance is $^{23}$Na, which has nuclear spin of

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$I=3/2$ and a nuclear magnetic moment of +2.217 52 nuclear magneton [05CRC]. When heated in a flame sodium, its salts give off a characteristic yellow color due to the first doublet in the principal series of Na I, which falls in the yellow region. The most common compound of sodium is table salt, which is sodium chloride. Both metallic sodium and its salts are used extensively in manufacture, commercial chemicals, and household products.

For this compilation of spectral data, the literature for each ionization stage of sodium has been reviewed and lists of the most accurate wavelengths and energy levels have been assembled. A brief summary of the history of research for each spectrum and details regarding the data included in this compilation are given. Where available, experimental data are presented; however, when only fitted data or theoretically calculated data are available, these are included. To clarify which data are not obtained by experimental observation, wavelengths, energy levels, and ionization energies which have been obtained by isoelectronic fitting are indicated by being enclosed in square brackets, while theoretical values are presented enclosed in parentheses.

## 2. Wavelength Tables

In the tables of wavelengths, the following information is included:

(i) **Wavelengths** are reported in units of ångströms, with all lines with wave numbers below 10 000 $cm^{-1}$ or above 50 000 $cm^{-1}$ given as vacuum wavelengths and those between 10 000 and 50 000 $cm^{-1}$ as air wavelengths. The index of refraction used for conversions is obtained using the three-term formula of Peck and Reeder [72PEC/REE]. Occasionally wavelengths calculated from optimized energy levels (known as Ritz wavelengths) are given because they are much more accurate than experimentally observed ones, in which case the calculated wavelength is followed by the notation "R."

(ii) **Uncertainty** in the wavelength measurement or calculation is also in ångströms.

(iii) **Wave number** of the transition is given in units of $cm^{-1}$.

(iv) **Intensity** is as observed by the original investigator, except as noted in the discussion for a particular spectrum. Since in general there is no way to normalize data taken from different sources, this means that intensities taken from different sources are not on the same scale and should not be used for comparison. Intensities marked by an asterisk indicate that the measured spectral line either is blended with another line or has two identifications. In either case the intensity cannot be assumed to be entirely due to the transition indicated in the classification.

(v) **Line codes** indicate additional descriptive information about the appearance of the spectral line. In general, the character of a line depends on the spectroscopic source used and the resolution of the spectrometer. For ease of use, we utilize a uniform set of line codes to describe the line characteristics provided by various authors. They have the following meanings:

a = asymmetric
b = blend
c = complex
d = lines consists of two unresolved lines
h = hazy
l = shaded to longer wavelengths
p = perturbed by close line
r = easily self-reversed
s = shaded to shorter wavelengths
u = unresolved shoulder on strong line
w = wide
* = intensity may be affected by nearby line
? = classification is uncertain

(vi) **Transition probabilities** ($A_{ki}$) for transitions from the upper state ($k$) to the lower ($i$) are given in units of $s^{-1}$. Exponential notation is used for these values; thus, for example, 3.2E+5 stands for $3.2\times10^5$. Virtually all transition probabilities are theoretically calculated. The method used is discussed in the text.

(vii) **Lower level** and **upper level** indicate the classification given for the transition.

(viii) **λ Ref.** and $\mathbf{A_{ki}}$ **Ref.** indicate the references for the wavelength measurement and transition probability, respectively. The list of references for each ionization stage is located at the bottom of the discussion for that particular spectrum.

## 3. Energy Level Tables

The energy level tables contain the following information:

(i) **Configuration** of the energy level. For visual clarity, only the first member of the term has the configuration written out. All members of the same term are grouped together and set off from other terms by a blank line.

(ii) **Term** is listed for each energy level. There are several kinds of coupling indicated for the energy levels. Most configurations are described in $LS$ coupling, with the state of the core indicated in parentheses when needed. Some levels are given in either $J_1j$ or $J_1J_2$ coupling, with the angular momentum of the core and of the final electron or group of electrons in parentheses. Levels best described by pair coupling, or $J_1l$, notation, have $J$ value of the core state listed first with the value of $K=J_1+l$ in square brackets, where $l$ is the orbital angular momentum of the final electron.

(iii) **J value** is also listed for each energy level.

(iv) **Level value** is given in the customary units of $cm^{-1}$. As reported in [05MOH/TAY], the unit $cm^{-1}$ is related to the SI unit for energy, the joule, by 1 $cm^{-1}$ $=1.986\,445\,61(34)\times10^{-23}$ J. As discussed above, values enclosed in parentheses are calculated and those in square brackets are obtained by isoelectronic fitting.

(v) **Uncertainty** of the level value, also given in $cm^{-1}$.

(vi) **Leading percentages** of components of the level configurations are included if there is significant configuration mixing and if they are available.

(vii) **Hyperfine structure constants**, the magnetic dipole constant *A* and the magnetic quadrupole constant *B*, given in units of megahertz.

(viii) **Reference** refers to the source of the energy level value or hyperfine structure data. The list of references can be found at the end of the discussion for that ionization stage.

## 4. Uncertainties and Significant Figures

The energy levels, wavelengths, and ionization energies reported here are given with uncertainties, as reported by the original authors. In the case of energy levels, it was sometimes necessary to calculate uncertainties from the reported uncertainties of the transitions involved. Many theoretical papers do not contain estimates of the uncertainty of the reported values and hence we are unable to include that information in our tables. The estimated uncertainty of the wave number of a transition can be calculated from that of the wavelength. Most transition probabilities contained herein are calculated values whose uncertainties are unknown. Since the scatter between transition probabilities from different sources is substantial (virtually always greater than 10% and frequently much more) it would be prudent to check the details of the calculations in the original source if the uncertainty of the transition probability is important.

In general the number of significant figures included here is such that the uncertainty in the last digit is between 1 and 15. If a decimal point follows a value which is a whole number, this implies that the last digit given is significant, even if it is a zero. If there is no decimal point, the uncertainty is greater than 15.

## 5. References for the Introduction


| | |
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## 6. Ionization Stages

### 6.1. Na I

**Na isoelectronic sequence**
**Ground state** $1s^2 2s^2 2p^6 3s\ ^2S_{1/2}$

**Ionization energy** 41 449.451(2) $cm^{-1}$; 5.139 076 4(3) eV

Many Na I spectral lines were reported early in the 20th century by researchers such as Paschen [08PAS], Wood and Fortrat [16WOO/FOR], Hetzler *et al.* [35HET/BOR], and Meggers [35MEG]. The earliest wavelengths retained in Table 1 are from Meissner and Luft [37MEI/LUF]. In one of the first spectroscopic applications of an atomic beam excited by electron impact, they made interferometric measurements of the Na I spectrum between 4664 Å and 8195 Å. The lines in Table 1 with wavelengths given to four decimal places are taken from their work, as corrected by Martin and Zalubas [81MAR/ZAL] for an improved measurement of the standard line used. Risberg [56RIS] remeasured the spectrum from 2800 Å to 11 400 Å, observing *ns* levels for $n=3-12$, *np* levels for $n=3-8$, *nd* levels for $n=3-11$, and *nf* levels for $n=4-10$. Johansson [61JOH] used measurements in the infrared to produce an improved value for the 4*f* and 5*f* $^2F^\circ$ levels, which are included below. (Johansson's estimates of the line intensities, *s*, *m*, and *f* listed in Table 1, stand for strong, medium, and faint, respectively.) The 4*f*-5*g* transition in the infrared was reported by Litzén [70LIT]. Formulas for calculating levels in the *nl* series for *s*, *p*, *d*, *f*, *g*, *h*, and *i* electrons were reported by Martin [80MAR] and the resulting values up to $n=50$ were included in the energy level compilation of Martin and Zalubas [81MAR/ZAL]. The wavelengths of the $D_1$ and $D_2$ lines of sodium have been measured by many research groups, but the values retained here are taken from the precision laser measurement of Juncar *et al.* [81JUN/PIN]. Due to the uncertainty in the index of refraction used to calculate the air wavelength given in Table 1, it is advised that those needing the full accuracy use the wave number given. The 4*s* level value and hyperfine splitting constant were determined by Arqueros [88ARQ] using Doppler-free two-photon spectroscopy. Energies for the 10*p*, 10*d*, and 11*p* levels were determined by precision Stark spectroscopy by Baugh *et al.* [98BAU/BUR]. All available data for the *f*, *g*, and *h* levels were used by Dyubko *et al.* [97DYU/EFR] to produce formulas for the quantum defects used in calculating the levels shown in brackets in Table 2. Baig *et al.* [95BAI/AKR, 07BAI/MAH] have used laser pumping to more accurately measure the 3*p*-*nd* Rydberg transitions.

Although not included in Table 1, *ns*-*np* and *ns*-$(n+1)p$ transition frequencies have been measured by Dyubko *et al.* [95DYU/EFI] for $n=22-32$ and by Fabre *et al.* [80FAB/HAR] for $n=23-36$. Splittings between the *nd* $^2D_{3/2}$ and $^2D_{5/2}$ levels for $n=15-34$ have been determined by Conover and Doogue [01CON/DOO] by observing microwave absorption. Combining their data with the best-known values for $n=4-14$, they developed a formula for calculating the splitting for other values of *n*.

Configurations involving excitations from the 2*p* or 2*s* shell have been identified in the interpretation of photoabsorption spectra below 410 Å. Connerade *et al.* [71CON/GAR] observed 38 transitions between 298 Å and 346 Å, including those with upper levels in the $2s^22p^53s^2$ configuration. Wolff *et al.* [72WOL/RAD] focused on the region 322–403 Å, with most of the lines falling below 350 Å. Sugar *et al.* [79SUG/LUC] used a laser to selectively populate the $2s^22p^63p$ level, then used absorption to detect 18 transitions between 356 Å and 398 Å, which were assigned upper levels in the even-parity $2s^22p^53s3p$ and $2s^22p^53s4p$ configurations. Having used a pulsed hollow-cathode source to selectively populate the metastable $2p^53s3p\ ^4S_{3/2}$ and $2p^53s3p\ ^4D_{7/2}$ levels, Holmgren *et al.* [85HOL/WAL] used a tunable laser to determine the splittings between the $2p^53s3p$, $3s3d$, and $3s4s$ quartet levels. Gaardsted and Andersen [88GAA/AND] verified the measurements by Holmgren *et al.* [85HOL/WAL] and observed 16 additional lines, some of which connected established levels and some of which produced values for new quartet levels. Excitation of one of the $2s$ electrons was reported by La Villa *et al.* [81LAV/MEH], who published values for 11 odd-parity $2s2p^6nln'l'$ levels listed in Table 2. In the region around 400 Å, Pedrotti *et al.* [85PED/MEN] identified seven transitions to the $2p^53s3p$ and $3s3d$ configurations. The region between 320 Å and 400 Å was remeasured with smaller claimed uncertainties by Baig *et al.* [94BAI/MAH]. The data were grouped into 22 series of the types $2p^53sns$, $3snd$, $3pnp$, $3dns$, $3dnd$, $4sns$, and $4snd$, which were presented in $J_CK$ notation. The lines represent unresolved groups of transitions to levels with $J=1/2$ or $3/2$; for many of them, the $J_C$ value can be determined, but the value of $K$ remains undetermined. To avoid ambiguous level names, a lowercase letter has been added to the term for configurations where the $J=1/2$ and $3/2$ levels have distinct values, but which is which is uncertain.

The hyperfine structure of $^{23}$Na I has been investigated by many groups utilizing a wide variety of methods, so we will discuss here only those whose values are retained below. The magnetic dipole constant $A$ of the ground state was determined by Beckmann *et al.* [74BEC/BOK] using the atomic beam magnetic resonance technique. For the $2s^22p^63p\ ^2P^\circ_{1/2}$ state, the $A$ value cited here was measured by Griffith *et al.* [77GRI/ISA] using the optical heterodyne method. Polarization quantum-beat spectroscopy enabled Yei *et al.* [93YEI/SIE] to determine the splitting constants for the $2s^22p^63p\ ^2P^\circ_{3/2}$ state. The magnetic dipole constant of the $2s^22p^64p\ ^2P^\circ_{1/2}$ state was measured by Bhattacharya *et al.* [03BAT/HAI] in atoms confined in a magneto-optical trap. Tsekeris *et al.* [76TSE/LIA] determined the hyperfine splitting of the $5s$ level retained in Table 2 by radio frequency spectroscopy. The hyperfine splitting of the ground state of $^{21}$Na I (which has a nuclear spin of $I=3/2$) has been measured by Rowe *et al.* [99ROW/FRE], resulting in a magnetic dipole constant $A=953.235\,935(100)$ MHz. The $^{22}$Na I constants ($I=3$) for the $2s^22p^63p\ ^2P^\circ_{3/2}$ level have been reported by Gangrsky *et al.* [98GAN/KAR] to be $A=7.31(4)$ and $B=4.7(3)$ MHz.

Though most transition probabilities for spectroscopic transitions are calculated values, in sodium measurements of the lifetimes of the $3p\ ^2P^\circ$ levels by Gaupp *et al.* [82GAU/KUS], Jones *et al.* [96JON/JUL], Oates *et al.* [96OAT/VOG], and Volz *et al.* [96VOL/MAJ] provide experimental values for the $D_1$ and $D_2$ lines. The probabilities for transitions with upper levels in the $4p$ and $5p$ configurations are obtained from Lowe and Biémont [94LOW/BIE], who normalized calculated values according to experimentally observed lifetimes. Most of the transition probabilities of the other allowed transitions of Na I have been reported by Froese Fischer *et al.* [06FRO/TAC] using a multiconfiguration Hartree-Fock formulation. An extensive compilation has been done by Kelleher and Podobedova [08KEL/POD]. For transitions from high $ns$ and $nd$ levels to $3p\ ^2P^\circ_{3/2}$, we have retained the probabilities determined by Miculus and Meyer [05MIC/MEY] using a model potential method. Values for transitions in which the upper level is $9f$ or $10f$ are taken from Anderson and Zilitis [64AND/ZIL]. Holmgren *et al.* [85HOL/WAL] used the Hartree-Fock method to derive transition probabilities for the lines they measured.

The $2s^22p^6\ ^1S_0$ ionization energy cited above was determined by Ciocca *et al.* [92CIO/BUR] using a combination of precision optical data and Stark spectroscopy. The $2s^22p^5nl$ ionization limits listed in Table 2 are obtained by adding the [92CIO/BUR] limit to the Na II energy level. The limits obtained by Baig *et al.* [94BAI/MAH] are consistently 4 cm$^{-1}$ higher than this, suggesting that the calibration for their wavelengths might have been too low by 0.003 Å–0.004 Å. The $2s2p^63s$ series limits have been obtained by adding the Na I ionization limit above to the Na II $2s2p^63s$ level measured by Dorn [94DOR].

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TABLE 1. Observed spectral lines of Na I

| λ (Å) | Unc. (Å) | $\sigma$ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | | |
| 157.1 | 0.1 | 636 600 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^6(^2S)3d4p(^3P^\circ)\ ^2P^\circ$ | 81LAV/MEH | |
| 158.8 | 0.2 | 629 700 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^6(^2S)4s5p(^3P^\circ)\ ^2P^\circ$ | 81LAV/MEH | |
| 161.6 | 0.1 | 618 900 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^6(^2S)4s4p(^3P^\circ)\ ^2P^\circ$ | 81LAV/MEH | |
| 166.7 | 0.1 | 600 000 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^6(^2S)3p(^3P^\circ)6s\ ^2P^\circ$ | 81LAV/MEH | |
| 167.7 | 0.1 | 596 400 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^63p(^3P^\circ)5s\ ^2P^\circ$ | 81LAV/MEH | |
| 168.2 | 0.1 | 594 600 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^63p(^3P^\circ)3d\ ^2P^\circ$ | 81LAV/MEH | |
| 169.1 | 0.1 | 591 400 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^63p(^1P^\circ)4s\ ^2P^\circ$ | 81LAV/MEH | |
| 170.6 | 0.1 | 586 200 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^63p(^3P^\circ)4s\ ^2P^\circ$ | 81LAV/MEH | |
| 178.7 | 0.1 | 559 600 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^63s(^3S)4p\ ^2P^\circ$ | 81LAV/MEH | |
| 182.9 | 0.1 | 546 600 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^6(^2S)3s3p(^1P^\circ)\ ^2P^\circ$ | 81LAV/MEH | |
| 186.80 | 0.07 | 535 330 | | | | $2p^63s\ ^2S_{1/2}$ | $2s2p^6(^2S)3s3p(^3P^\circ)\ ^2P^\circ$ | 81LAV/MEH | |
| 267.33 | 0.01 | 374 070 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)16s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 267.38 | 0.01 | 374 000 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)15s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 267.44 | 0.01 | 373 916 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)14s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 267.54 | 0.01 | 373 776 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)13s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 267.64 | 0.01 | 373 636 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)11d^\circ$ | 94BAI/MAH | |
| 267.66 | 0.01 | 373 608 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)12s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 267.77 | 0.01 | 373 455 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)10d^\circ$ | 94BAI/MAH | |
| 267.83 | 0.01 | 373 371 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)11s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 267.97 | 0.01 | 373 176 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)9d^\circ$ | 94BAI/MAH | |
| 268.06 | 0.01 | 373 051 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)10s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 268.24 | 0.01 | 372 800 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)8d^\circ$ | 94BAI/MAH | |
| 268.27 | 0.01 | 372 759 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)14d^\circ$ | 94BAI/MAH | |
| 268.34 | 0.01 | 372 662 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)13d^\circ$ | 94BAI/MAH | |
| 268.38 | 0.01 | 372 606 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)9s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 268.42 | 0.01 | 372 550 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)12d^\circ$ | 94BAI/MAH | |
| 268.53 | 0.01 | 372 398 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)11d^\circ$ | 94BAI/MAH | |
| 268.62 | 0.01 | 372 273 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)7d^\circ$ | 94BAI/MAH | |
| 268.66 | 0.01 | 372 218 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)10d^\circ$ | 94BAI/MAH | |
| 268.71 | 0.01 | 372 148 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)11d$ | 94BAI/MAH | |
| 268.86 | 0.01 | 371 941 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)10d$ | 94BAI/MAH | |
| 268.86 | 0.01 | 371 941 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)9d^\circ$ | 94BAI/MAH | |
| 268.86 | 0.01 | 371 941 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)8s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 268.94 | 0.01 | 371 830 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)9d$ | 94BAI/MAH | |
| 269.06 | 0.01 | 371 664 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)9d$ | 94BAI/MAH | |
| 269.13 | 0.01 | 371 568 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)8d^\circ$ | 94BAI/MAH | |
| 269.14 | 0.01 | 371 554 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)10s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 269.20 | 0.01 | 371 471 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)8d$ | 94BAI/MAH | |
| 269.22 | 0.01 | 371 443 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)6d^\circ$ | 94BAI/MAH | |
| 269.37 | 0.01 | 371 237 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)8d$ | 94BAI/MAH | |
| 269.37 | 0.01 | 371 237 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)10s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 269.53 | 0.01 | 371 016 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)9s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 269.53 | 0.01 | 371 016 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)7d^\circ$ | 94BAI/MAH | |
| 269.61 | 0.01 | 370 906 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)7d$ | 94BAI/MAH | |
| 269.67 | 0.01 | 370 824 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)7s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 269.80 | 0.01 | 370 645 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)10s\ [2]^\circ_{3/2}$ | 94BAI/MAH | |
| 269.81 | 0.01 | 370 631 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)7d$ | 94BAI/MAH | |
| 269.88 | 0.01 | 370 535 | | b | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)9s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 270.06 | 0.01 | 370 288 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)8s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 270.12 | 0.01 | 370 206 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)6d^\circ$ | 94BAI/MAH | |
| 270.17 | 0.01 | 370 137 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)9s\ [2]^\circ_{3/2}$ | 94BAI/MAH | |
| 270.20 | 0.01 | 370 096 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)6d$ | 94BAI/MAH | |
| 270.276 | 0.008 | 369 992 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)5d^\circ$ | 94BAI/MAH | |
| 270.53 | 0.01 | 369 645 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)6d$ | 94BAI/MAH | |
| 270.67 | 0.01 | 369 454 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)8s\ [2]^\circ_{3/2}$ | 94BAI/MAH | |
| 270.76 | 0.01 | 369 331 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)8s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 270.98 | 0.01 | 369 031 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)7s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 271.04 | 0.01 | 368 949 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)6s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 271.19 | 0.01 | 368 745 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)5d$ | 94BAI/MAH | |
| 271.19 | 0.01 | 368 745 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)5d^\circ$ | 94BAI/MAH | |
| 271.527 | 0.008 | 368 287 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)7s\ [2]^\circ_{3/2}$ | 94BAI/MAH | |
| 271.773 | 0.008 | 367 954 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)5d$ | 94BAI/MAH | |
| 272.180 | 0.008 | 367 404 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)4d^\circ$ | 94BAI/MAH | |
| 272.32 | 0.01 | 367 215 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)7s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 272.53 | 0.01 | 366 932 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)6s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 272.907 | 0.008 | 366 425 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)4d^\circ$ | 94BAI/MAH | |
| 273.07 | 0.01 | 366 206 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)4d$ | 94BAI/MAH | |
| 273.07 | 0.01 | 366 205 | | * | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)6s\ [2]^\circ_{3/2}$ | 94BAI/MAH | |
| 273.98 | 0.01 | 364 990 | | | | $2p^6 3s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)5s\ [1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 274.148 | 0.008 | 364766 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3F^\circ_2)4d$ | 94BAI/MAH | |
| 275.59 | 0.01 | 362 858 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)6s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 276.09 | 0.01 | 362 201 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)5s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 276.205 | 0.008 | 362 050 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)5s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 276.688 | 0.008 | 361 418 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})4s(^1P^\circ_1)3d^\circ$ | 94BAI/MAH | |
| 276.912 | 0.008 | 361 126 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)3d^\circ$ | 94BAI/MAH | |
| 277.142 | 0.008 | 360 826 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)3d$ | 94BAI/MAH | |
| 281.20 | 0.01 | 355 619 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3d(^3D^\circ_1)4s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 284.29 | 0.01 | 351 753 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})4s(^3P^\circ_1)5s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.35 | 0.01 | 350 447 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^1P^\circ_1)4s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.701 | 0.008 | 350 016 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3d(^3P^\circ_2)4s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 285.71 | 0.01 | 350 005 | | d | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)19p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.73 | 0.01 | 349 981 | | d | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)18p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.77 | 0.01 | 349 932 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)17p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.82 | 0.01 | 349 871 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)16p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.86 | 0.01 | 349 822 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)15p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 285.93 | 0.01 | 349 736 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)14p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 286.01 | 0.01 | 349 638 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)13p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 286.11 | 0.01 | 349 516 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)12p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 286.22 | 0.01 | 349 382 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)11p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 286.397 | 0.008 | 349 166 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)10p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 286.621 | 0.008 | 348 893 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)9p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 286.944 | 0.008 | 348 500 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)8p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 287.420 | 0.008 | 347 923 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)7p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 288.163 | 0.008 | 347 026 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)6p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 289.453 | 0.008 | 345 479 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)5p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 291.874 | 0.008 | 342 614 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1S_0)4p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 292.8 | 0.1 | 341 500 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(P_1{}^3)15p(II)$ | 94BAI/MAH | |
| 292.9 | 0.1 | 341 400 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)14p(II)$ | 94BAI/MAH | |
| 293.0 | 0.1 | 341 300 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)13p(II)$ | 94BAI/MAH | |
| 293.1 | 0.1 | 341 200 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)12p(II)$ | 94BAI/MAH | |
| 293.16 | 0.01 | 341 111 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)13p(I)$ | 94BAI/MAH | |
| 293.24 | 0.01 | 341 018 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)11p(II)$ | 94BAI/MAH | |
| 293.30 | 0.01 | 340 948 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)12p(I)$ | 94BAI/MAH | |
| 293.41 | 0.01 | 340 820 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)10p(II)$ | 94BAI/MAH | |
| 293.46 | 0.01 | 340 762 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)14p$ | 94BAI/MAH | |
| 293.51 | 0.01 | 340 704 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)11p(I)$ | 94BAI/MAH | |
| 293.54 | 0.01 | 340 669 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)13p$ | 94BAI/MAH | |
| 293.64 | 0.01 | 340 553 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)12p$ | 94BAI/MAH | |
| 293.64 | 0.01 | 340 553 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)9p(II)$ | 94BAI/MAH | |
| 293.77 | 0.01 | 340 402 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)11p$ | 94BAI/MAH | |
| 293.79 | 0.01 | 340 379 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)10p(I)$ | 94BAI/MAH | |
| 293.95 | 0.01 | 340 194 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)10p$ | 94BAI/MAH | |
| 293.97 | 0.01 | 340 171 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)8p(II)$ | 94BAI/MAH | |
| 294.18 | 0.01 | 339 928 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)9p$ | 94BAI/MAH | |
| 294.18 | 0.01 | 339 928 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)9p(I)$ | 94BAI/MAH | |
| 294.44 | 0.01 | 339 628 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)7p(II)$ | 94BAI/MAH | |
| 294.49 | 0.01 | 339 570 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)8p$ | 94BAI/MAH | |
| 294.54 | 0.01 | 339 512 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)10p$ | 94BAI/MAH | |
| 294.75 | 0.01 | 339 271 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)8p(I)$ | 94BAI/MAH | |
| 294.77 | 0.01 | 339 248 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)9p$ | 94BAI/MAH | |
| 294.99 | 0.01 | 338 995 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)7p$ | 94BAI/MAH | |
| 295.11 | 0.01 | 338 857 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)8p$ | 94BAI/MAH | |
| 295.12 | 0.01 | 338 845 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)6p(II)$ | 94BAI/MAH | |
| 295.595 | 0.008 | 338 301 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)7p$ | 94BAI/MAH | |
| 295.71 | 0.01 | 338 169 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)7p(I)$ | 94BAI/MAH | |
| 295.728 | 0.008 | 338 149 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)6p$ | 94BAI/MAH | |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 296.368 | 0.008 | 337 418 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)6p$ | 94BAI/MAH | |
| 296.51 | 0.01 | 337 257 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)5p(II)$ | 94BAI/MAH | |
| 296.980 | 0.008 | 336 723 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)5p$ | 94BAI/MAH | |
| 297.39 | 0.01 | 336 259 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)6p(I)$ | 94BAI/MAH | |
| 297.610 | 0.008 | 336 010 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)5p$ | 94BAI/MAH | |
| 298.85 | 0.01 | 334 616 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)4p(II)$ | 94BAI/MAH | |
| 299.21 | 0.01 | 334 213 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)16p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 299.25 | 0.01 | 334 169 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)15p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 299.325 | 0.008 | 334 085 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)14p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 299.362 | 0.008 | 334 044 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^1P_1)4p$ | 94BAI/MAH | |
| 299.415 | 0.008 | 333 985 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)13p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 299.521 | 0.008 | 333 866 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)12p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 299.645 | 0.008 | 333 728 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)11p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 299.834 | 0.008 | 333 518 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)10p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 300.084 | 0.008 | 333 240 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)9p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 300.247 | 0.008 | 333 059 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^1D_2)4p$ | 94BAI/MAH | |
| 300.424 | 0.008 | 332 863 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)8p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 300.75 | 0.01 | 332 502 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)5p(I)$ | 94BAI/MAH | |
| 300.940 | 0.008 | 332 292 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)7p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 301.769 | 0.008 | 331 379 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)6p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 303.154 | 0.008 | 329 865 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)5p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 305.960 | 0.008 | 326 840 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{3/2})3p(^3S_1)4p\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 308.8 | 0.1 | 323 834 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^5(^2P^\circ_{1/2})3p(^3P_1)4p(I)$ | 94BAI/MAH | |
| 320.32 | 0.025 | 312 190 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53p2\ ^\circ$ | 71CON/GAR | |
| 321.57 | 0.025 | 310 970 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53p2\ ^\circ$ | 71CON/GAR | |
| 322.67 | 0.01 | 309 914 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)20d^\circ$ | 94BAI/MAH | |
| 322.70 | 0.01 | 309 885 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)19d^\circ$ | 94BAI/MAH | |
| 322.75 | 0.01 | 309 837 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)18d^\circ$ | 94BAI/MAH | |
| 322.79 | 0.01 | 309 799 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)17d^\circ$ | 94BAI/MAH | |
| 322.84 | 0.01 | 309 751 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)16d^\circ$ | 94BAI/MAH | |
| 322.90 | 0.01 | 309 693 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)15d^\circ$ | 94BAI/MAH | |
| 322.984 | 0.008 | 309 613 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)14d^\circ$ | 94BAI/MAH | |
| 323.01 | 0.01 | 309 588 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)15s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 323.077 | 0.008 | 309 524 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)13d^\circ$ | 94BAI/MAH | |
| 323.13 | 0.01 | 309 473 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)14s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 323.203 | 0.008 | 309 403 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)12d^\circ$ | 94BAI/MAH | |
| 323.263 | 0.008 | 309 346 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)13s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 323.366 | 0.008 | 309 247 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)11d^\circ$ | 94BAI/MAH | |
| 323.443 | 0.008 | 309 173 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)12s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 323.579 | 0.008 | 309 044 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)10d^\circ$ | 94BAI/MAH | |
| 323.679 | 0.008 | 308 948 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)11s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 323.862 | 0.008 | 308 773 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)9d^\circ$ | 94BAI/MAH | |
| 324.001 | 0.008 | 308 641 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)10s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 324.277 | 0.008 | 308 378 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)8d^\circ$ | 94BAI/MAH | |
| 324.470 | 0.008 | 308 195 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)9s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 324.823 | 0.008 | 307 860 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)7d^\circ$ | 94BAI/MAH | |
| 325.178 | 0.008 | 307 524 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)8s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 325.4 | 0.1 | 307 300 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)17s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 325.517 | 0.008 | 307 204 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)16s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 325.614 | 0.008 | 307 112 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)15s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 325.700 | 0.008 | 307 031 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)14s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 325.840 | 0.008 | 306 899 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)13s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 325.840 | 0.008 | 306 899 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)6d^\circ$ | 94BAI/MAH | |
| 326.039 | 0.008 | 306 712 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)12s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 326.239 | 0.008 | 306 524 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)11s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 326.325 | 0.008 | 306 443 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)7s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 326.45 | 0.01 | 306 326 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)9d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | $\sigma$ ($cm^{-1}$) | Int. | Line code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 326.51 | 0.01 | 306 269 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)13s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 326.618 | 0.008 | 306 168 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)10s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 326.674 | 0.008 | 306 116 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)12s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 326.837 | 0.008 | 305 963 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)8d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 326.907 | 0.008 | 305 897 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)11s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 326.96 | 0.01 | 305 848 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)16s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.05 | 0.01 | 305 764 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)15s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.13 | 0.01 | 305 689 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)13d^\circ$ | 94BAI/MAH | |
| 327.13 | 0.01 | 305 689 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)9s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 327.175 | 0.008 | 305 647 | | b | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)14s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.266 | 0.008 | 305 562 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)12d^\circ$ | 94BAI/MAH | |
| 327.266 | 0.008 | 305 562 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)10s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 327.326 | 0.008 | 305 506 | | b | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)13s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.432 | 0.008 | 305 407 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)11d^\circ$ | 94BAI/MAH | |
| 327.432 | 0.008 | 305 407 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)5d^\circ$ | 94BAI/MAH | |
| 327.486 | 0.008 | 305 357 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)12s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.526 | 0.008 | 305 319 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)7d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.62 | 0.01 | 305 232 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)8d^\circ$ | 94BAI/MAH | |
| 327.639 | 0.008 | 305 214 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)10d^\circ$ | 94BAI/MAH | |
| 327.712 | 0.008 | 305 146 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)11s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 327.715 | 0.008 | 305 143 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)9s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 327.818 | 0.008 | 305 047 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)8s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 327.931 | 0.008 | 304 942 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)9d^\circ$ | 94BAI/MAH | |
| 328.057 | 0.008 | 304 825 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)10s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 328.12 | 0.01 | 304 767 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)7d^\circ$ | 94BAI/MAH | |
| 328.290 | 0.008 | 304 609 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)8d^\circ$ | 94BAI/MAH | |
| 328.357 | 0.008 | 304 547 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)6d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 328.460 | 0.008 | 304 451 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)8s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 328.460 | 0.008 | 304 451 | | * | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)6s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 328.546 | 0.008 | 304 371 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)9s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 328.889 | 0.008 | 304 054 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)7d^\circ$ | 94BAI/MAH | |
| 328.975 | 0.008 | 303 974 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)7s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 329.23 | 0.01 | 303 739 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)6d^\circ$ | 94BAI/MAH | |
| 329.291 | 0.008 | 303 683 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)8s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 329.37 | 0.15 | 303 610 | | | | | | 72WOL/RAD | |
| 329.47 | 0.15 | 303 520 | | | | | | 72WOL/RAD | |
| 329.597 | 0.008 | 303 401 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)7s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 329.70 | 0.15 | 303 310 | | | | | | 72WOL/RAD | |
| 329.779 | 0.008 | 303 233 | | b | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)6d^\circ$ | 94BAI/MAH | |
| 330.10 | 0.15 | 302 940 | | | | | | 72WOL/RAD | |
| 330.218 | 0.008 | 302 830 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)5d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 330.375 | 0.008 | 302 686 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)7s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 330.624 | 0.008 | 302 458 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)4d\ q^\circ$ | 94BAI/MAH | |
| 330.667 | 0.008 | 302 419 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)4d\ p^\circ$ | 94BAI/MAH | |
| 330.97 | 0.01 | 302 142 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)5d^\circ$ | 94BAI/MAH | |
| 331.152 | 0.008 | 301 976 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)6s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 331.578 | 0.008 | 301 588 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)5d^\circ$ | 94BAI/MAH | |
| 331.69 | 0.15 | 301 490 | | | | | | 72WOL/RAD | |
| 331.760 | 0.008 | 301 423 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)6s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 332.27 | 0.15 | 300 960 | | | | | | 72WOL/RAD | |
| 332.472 | 0.008 | 300 777 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)6s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 332.645 | 0.008 | 300 621 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)5s\,[1]\ n^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 333.07 | 0.025 | 300 240 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)5s\,[1]\ m^\circ_{1/2,3/2}$ | 71CON/GAR | |
| 333.289 | 0.008 | 300 040 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)4d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 333.95 | 0.01 | 299 446 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)4d\ l^\circ$ | 94BAI/MAH | |
| 333.99 | 0.01 | 299 410 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)4d\ k^\circ$ | 94BAI/MAH | |
| 334.46 | 0.15 | 298 990 | | | | | | 72WOL/RAD | |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | Line code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 335.177 | 0.008 | 298 350 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)4d^\circ$ | 94BAI/MAH | |
| 335.742 | 0.008 | 297 848 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)5s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 335.881 | 0.008 | 297 724 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)5s[1]\ j^\circ{}_{1/2,3/2}$ | 94BAI/MAH | |
| 335.971 | 0.008 | 297 645 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)5s[1]\ i^\circ{}_{1/2,3/2}$ | 94BAI/MAH | |
| 336.616 | 0.008 | 297 074 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)5s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 338.11 | 0.15 | 295 760 | | | | | | 72WOL/RAD | |
| 338.380 | 0.008 | 295 526 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)3d\ h^\circ$ | 94BAI/MAH | |
| 338.646 | 0.008 | 295 294 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)3d\ g^\circ$ | 94BAI/MAH | |
| 340.679 | 0.008 | 293 531 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)3d\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 341.18 | 0.01 | 293 100 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)3d\ f^\circ$ | 94BAI/MAH | |
| 341.28 | 0.15 | 293 010 | | | | | | 72WOL/RAD | |
| 342.10 | 0.15 | 292 310 | | | | | | 72WOL/RAD | |
| 342.36 | 0.01 | 292 090 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)3d\ e^\circ$ | 94BAI/MAH | |
| 343.194 | 0.008 | 291 380 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)3d\ d^\circ$ | 94BAI/MAH | |
| 343.49 | 0.15 | 291 130 | | | | | | 72WOL/RAD | |
| 343.895 | 0.008 | 290 786 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)3d\ c^\circ$ | 94BAI/MAH | |
| 344.247 | 0.008 | 290 489 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)4s[1]\ b^\circ{}_{1/2,3/2}$ | 94BAI/MAH | |
| 344.550 | 0.008 | 290 234 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)4s[1]\ a^\circ{}_{1/2,3/2}$ | 94BAI/MAH | |
| 345.83 | 0.15 | 289 160 | | | | | | 72WOL/RAD | |
| 346.07 | 0.15 | 288 960 | | | | | | 72WOL/RAD | |
| 346.678 | 0.008 | 288 452 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_0)4s\,[0]^\circ_{1/2}$ | 94BAI/MAH | |
| 347.853 | 0.008 | 287 478 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)4s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 347.983 | 0.008 | 287 370 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_1)4s\,[1]^\circ_{1/2,3/2}$ | 94BAI/MAH | |
| 348.624 | 0.008 | 286 842 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s(^3P^\circ_2)4s\,[2]^\circ_{3/2}$ | 94BAI/MAH | |
| 350.22 | 0.15 | 285 530 | | | | | | 72WOL/RAD | |
| 351.69 | 0.15 | 284 340 | | | | | | 72WOL/RAD | |
| 353.44 | 0.15 | 282 930 | | * | | $2p^64s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)9d^\circ$ | 72WOL/RAD | |
| 353.44 | 0.15 | 282 930 | | * | | $2p^64s\ ^2S_{1/2}$ | $2p^53s(^1P^\circ_1)10s\,[1]^\circ_{1/2,3/2}$ | 72WOL/RAD | |
| 356.94 | 0.02 | 280 160 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^53s(^1P^\circ)4p\ ^2P_{1/2}$ | 79SUG/LUC | |
| 357.03 | 0.02 | 280 090 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^53s(^1P^\circ)4p\ ^2D_{3/2}$ | 79SUG/LUC | |
| 357.35 | 0.02 | 279 840 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^53s(^1P^\circ)4p\ ^2P_{3/2}$ | 79SUG/LUC | |
| 357.59 | 0.02 | 279 650 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^53s(^1P^\circ)4p\ ^2S_{1/2}$ | 79SUG/LUC | |
| 357.65 | 0.02 | 279 600 | | | | $2p^63p^2P^\circ_{3/2}$ | $2p^53s(^1P^\circ)4p\ ^2D_{5/2}$ | 79SUG/LUC | |
| 358.05 | 0.15 | 279 290 | | | | | | 72WOL/RAD | |
| 359.59 | 0.02 | 278 090 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^53s(^3P^\circ)4p\ ^2D_{3/2}$ | 79SUG/LUC | |
| 359.71 | 0.15 | 278 000 | | | | | | 72WOL/RAD | |
| 363.30 | 0.15 | 275 250 | | | | | | 72WOL/RAD | |
| 375.14 | 0.10 | 266 570 | 895 | | | $2p^63d\ ^2D_{5/2,3/2}$ | $2p^53s(^1P^\circ)3d\ ^2D^\circ$ | 85PED/MEN | |
| 376.83 | 0.02 | 265 370 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^1P^\circ)\ ^2P_{1/2}$ | 79SUG/LUC | |
| 377.21 | 0.02 | 265 100 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^1P^\circ)\ ^2D_{3/2}$ | 79SUG/LUC | |
| 378.70 | 0.02 | 264 060 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^1P^\circ)\ ^2P_{3/2}$ | 79SUG/LUC | |
| 379.05 | 0.02 | 263 820 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^1P^\circ)\ ^2S_{1/2}$ | 79SUG/LUC | |
| 379.33 | 0.02 | 263 620 | | | | $2p^63p^2P^\circ_{3/2}$ | $2p^5(\,^2P^\circ)3s3p(^1P^\circ)\ ^2D_{5/2}$ | 79SUG/LUC | |
| 390.21 | 0.02 | 256 270 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^2S_{1/2}$ | 79SUG/LUC | |
| 393.84 | 0.02 | 253 910 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^2P_{3/2}$ | 79SUG/LUC | |
| 394.29 | 0.02 | 253 620 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^2P_{1/2}$ | 79SUG/LUC | |
| 394.91 | 0.02 | 253 220 | | | | $2p^63p^2P^\circ_{3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^2D_{5/2}$ | 79SUG/LUC | |
| 395.62 | 0.02 | 252 770 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^2D_{3/2}$ | 79SUG/LUC | |
| 396.88 | 0.02 | 251 970 | | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^4P_{3/2}$ | 79SUG/LUC | |
| 397.52 | 0.02 | 251 560 | | | | $2p^63p^2P^\circ_{3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^4P_{5/2}$ | 79SUG/LUC | |
| 398.98 | 0.10 | 250 640 | 338 | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)\ ^4D_{1/2}$ | 85PED/MEN | |
| 399.42 | 0.10 | 250 360 | 152 | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)^4D_{3/2}$ | 85PED/MEN | |
| 400.14 | 0.10 | 249 910 | 64 | | | $2p^63p^2P^\circ_{3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)^4D_{5/2}$ | 85PED/MEN | |
| 400.80 | 0.025 | 249 500 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s^2\ ^2P^\circ_{1/2}$ | 71CON/GAR | |
| 402.97 | 0.025 | 248 160 | | | | $2p^63s\ ^2S_{1/2}$ | $2p^53s^2\ ^2P^\circ_{3/2}$ | 71CON/GAR | |
| 405.26 | 0.10 | 246 760 | 190 | | | $2p^63p\ ^2P^\circ_{1/2,3/2}$ | $2p^5(\,^2P^\circ)3s3p(^3P^\circ)^4S_{3/2}$ | 85PED/MEN | |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Air* | | | | | | | | | |
| 2 543.841 | 0.004 | 39 298.85 | | | 4.46E+4 | $2p^63s\ ^2S_{1/2}$ | $2p^68p\ ^2P^\circ_{3/2}$ | 56RIS | 08KEL/POD |
| 2 543.872 | 0.004 | 39 298.38 | | | 4.35E+4 | $2p^63s\ ^2S_{1/2}$ | $2p^68p\ ^2P^\circ_{1/2}$ | 56RIS | 08KEL/POD |
| 2 593.869 | 0.004 | 38 540.91 | | | 8.13E+4 | $2p^63s\ ^2S_{1/2}$ | $2p^67p\ ^2P^\circ_{3/2}$ | 56RIS | 08KEL/POD |
| 2 593.919 | 0.004 | 38 540.17 | | | 7.96E+4 | $2p^63s\ ^2S_{1/2}$ | $2p^67p\ ^2P^\circ_{1/2}$ | 56RIS | 08KEL/POD |
| 2 680.340 | 0.004 | 37 297.62 | | | 1.84E+5 | $2p^63s\ ^2S_{1/2}$ | $2p^66p\ ^2P^\circ_{3/2}$ | 56RIS | 08KEL/POD |
| 2 680.433 | 0.004 | 37 296.37 | | | 1.81E+5 | $2p^63s\ ^2S_{1/2}$ | $2p^66p\ ^2P^\circ_{1/2}$ | 56RIS | 08KEL/POD |
| 2 852.811 | 0.004 | 35 042.86 | 16 | | 5.96E+5 | $2p^63s\ ^2S_{1/2}$ | $2p^65p\ ^2P^\circ_{3/2}$ | 56RIS | 94LOW/BIE |
| 2 853.013 | 0.004 | 35 040.40 | 15 | | 5.95E+5 | $2p^63s\ ^2S_{1/2}$ | $2p^65p\ ^2P^\circ_{1/2}$ | 56RIS | 94LOW/BIE |
| 2 893.618 | 0.004 | 34 548.68 | 1 | | | $2p^63s\ ^2S_{1/2}$ | $2p^64d\ ^2D_{3/2}$ | 56RIS | |
| 3 302.369 | 0.005 | 30 272.57 | 19 | | 2.19E+6 | $2p^63s\ ^2S_{1/2}$ | $2p^64p\ ^2P^\circ_{3/2}$ | 56RIS | 94LOW/BIE |
| 3 302.979 | 0.005 | 30 266.98 | 18 | | 2.17E+6 | $2p^63s\ ^2S_{1/2}$ | $2p^64p\ ^2P^\circ_{1/2}$ | 56RIS | 94LOW/BIE |
| 3 416.2 | 0.2 | 29 263.9 | | | 1.5E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4S_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 426.862 | 0.005 | 29 172.85 | 6 | | | $2p^63s\ ^2S_{1/2}$ | $2p^63d\ ^2D_{3/2}$ | 56RIS | |
| 3 427.3 | 0.2 | 29 169.1 | 9 | | 2.8E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4S_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 489.0 | 0.2 | 28 653.3 | 130 | | 4.2E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4S_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 502.5 | 0.2 | 28 542.9 | 160 | | 8.8E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4S_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4P^\circ_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 511.0 | 0.2 | 28 473.8 | 130 | | 1.15E+8 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4S_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4P^\circ_{1/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 833.6 | 0.2 | 26 077.7 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{3/2}$ | 88GAA/AND | |
| 3 848.0 | 0.2 | 25 980.2 | 5 | | 2.8E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{5/2}$ | 85HOL/WAL | |
| 3 852.3 | 0.5 | 25 951 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)$ D1/24 | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{3/2}$ | 88GAA/AND | |
| 3 865.5 | 0.2 | 25 862.5 | 130 | | 5.8E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{7/2}$ | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{7/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 872.9 | 0.2 | 25 813.1 | 19 | | 1.2E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{7/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 881.8 | 0.2 | 25 753.9 | 420 | | 1.63E+8 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{7/2}$ | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{9/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 885.7 | 0.2 | 25 728.1 | 36 | | 6.2E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 900.4 | 0.2 | 25 631.1 | 15 | | 7.7E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 911.8 | 0.2 | 25 556.4 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{1/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{1/2}$ | 88GAA/AND | |
| 3 917.9 | 0.2 | 25 516.7 | 160 | | 6.6E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)3d\ ^4F^\circ_{7/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 925.6 | 0.2 | 25 466.6 | 85 | | 4.5E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 930.6 | 0.2 | 25 434.2 | 15 | | 2.5E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{1/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 942.6 | 0.2 | 25 356.8 | 32 | | 2.1E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)3d\ ^4P^\circ_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 980.3 | 0.2 | 25 116.6 | 14 | | 5.E+6 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 3 997.7 | 0.2 | 25 007.3 | 14 | | 8.E+6 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4P^\circ_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 008.8 | 0.2 | 24 938.1 | 27 | | 1.5E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4P^\circ_{1/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 056.6 | 0.2 | 24 644.2 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{1/2}$ | $2p^53s(^3P^\circ)3d\ ^4P^\circ_{1/2}$ | 88GAA/AND | |
| 4 127.90 | 0.02 | 24 218.6 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^620d\ ^2D_{3/2}$ | 95BAI/AKR | |
| 4 130.82 | 0.02 | 24 201.4 | | * | 8.62E+3 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^620d\ ^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 130.82 | 0.02 | 24 201.4 | | * | 5.17E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^620d\ ^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 132.91 | 0.02 | 24 189.2 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^619d\ ^2D_{3/2}$ | 95BAI/AKR | |
| 4 134.81 | 0.02 | 24 178.1 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^620s\ ^2S_{1/2}$ | 95BAI/AKR | |
| 4 135.84 | 0.02 | 24 172.1 | | * | 1.01E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^619d\ ^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 135.84 | 0.02 | 24 172.1 | | * | 6.06E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^619d\ ^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 137.74 | 0.02 | 24 161.0 | | | 3.40E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^620s\ ^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 138.90 | 0.02 | 24 154.2 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^618d\ ^2D_{3/2}$ | 95BAI/AKR | |
| 4 141.08 | 0.02 | 24 141.5 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^619s\ ^2S_{1/2}$ | 95BAI/AKR | |
| 4 141.84 | 0.02 | 24 137.1 | | * | 1.12E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^618d\ ^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 141.84 | 0.02 | 24 137.1 | | * | 6.72E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^618d\ ^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 144.03 | 0.02 | 24 124.3 | | | 4.01E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^619s\ ^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 145.98 | 0.02 | 24 113.0 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^617d\ ^2D_{3/2}$ | 95BAI/AKR | |
| 4 146.2 | 0.4 | 24 112 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{3/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{3/2}$ | 88GAA/AND | |
| 4 148.61 | 0.02 | 24 097.7 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^618s\ ^2S_{1/2}$ | 95BAI/AKR | |
| 4 148.93 | 0.02 | 24 095.8 | | * | 1.42E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^617d\ ^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 148.93 | 0.02 | 24 095.8 | | * | 8.52E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^617d\ ^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 151.75 | 0.02 | 24 079.4 | | | 4.78E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^618s\ ^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 154.44 | 0.02 | 24 063.8 | | | | $2p^63p\ ^2P^\circ_{1/2}$ | $2p^616d\ ^2D_{3/2}$ | 95BAI/AKR | |
| 4 157.0 | 0.4 | 24 049 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{1/2}$ | $2p^53s(^3P^\circ)3d\ ^4D^\circ_{1/2}$ | 88GAA/AND | |
| 4 157.40 | 0.02 | 24 046.7 | | * | 1.71E+4 | $2p^63p\ ^2P^\circ_{3/2}$ | $2p^616d\ ^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 4 157.40 | 0.02 | 24 046.7 | | * | 1.03E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^616d\,^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 157.60 | 0.02 | 24 045.6 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^617s\,^2S_{1/2}$ | 95BAI/AKR | |
| 4 160.57 | 0.02 | 24 028.4 | | | 5.76E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^617s\,^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 164. 70 | 0.02 | 24 004.6 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^615d\,^2D_{3/2}$ | 95BAI/AKR | |
| 4 167.67 | 0.02 | 23 987.5 | | * | 2.09E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^615d\,^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 167.67 | 0.02 | 23 987.5 | | * | 1.25E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^615d\,^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 176.7 | 0.2 | 23 935.6 | 82 | | 3.5E+7 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4P_{5/2}$ | $2p^53s(^3P^{\circ})3d\,^4F^{\circ}_{7/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 177.23 | 0.02 | 23 932.6 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^614d\,^2D_{3/2}$ | 95BAI/AKR | |
| 4 168.58 | 0.02 | 23 982.2 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^616s\,^2S_{1/2}$ | 95BAI/AKR | |
| 4 171.56 | 0.02 | 23 965.1 | | | 7.03E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^616s\,^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 180.22 | 0.02 | 23 915.4 | | * | 2.58E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^614d\,^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 180.22 | 0.02 | 23 915.4 | | * | 1.55E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^614d\,^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 182.09 | 0.02 | 23 904.8 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^615s\,^2S_{1/2}$ | 95BAI/AKR | |
| 4 185.09 | 0.02 | 23 887.6 | | | 8.70E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^615s\,^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 185.5 | 0.2 | 23 885.3 | 150 | | 4.9E+7 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4P_{5/2}$ | $2p^53s(^3P^{\circ})3d\,^4D^{\circ}_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 192.97 | 0.02 | 23 842.7 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^613d\,^2D_{3/2}$ | 95BAI/AKR | |
| 4 195.98 | 0.02 | 23 825.6 | | * | 3.27E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^613d\,^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 195.98 | 0.02 | 23 825.6 | | * | 1.96E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^613d\,^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 199.14 | 0.02 | 23 807.7 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^614s\,^2S_{1/2}$ | 95BAI/AKR | |
| 4 202.16 | 0.02 | 23 790.6 | | | 1.09E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^614s\,^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 204.9 | 0.2 | 23 775.1 | 46 | | 2.5E+7 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4P_{5/2}$ | $2p^53s(^3P^{\circ})3d\,^4P^{\circ}_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 213.09 | 0.02 | 23 728.9 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^612d\,^2D_{3/2}$ | 95BAI/AKR | |
| 4 216.13 | 0.02 | 23 711.8 | | * | 4.20E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^612d\,^2D_{3/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 216.13 | 0.02 | 23 711.8 | | * | 2.52E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^612d\,^2D_{5/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 220.76 | 0.02 | 23 685.7 | | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^613s\,^2S_{1/2}$ | 95BAI/AKR | |
| 4 223.81 | 0.02 | 23 668.6 | | | 1.40E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^613s\,^2S_{1/2}$ | 95BAI/AKR | 05MIC/MEY |
| 4 238.987 | 0.008 | 23 583.89 | 2 | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^611d\,^2D_{3/2}$ | 56RIS | |
| 4 242.082 | 0.008 | 23 566.71 | 3 | * | 5.54E+4 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^611d\,^2D_{3/2}$ | 56RIS | 05MIC/MEY |
| 4 242.082 | 0.008 | 23 566.71 | 3 | * | 3.32E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^611d\,^2D_{5/2}$ | 56RIS | 05MIC/MEY |
| 4 249.410 | 0.008 | 23 526.06 | 1 | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^612s\,^2S_{1/2}$ | 56RIS | |
| 4 252.520 | 0.008 | 23 508.85 | 2 | | 1.84E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^612s\,^2S_{1/2}$ | 56RIS | 05MIC/MEY |
| 4 253.8 | 0.2 | 23 501.8 | 17 | | 5.E+6 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4P_{3/2}$ | $2p^53s(^3P^{\circ})3d\,^4D^{\circ}_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 273.642 | 0.008 | 23 392.67 | 4 | | 1.17E+6 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^610d\,^2D_{3/2}$ | 56RIS | 06FRO/TAC |
| 4 273.9 | 0.2 | 23 391.3 | 23 | | 1.6E+7 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4P_{3/2}$ | $2p^53s(^3P^{\circ})3d\,^4P^{\circ}_{3/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 276.787 | 0.008 | 23 375.44 | 5 | * | 2.32E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^610d\,^2D_{3/2}$ | 56RIS | 06FRO/TAC |
| 4 276.787 | 0.008 | 23 375.44 | 5 | * | 1.39E+6 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^610d\,^2D_{5/2}$ | 56RIS | 06FRO/TAC |
| 4 286.7 | 0.2 | 23 321.4 | 46 | | 2.8E+7 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4P_{3/2}$ | $2p^53s(^3P^{\circ})3d\,^4P^{\circ}_{1/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 287.838 | 0.008 | 23 315.21 | 2 | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^611s\,^2S_{1/2}$ | 56RIS | |
| 4 291.006 | 0.008 | 23 297.98 | 3 | | 2.47E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^611s\,^2S_{1/2}$ | 56RIS | 05MIC/MEY |
| 4 321.400 | 0.008 | 23 134.14 | 6 | | | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^69d\,^2D_{3/2}$ | 56RIS | |
| 4 324.615 | 0.008 | 23 116.92 | 7 | * | 1.14E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^69d\,^2D_{3/2}$ | 56RIS | 05MIC/MEY |
| 4 324.615 | 0.008 | 23 116.92 | 7 | * | 6.84E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^69d\,^2D_{5/2}$ | 56RIS | 05MIC/MEY |
| 4 326.3 | 0.4 | 23 108 | | | | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4S_{3/2}$ | $2p^53s(^3P^{\circ})4s\,^4P^{\circ}_{3/2}$ | 88GAA/AND | |
| 4 341.489 | 0.008 | 23 027.09 | 4 | | 3.26E+5 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^610s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 4 344.736 | 0.008 | 23 009.87 | 5 | | 6.50E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^610s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 4 390.029 | 0.008 | 22 772.49 | 8 | | 9.83E+5 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^68d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 4 393.340 | 0.008 | 22 755.33 | 9 | * | 1.17E+6 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^68d\,^2D_{5/2}$ | 56RIS | 08KEL/POD |
| 4 393.340 | 0.008 | 22 755.33 | 9 | * | 1.95E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^68d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 4 419.885 | 0.008 | 22 618.70 | 6 | | 2.82E+5 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^69s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 4 423.246 | 0.008 | 22 601.46 | 7 | | 5.61E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^69s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 4 432.3 | 0.2 | 22 555.3 | 310 | | 1.4E+7 | $2p^5(^2P^{\circ})3s3p(^3P^{\circ})\,^4S_{3/2}$ | $2p^53s(^3P^{\circ})4s\,^4P^{\circ}_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 4 494.177 | 0.009 | 22 244.76 | 10 | | 1.23E+6 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^67d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 4 497.658 | 0.009 | 22 227.55 | 11 | * | 1.46E+6 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^67d\,^2D_{5/2}$ | 56RIS | 08KEL/POD |
| 4 497.658 | 0.009 | 22 227.55 | 11 | * | 2.44E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^67d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 4 541.633 | 0.009 | 22 012.36 | 7 | | 3.76E+5 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^68s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 4 545.186 | 0.009 | 21 995.133 | 8 | | 7.50E+5 | $2p^63p\,^2P^{\circ}_{3/2}$ | $2p^68s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 4 664.810 7 | 0.0005 | 21 431.117 | 1 | | 2.08E+6 | $2p^63p\,^2P^{\circ}_{1/2}$ | $2p^66d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 4 668.559 5 | 0.0005 | 21 413.908 | 2 | * | 4.14E+5 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^66d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |
| 4 668.559 5 | 0.0005 | 21 413.908 | 2 | * | 2.49E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^66d\,^2D_{5/2}$ | 37MEI/LUF | 08KEL/POD |
| 4 747.941 0 | 0.0005 | 21 055.891 | 1 | | 6.19E+5 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^67s\,^2S_{1/2}$ | 37MEI/LUF | 08KEL/POD |
| 4 751.821 8 | 0.0005 | 21 038.695 | 2 | | 1.23E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^67s\,^2S_{1/2}$ | 37MEI/LUF | 08KEL/POD |
| 4 975.3 | 0.3 | 20 093.7 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{1/2}$ | 88GAA/AND | |
| 4 978.541 4 | 0.0005 | 20 080.622 | 1 | | 4.09E+6 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^65d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |
| 4 982.813 4 | 0.0005 | 20 063.402 | 2 | | 4.88E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^65d\,^2D_{5/2}$ | 37MEI/LUF | 08KEL/POD |
| 5 019.8 | 0.2 | 19 915.6 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{3/2}$ | 88GAA/AND | |
| 5 049.4 | 0.2 | 19 798.8 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{1/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{1/2}$ | 88GAA/AND | |
| 5 071.2 | 0.2 | 19 713.7 | 270 | | 4.1E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{7/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 5 109.6 | 0.2 | 19 565.6 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{3/2}$ | 88GAA/AND | |
| 5 148.838 1 | 0.0005 | 19 416.463 8 | 1 | | 1.14E+6 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^66s\,^2S_{1/2}$ | 37MEI/LUF | 08KEL/POD |
| 5 153.402 4 | 0.0005 | 19 399.267 2 | 2 | | 2.27E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^66s\,^2S_{1/2}$ | 37MEI/LUF | 08KEL/POD |
| 5 162.5 | 0.2 | 19 365.1 | 83 | | 1.5E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{5/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 5 256.4 | 0.2 | 19 019.1 | 7 | | 2.E+6 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4D_{3/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 5 411.0 | 0.4 | 18 475.7 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{3/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{1/2}$ | 88GAA/AND | |
| 5 451.9 | 0.2 | 18 337.1 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{5/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{3/2}$ | 88GAA/AND | |
| 5 466.4 | 0.5 | 18 288.5 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{1/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{1/2}$ | 88GAA/AND | |
| 5 569.9 | 0.9 | 17 948.7 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{1/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{3/2}$ | 88GAA/AND | |
| 5 621.0 | 0.2 | 17 785.5 | 42 | | 1.4E+7 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{5/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 5 628.5 | 0.5 | 17 761.8 | | | | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{1/2}$ | $2p^53s(^3P^\circ)4s\,^4P^\circ_{3/2}$ | 88GAA/AND | |
| 5 682.633 3 | 0.0005 | 17 592.606 0 | 5 | | 1.01E+7 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^64d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |
| 5 688.193 4 | 0.0005 | 17 575.409 7 | 1 | | 2.02E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^64d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |
| 5 688.204 6 | 0.0005 | 17 575.375 1 | 9 | | 1.21E+7 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^64d\,^2D_{5/2}$ | 37MEI/LUF | 08KEL/POD |
| 5 744.2 | 0.2 | 17 404.0 | 12 | | 4.E+6 | $2p^5(^2P^\circ)3s3p(^3P^\circ)\,^4P_{3/2}$ | $2p^53s(^3P^\circ)4s4P^\circ{}_{5/2}$ | 85HOL/WAL | 85HOL/WAL |
| 5 889.950 954 | 0.000015 | 16 973.36616 | 80000 | | 6.161(5)E+7 | $2p^63s\,^2S_{1/2}$ | $2p^63p\,^2P^\circ_{3/2}$ | 81JUN/PIN | 96JON/JUL |
| 5 895.924 237 | 0.000015 | 16 956.17025 | 40000 | | 6.135(7)E+7 | $2p^63s\,^2S_{1/2}$ | $2p^63p\,^2P^\circ_{1/2}$ | 81JUN/PIN | 96VOL/MAJ |
| 6 154.225 3 | 0.0005 | 16 244.513 2 | 1 | | 2.50E+6 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^65s\,^2S_{1/2}$ | 37MEI/LUF | 08KEL/POD |
| 6 160.747 0 | 0.0005 | 16 227.316 9 | 2 | | 4.98E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^65s\,^2S_{1/2}$ | 37MEI/LUF | 08KEL/POD |
| 7 373.23 | 0.02 | 13 558.84 | 2 | | 5.42E+4 | $2p^64s\,^2S_{1/2}$ | $2p^68p\,^2P^\circ_{3/2}$ | 56RIS | 08KEL/POD |
| 7 373.49 | 0.02 | 13 558.36 | 1 | | 5.30E+4 | $2p^64s\,^2S_{1/2}$ | $2p^68p\,^2P^\circ_{1/2}$ | 56RIS | 08KEL/POD |
| 7 809.78 | 0.02 | 12 800.94 | 4 | | 9.91E+4 | $2p^64s\,^2S_{1/2}$ | $2p^67p\,^2P^\circ_{3/2}$ | 56RIS | 08KEL/POD |
| 7 810.24 | 0.02 | 12 800.18 | 3 | | 9.72E+4 | $2p^64s\,^2S_{1/2}$ | $2p^67p\,^2P^\circ_{1/2}$ | 56RIS | 08KEL/POD |
| 8 183.255 6 | 0.0005 | 12 216.721 1 | 5 | | 4.29E+7 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^63d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |
| 8 194.790 5 | 0.0005 | 12 199.525 1 | 1 | | 8.57E+6 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^63d\,^2D_{3/2}$ | 37MEI/LUF | 08KEL/POD |
| 8 194.823 7 | 0.0005 | 12 199.475 7 | 9 | | 5.14E+7 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^63d\,^2D_{5/2}$ | 37MEI/LUF | 08KEL/POD |
| 8 649.92 | 0.02 | 11 557.63 | 7 | | 2.25E+5 | $2p^64s\,^2S_{1/2}$ | $2p^66p\,^2P^\circ_{3/2}$ | 56RIS | 08KEL/POD |
| 8 650.89 | 0.02 | 11 556.33 | 6 | | 2.21E+5 | $2p^64s\,^2S_{1/2}$ | $2p^66p\,^2P^\circ_{1/2}$ | 56RIS | 08KEL/POD |
| 8 942.96 | 0.02 | 11 178.91 | 2 | * | 3.71E+5 | $2p^63d\,^2D_{5/2}$ | $2p^610f\,^2F^\circ_{7/2}$ | 56RIS | 64AND/ZIL |
| 8 942.96 | 0.02 | 11 178.91 | 2 | * | 2.47E+4 | $2p^63d\,^2D_{5/2}$ | $2p^610f\,^2F^\circ_{5/2}$ | 56RIS | 64AND/ZIL |
| 9 153.88 | 0.02 | 10 921.33 | 4 | * | 5.3E+5 | $2p^63d\,^2D_{5/2}$ | $2p^69f\,^2F^\circ_{7/2}$ | 56RIS | 64AND/ZIL |
| 9 153.88 | 0.02 | 10 921.33 | 4 | * | 3.5E+4 | $2p^63d\,^2D_{5/2}$ | $2p^69f\,^2F^\circ_{5/2}$ | 56RIS | 64AND/ZIL |
| 9 465.94 | 0.02 | 10 561.29 | 6 | * | 9.57E+5 | $2p^63d\,^2D_{5/2}$ | $2p^68f\,^2F^\circ_{7/2}$ | 56RIS | 08KEL/POD |
| 9 465.94 | 0.02 | 10 561.29 | 6 | * | 6.38E+4 | $2p^63d\,^2D_{5/2}$ | $2p^68f\,^2F^\circ_{5/2}$ | 56RIS | 08KEL/POD |
| 9 961.28 | 0.03 | 10 036.12 | 7 | * | 1.27E+6 | $2p^63d\,^2D_{5/2}$ | $2p^67f\,^2F^\circ_{7/2}$ | 56RIS | 08KEL/POD |
| 9 961.28 | 0.03 | 10 036.12 | 7 | * | 8.45E+4 | $2p^63d\,^2D_{5/2}$ | $2p^67f\,^2F^\circ_{5/2}$ | 56RIS | 08KEL/POD |
| 10 566.00 | 0.03 | 9 461.73 | 1 | | 4.96E+5 | $2p^64p\,^2P^\circ_{1/2}$ | $2p^68d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 10 572.28 | 0.03 | 9 456.11 | 3 | * | 5.92E+5 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^68d\,^2D_{5/2}$ | 56RIS | 08KEL/POD |
| 10 572.28 | 0.03 | 9 456.11 | 3 | * | 9.88E+4 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^68d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 10 746.44 | 0.03 | 9 302.86 | 10 | | 5.91E+5 | $2p^64s\,^2S_{1/2}$ | $2p^65p\,^2P^\circ_{3/2}$ | 56RIS | 94LOW/BIE |
| 10 749.29 | 0.03 | 9 300.39 | 9 | | 5.89E+5 | $2p^64s\,^2S_{1/2}$ | $2p^65p\,^2P^\circ_{1/2}$ | 56RIS | 94LOW/BIE |
| 10 834.87 | 0.03 | 9 226.93 | 8 | * | 2.23E+6 | $2p^63d\,^2D_{5/2}$ | $2p^66f\,^2F^\circ_{7/2}$ | 56RIS | 08KEL/POD |
| 10 834.87 | 0.03 | 9 226.93 | 8 | * | 1.49E+5 | $2p^63d\,^2D_{5/2}$ | $2p^66f\,^2F^\circ_{5/2}$ | 56RIS | 08KEL/POD |
| 11 190.19 | 0.03 | 8 933.95 | 1 | | 6.29E+5 | $2p^64p\,^2P^\circ_{1/2}$ | $2p^67d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 11 197.21 | 0.03 | 8 928.35 | 2 | * | 7.52E+5 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^67d\,^2D_{5/2}$ | 56RIS | 08KEL/POD |
| 11 197.21 | 0.03 | 8 928.35 | 2 | * | 1.25E+5 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^67d\,^2D_{3/2}$ | 56RIS | 08KEL/POD |
| 11 381.45 | 0.03 | 8 783.82 | 11 | | 8.80E+6 | $2p^63p\,^2P^\circ_{1/2}$ | $2p^64s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |

TABLE 1. Observed spectral lines of Na I—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 11 403.78 | 0.03 | 8 766.62 | 12 | | 1.76E+7 | $2p^63p\,^2P^\circ_{3/2}$ | $2p^64s\,^2S_{1/2}$ | 56RIS | 08KEL/POD |
| 12 679.17 | 0.03 | 7 884.80 | m | * | 4.70E+6 | $2p^63d\,^2D_{5/2}$ | $2p^65f\,^2F^\circ_{7/2}$ | 61JOH | 08KEL/POD |
| 12 679.17 | 0.03 | 7 884.80 | m | * | 3.13E+5 | $2p^63d\,^2D_{5/2}$ | $2p^65f\,^2F^\circ_{5/2}$ | 61JOH | 08KEL/POD |
| 14 767.54 | 0.03 | 6 769.758 | m | | 2.18E+6 | $2p^64p\,^2P^\circ_{1/2}$ | $2p^65d\,^2D_{3/2}$ | 61JOH | 08KEL/POD |
| 14 779.75 | 0.03 | 6 764.166 | m | | 2.61E+6 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^65d\,^2D_{5/2}$ | 61JOH | 08KEL/POD |
| 16 373.87 | 0.03 | 6 105.624 | f | | 5.85E+5 | $2p^64p\,^2P^\circ_{1/2}$ | $2p^66s\,^2S_{1/2}$ | 61JOH | 08KEL/POD |
| 16 388.85*R* | 0.03 | 6 100.043 | | | 1.17E+6 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^66s\,^2S_{1/2}$ | | 08KEL/POD |
| 18 465.39 | 0.03 | 5 414.058 | s | * | 1.40E+7 | $2p^63d\,^2D_{5/2}$ | $2p^64f\,^2F^\circ_{7/2}$ | 61JOH | 08KEL/POD |
| 18 465.39 | 0.03 | 5 414.058 | s | * | 9.35E+5 | $2p^63d\,^2D_{5/2}$ | $2p^64f\,^2F^\circ_{5/2}$ | 61JOH | 08KEL/POD |
| *Vacuum* | | | | | | | | | |
| 22 056.40 | 0.03 | 4 532.594 | s | | 6.96E+6 | $2p^64s\,^2S_{1/2}$ | $2p^64p\,^2P^\circ_{3/2}$ | 61JOH | 94LOW/BIE |
| 22 083.66 | 0.03 | 4 526.999 | s | | 6.94E+6 | $2p^64s\,^2S_{1/2}$ | $2p^64p\,^2P^\circ_{1/2}$ | 61JOH | 94LOW/BIE |
| 23 348.38 | 0.03 | 4 281.784 | s | | 5.84E+6 | $2p^64p\,^2P^\circ_{1/2}$ | $2p^64d\,^2D_{3/2}$ | 61JOH | 08KEL/POD |
| 23 379.14 | 0.03 | 4 276.150 | s | | 7.01E+6 | $2p^64p\,^2P^\circ_{3/2}$ | $2p^64d\,^2D_{5/2}$ | 61JOH | 08KEL/POD |
| 40 431.88 | 0.16 | 2 472.622 | | | | $2p^64f\,^2F^\circ$ | $2p^65g\,^2G$ | 70LIT | |

TABLE 2. Energy levels of Na I

| Configuration | Term | J | Energy (cm$^{-1}$) | Uncertainty (cm$^{-1}$) | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^63s$ | $^2S$ | 1/2 | 0.000 00 | | 81MAR/ZAL | 885.813 064 4(5) | | 74BEC/BOK |
| $2p^63p$ | $^2P^\circ$ | 1/2 | 16 956.170 25 | 0.000 04 | 81JUN/PIN | 94.465(10) | | 77GRI/ISA |
| | | 3/2 | 16 973.366 19 | 0.00005 | 81JUN/PIN | 18.534(15) | 2.72(3) | 93YEI/SIE |
| $2p^64s$ | $^2S$ | 1/2 | 25 739.999 | 0.003 | 88ARQ | 203.6(2) | | 88ARQ |
| $2p^63d$ | $^2D$ | 5/2 | 29 172.837 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| | | 3/2 | 29 172.887 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| $2p^64p$ | $^2P^\circ$ | 1/2 | 30 266.99 | 0.02 | 56RIS | 30.6(1) | | 03BAT/HAI |
| | | 3/2 | 30 272.58 | 0.02 | 56RIS | | | |
| $2p^65s$ | $^2S$ | 1/2 | 33 200.673 | 0.002 | 81MAR/ZAL,81JUN/PIN | 77.6(2) | | 76TSE/LIA |
| $2p^64d$ | $^2D$ | 5/2 | 34 548.729 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| | | 3/2 | 34 548.764 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| $2p^64f$ | $^2F^\circ$ | 5/2,7/2 | 34 586.92 | 0.02 | 61JOH | | | |
| $2p^65p$ | $^2P^\circ$ | 1/2 | 35 040.38 | 0.02 | 56RIS | | | |
| | | 3/2 | 35 042.85 | 0.02 | 56RIS | | | |
| $2p^66s$ | $^2S$ | 1/2 | 36 372.618 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| $2p^65d$ | $^2D$ | 5/2 | 37 036.752 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| | | 3/2 | 37 036.772 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| $2p^65f$ | $^2F^\circ$ | 5/2,7/2 | 37 057.65 | 0.02 | 56RIS | | | |
| $2p^65g$ | $^2G$ | 7/2,9/2 | 37 059.54 | 0.07 | 70LIT | | | |
| $2p^66p$ | $^2P^\circ$ | 1/2 | 37 296.32 | 0.02 | 56RIS | | | |
| | | 3/2 | 37 297.61 | 0.02 | 56RIS | | | |
| $2p^67s$ | $^2S$ | 1/2 | 38 012.042 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| $2p^66d$ | $^2D$ | 5/2 | 38 387.255 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| | | 3/2 | 38 387.268 | 0.002 | 81MAR/ZAL,81JUN/PIN | | | |
| $2p^66f$ | $^2F^\circ$ | 5/2,7/2 | 38 399.79 | 0.02 | 56RIS | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^66g$ | $^2G$ | 7/2 | [38 400.900] | 0.002 | 97DYU/EFR | | | |
| | | 9/2 | [38 400.904] | 0.002 | 97DYU/EFR | | | |
| $2p^66h$ | $^2H^\circ$ | 11/2 | [38 401.147] | 0.002 | 97DYU/EFR | | | |
| | | 9/2 | [38 401.153] | 0.002 | 97DYU/EFR | | | |
| $2p^67p$ | $^2P^\circ$ | 1/2 | 38 540.18 | 0.02 | 56RIS | | | |
| | | 3/2 | 38 540.93 | 0.02 | 56RIS | | | |
| $2p^68s$ | $^2S$ | 1/2 | 38 968.51 | 0.02 | 56RIS | | | |
| $2p^67d$ | $^2D$ | 3/2,5/2 | 39 200.93 | 0.02 | 56RIS | | | |
| $2p^67f$ | $^2F^\circ$ | 5/2,7/2 | 39 208.98 | 0.02 | 56RIS | | | |
| $2p^67g$ | $^2G$ | 7/2,9/2 | [39 209.725] | 0.002 | 97DYU/EFR | | | |
| $2p^67h$ | $^2H^\circ$ | 9/2,11/2 | [39 209.887] | 0.002 | 97DYU/EFR | | | |
| $2p^68p$ | $^2P^\circ$ | 1/2 | 39 298.35 | 0.02 | 56RIS | | | |
| | | 3/2 | 39 298.84 | 0.02 | 56RIS | | | |
| $2p^69s$ | $^2S$ | 1/2 | 39 574.85 | 0.02 | 56RIS | | | |
| $2p^68d$ | $^2D$ | 3/2,5/2 | 39 728.70 | 0.02 | 56RIS | | | |
| $2p^68f$ | $^2F^\circ$ | 5/2,7/2 | 39 734.16 | 0.02 | 56RIS | | | |
| $2p^68g$ | $^2G$ | 7/2,9/2 | [39 734.678] | 0.002 | 97DYU/EFR | | | |
| $2p^68h$ | $^2H^\circ$ | 9/2,11/2 | [39 734.790] | 0.002 | 97DYU/EFR | | | |
| $2p^69p$ | $^2P^\circ$ | 1/2 | [39 794.479] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [39 794.810] | 0.002 | 95DYU/EFI | | | |
| $2p^610s$ | $^2S$ | 1/2 | 39 983.27 | 0.02 | 56RIS | | | |
| $2p^69d$ | $^2D$ | 3/2,5/2 | 40 090.31 | 0.02 | 56RIS | | | |
| $2p^69f$ | $^2F^\circ$ | 5/2,7/2 | 40 094.19 | 0.02 | 56RIS | | | |
| $2p^69g$ | $^2G$ | 7/2,9/2 | [40 094.581] | 0.002 | 97DYU/EFR | | | |
| $2p^69h$ | $^2H^\circ$ | 9/2,11/2 | [40 094.660] | 0.002 | 97DYU/EFR | | | |
| $2p^610p$ | $^2P^\circ$ | 1/2 | 40 136.810 | 0.002 | 98BAU/BUR | | | |
| | | 3/2 | 40 137.043 | 0.002 | 98BAU/BUR | | | |
| $2p^611s$ | $^2S$ | 1/2 | 40 271.396 | 0.002 | 92CIO/BUR | | | |
| $2p^610d$ | $^2D$ | 5/2 | 40 348.915 | 0.002 | 98BAU/BUR | | | |
| | | 3/2 | 40 348.918 | 0.002 | 98BAU/BUR | | | |
| $2p^610f$ | $^2F^\circ$ | 5/2,7/2 | [40 351.761] | 0.002 | 97DYU/EFR | | | |
| $2p^610g$ | $^2G$ | 7/2,9/2 | [40 352.015] | 0.002 | 97DYU/EFR | | | |
| $2p^610h$ | $^2H^\circ$ | 9/2,11/2 | [40 352.073] | 0.002 | 97DYU/EFR | | | |
| $2p^611p$ | $^2P^\circ$ | 1/2 | 40 382.925 | 0.002 | 98BAU/BUR | | | |
| | | 3/2 | 40 383.097 | 0.002 | 98BAU/BUR | | | |
| $2p^612s$ | $^2S$ | 1/2 | 40 482.236 | 0.002 | 92CIO/BUR | | | |
| $2p^611d$ | $^2D$ | 5/2 | [40 540.093] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [40 540.095] | 0.002 | 97DYU/EFR | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^6 11f$ | $^2F^\circ$ | 5/2,7/2 | [40 542.293] | 0.002 | 97DYU/EFR | | | |
| $2p^6 11g$ | $^2G$ | 7/2,9/2 | [40 542.484] | 0.002 | 97DYU/EFR | | | |
| $2p^6 12p$ | $^2P^\circ$ | 1/2 | [40 565.783] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [40 565.913] | 0.002 | 95DYU/EFI | | | |
| $2p^6 13s$ | $^2S$ | 1/2 | [40 641.148] | 0.002 | 95DYU/EFI | | | |
| $2p^6 12d$ | $^2D$ | 5/2 | [40 685.509] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [40 685.509] | 0.002 | 97DYU/EFR | | | |
| $2p^6 12f$ | $^2F^\circ$ | 5/2,7/2 | [40 687.203] | 0.002 | 97DYU/EFR | | | |
| $2p^6 12g$ | $^2G$ | 7/2,9/2 | [40 687.352] | 0.002 | 97DYU/EFR | | | |
| $2p^6 13p$ | $^2P^\circ$ | 1/2 | [40 705.344] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [40 705.444] | 0.002 | 95DYU/EFI | | | |
| $2p^6 14s$ | $^2S$ | 1/2 | [40 763.884] | 0.002 | 95DYU/EFI | | | |
| $2p^6 13d$ | $^2D$ | 5/2 | [40 798.642] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [40 798.644] | 0.002 | 97DYU/EFR | | | |
| $2p^6 13f$ | $^2F^\circ$ | 5/2,7/2 | [40 799.974] | 0.002 | 97DYU/EFR | | | |
| $2p^6 13g$ | $^2G$ | 7/2,9/2 | [40 800.091] | 0.002 | 97DYU/EFR | | | |
| $2p^6 14p$ | $^2P^\circ$ | 1/2 | [40 814.273] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [40 814.352] | 0.002 | 95DYU/EFI | | | |
| $2p^6 15s$ | $^2S$ | 1/2 | [40 860.648] | 0.002 | 95DYU/EFI | | | |
| $2p^6 14d$ | $^2D$ | 5/2 | [40 888.386] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [40 888.387] | 0.002 | 97DYU/EFR | | | |
| $2p^6 14f$ | $^2F^\circ$ | 5/2,7/2 | [40 889.452] | 0.002 | 97DYU/EFR | | | |
| $2p^6 14g$ | $^2G$ | 7/2,9/2 | [40 889.546] | 0.002 | 97DYU/EFR | | | |
| $2p^6 15p$ | $^2P^\circ$ | 1/2 | [40 900.922] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [40 900.985] | 0.002 | 95DYU/EFI | | | |
| $2p^6 16s$ | $^2S$ | 1/2 | [40 938.281] | 0.002 | 95DYU/EFI | | | |
| $2p^6 15d$ | $^2D$ | 3/2,5/2 | [40 960.771] | 0.002 | 97DYU/EFR | | | |
| $2p^6 15f$ | $^2F^\circ$ | 5/2,7/2 | [40 961.637] | 0.002 | 97DYU/EFR | | | |
| $2p^6 15g$ | $^2G$ | 7/2,9/2 | [40 961.714] | 0.002 | 97DYU/EFR | | | |
| $2p^6 16p$ | $^2P^\circ$ | 1/2 | [40 970.976] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [40 971.028] | 0.002 | 95DYU/EFI | | | |
| $2p^6 17s$ | $^2S$ | 1/2 | [41 001.515] | 0.002 | 95DYU/EFI | | | |
| $2p^6 16d$ | $^2D$ | 5/2 | [41 020.000] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [41 020.001] | 0.002 | 97DYU/EFR | | | |
| $2p^6 16f$ | $^2F^\circ$ | 5/2,7/2 | [41 020.714] | 0.002 | 97DYU/EFR | | | |
| $2p^6 16g$ | $^2G$ | 7/2,9/2 | [41 020.777] | 0.002 | 97DYU/EFR | | | |
| $2p^6 17p$ | $^2P^\circ$ | 1/2 | [41 028.419] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [41 028.462] | 0.002 | 95DYU/EFI | | | |
| $2p^6 18s$ | $^2S$ | 1/2 | [41 053.701] | 0.002 | 95DYU/EFI | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy (cm$^{-1}$) | Uncertainty (cm$^{-1}$) | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^6 17d$ | $^2D$ | 5/2 | [41 069.079] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [41 069.080] | 0.002 | 97DYU/EFR | | | |
| $2p^6 17f$ | $^2F^\circ$ | 5/2,7/2 | [41 069.674] | 0.002 | 97DYU/EFR | | | |
| $2p^6 17g$ | $^2G$ | 7/2,9/2 | [41 069.727] | 0.002 | 97DYU/EFR | | | |
| $2p^6 18p$ | $^2P^\circ$ | 1/2 | [41 076.106] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [41 076.141] | 0.002 | 95DYU/EFI | | | |
| $2p^6 19s$ | $^2S$ | 1/2 | [41 097.271] | 0.002 | 95DYU/EFI | | | |
| $2p^6 18d$ | $^2D$ | 3/2,5/2 | [41 110.202] | 0.002 | 97DYU/EFR | | | |
| $2p^6 18f$ | $^2F^\circ$ | 5/2,7/2 | [41 110.703] | 0.002 | 97DYU/EFR | | | |
| $2p^6 18g$ | $^2G$ | 7/2 | [41 110.747] | 0.002 | 97DYU/EFR | | | |
| | | 9/2 | [41 110.748] | 0.002 | 97DYU/EFR | | | |
| $2p^6 19p$ | $^2P^\circ$ | 1/2 | [41 116.126] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [41 116.156] | 0.002 | 95DYU/EFI | | | |
| $2p^6 20s$ | $^2S$ | 1/2 | [41 134.023] | 0.002 | 95DYU/EFI | | | |
| $2p^6 19d$ | $^2D$ | 5/2 | [41 144.999] | 0.002 | 97DYU/EFR | | | |
| | | 3/2 | [41 145.000] | 0.002 | 97DYU/EFR | | | |
| $2p^6 19f$ | $^2F^\circ$ | 5/2,7/2 | [41 145.425] | 0.002 | 97DYU/EFR | | | |
| $2p^6 19g$ | $^2G$ | 7/2,9/2 | [41 145.463] | 0.002 | 97DYU/EFR | | | |
| $2p^6 20p$ | $^2P^\circ$ | 1/2 | [41 150.040] | 0.002 | 95DYU/EFI | | | |
| | | 3/2 | [41 150.066] | 0.002 | 95DYU/EFI | | | |
| $2p^6 20d$ | $^2D$ | 3/2,5/2 | [41 174.705] | 0.002 | 97DYU/EFR | | | |
| $2p^6 20f$ | $^2F^\circ$ | 5/2,7/2 | [41 175.070] | 0.002 | 97DYU/EFR | | | |
| $2p^6 20g$ | $^2G$ | 7/2,9/2 | [41 175.102] | 0.002 | 97DYU/EFR | | | |
| **Na II ($2p^6$ $^1S_0$)** | *Limit* | — | 41 449.451 | 0.002 | 92CIO/BUR | | | |
| $2p^5 3s^2$ | $^2P^\circ$ | 3/2 | 248 159 | 15 | 71CON/GAR | | | |
| | | 1/2 | 249 503 | 15 | 71CON/GAR | | | |
| $2p^5(^2P^\circ)3s3p(^3P^\circ)$ | $^4S$ | 3/2 | 263 773 | 15 | 85PED/MEN | | | |
| $2p^5(^2P^\circ)3s3p(^3P^\circ)$ | $^4D$ | 7/2 | 266 614 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 5/2 | 266 960 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 3/2 | 267 309 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 1/2 | 267 603 | 15 | 85HOL/WAL,88GAA/AND | | | |
| $2p^5(^2P^\circ)3s3p(^3P^\circ)$ | $^4P$ | 5/2 | 268 543 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 3/2 | 268 926 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 1/2 | 269 113 | 15 | 88GAA/AND | | | |
| $2p^5(^2P^\circ)3s3p(^3P^\circ)$ | $^2D$ | 3/2 | 269 727 | 15 | 79SUG/LUC | | | |
| | | 5/2 | 270 196 | 15 | 79SUG/LUC | | | |
| $2p^5(^2P^\circ)3s3p(^3P^\circ)$ | $^2P$ | 1/2 | 270 582 | 15 | 79SUG/LUC | | | |
| | | 3/2 | 270 881 | 15 | 79SUG/LUC | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^5(^2P^\circ)3s3p(^3P^\circ)$ | $^2S$ | 1/2 | 273 240 | 15 | 79SUG/LUC | | | |
| $2p^5(^2P^\circ)3s3p(^1P^\circ)$ | $^2D$ | 5/2 | 280 596 | 15 | 79SUG/LUC | | | |
| | | 3/2 | 282 063 | 15 | 79SUG/LUC | | | |
| $2p^5(^2P^\circ)3s3p(^1P^\circ)$ | $^2S$ | 1/2 | 280 785 | 15 | 79SUG/LUC | | | |
| $2p^5(^2P^\circ)3s3p(^1P^\circ)$ | $^2P$ | 3/2 | 281 032 | 15 | 79SUG/LUC | | | |
| | | 1/2 | 282 334 | 15 | 79SUG/LUC | | | |
| $2p^53s(^3P^\circ_2)4s$ | $[2]^\circ$ | 5/2 | 286 328 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 3/2 | 286 842 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)4s$ | $[1]^\circ$ | 1/2 | 287 370 | 7 | 94BAI/MAH | | | |
| | | 3/2 | 287 478 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)4s$ | $[0]^\circ$ | 1/2 | 288 452 | 7 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)4s$ | $[1]a^\circ$ | 1/2,3/2 | 290 234 | 7 | 94BAI/MAH | | | |
| | $[1]b^\circ$ | 1/2,3/2 | 290 489 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)3d$ | $c^\circ$ | 1/2,3/2 | 290 786 | 7 | 94BAI/MAH | | | |
| | $d^\circ$ | 1/2,3/2 | 291 380 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)3d$ | $e^\circ$ | 1/2,3/2 | 292 090 | 9 | 94BAI/MAH | | | |
| | $f^\circ$ | 1/2,3/2 | 293 100 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ)3d$ | $^4P^\circ$ | 1/2 | 292 247 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 3/2 | 292 316 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 5/2 | 292 427 | 15 | 85HOL/WAL,88GAA/AND | | | |
| $2p^53s(^3P^\circ)3d$ | $^4F^\circ$ | 9/2 | 292 368 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 7/2 | 292 476 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 5/2 | 292 941 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 3/2 | 293 554 | 15 | 88GAA/AND | | | |
| $2p^53s(^3P^\circ)3d$ | $^4D^\circ$ | 3/2 | 293 037 | 15 | 85HOL/WAL,88GAA/AND | | | |
| | | 1/2 | 293 159 | 15 | 88GAA/AND | | | |
| $2p^53s(^3P^\circ_0)3d$ | $[2]^\circ$ | 3/2 | 293 531 | 7 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)3d$ | $g^\circ$ | 1/2,3/2 | 295 294 | 7 | 94BAI/MAH | | | |
| | $h^\circ$ | 1/2,3/2 | 295 526 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ)4p$ | $^2D$ | 3/2 | 295 054 | 15 | 79SUG/LUC | | | |
| $2p^53s(^1P^\circ)4p$ | $^2D$ | 5/2 | 296 576 | 15 | 79SUG/LUC | | | |
| | | 3/2 | 297 048 | 15 | 79SUG/LUC | | | |
| $2p^53s(^1P^\circ)4p$ | $^2S$ | 1/2 | 296 618 | 15 | 79SUG/LUC | | | |
| $2p^53s(^1P^\circ)4p$ | $^2P$ | 3/2 | 296 808 | 15 | 79SUG/LUC | | | |
| | | 1/2 | 297 121 | 15 | 79SUG/LUC | | | |
| $2p^53s(^3P^\circ_2)5s$ | $[2]^\circ$ | 3/2 | 297 074 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)5s$ | $[1]i^\circ$ | 1/2,3/2 | 297 645 | 7 | 94BAI/MAH | | | |
| | $[1]j^\circ$ | 1/2,3/2 | 297 724 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)5s$ | $[0]^\circ$ | 1/2 | 297 848 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)4d$ | $^\circ$ | 1/2,3/2 | 298 350 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ)4d?$ | $^\circ$ | 1/2,3/2 | 298 990 | 150 | 72WOL/RAD | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^53s(^3P^\circ_1)4d$ | $k^\circ$ | 1/2,3/2 | 299 410 | 9 | 94BAI/MAH | | | |
| | $l^\circ$ | 1/2,3/2 | 299 446 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)4d$ | $[2]^\circ$ | 3/2 | 300 040 | 7 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)5s$ | $[1]m^\circ$ | 1/2,3/2 | 300 240 | 20 | 71CON/GAR | | | |
| | $[1]n^\circ$ | 1/2,3/2 | 300 621 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)6s$ | $[2]^\circ$ | 3/2 | 300 777 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)6s$ | $[1]^\circ$ | 1/2,3/2 | 301 423 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)5d$ | $^\circ$ | 1/2,3/2 | 301 588 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)6s$ | $[0]^\circ$ | 1/2 | 301 976 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)5d$ | $^\circ$ | 1/2,3/2 | 302 142 | 9 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)4d$ | $p^\circ$ | 1/2,3/2 | 302 419 | 7 | 94BAI/MAH | | | |
| | $q^\circ$ | 1/2,3/2 | 302 458 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)7s$ | $[2]^\circ$ | 3/2 | 302 686 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)5d$ | $[2]^\circ$ | 3/2 | 302 830 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)6d$ | $^\circ$ | 1/2,3/2 | 303 233 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)7s$ | $[1]^\circ$ | 1/2,3/2 | 303 401 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)8s$ | $[2]^\circ$ | 3/2 | 303 683 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)6d$ | $^\circ$ | 1/2,3/2 | 303 739 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)7s$ | $[0]^\circ$ | 1/2 | 303 974 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)7d$ | $^\circ$ | 1/2,3/2 | 304 054 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)9s$ | $[2]^\circ$ | 3/2 | 304 371 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)8s$ | $[1]^\circ$ | 1/2,3/2 | 304 451 | 7 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)6s$ | $[1]^\circ$ | 1/2,3/2 | 304 451 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)6d$ | $[2]^\circ$ | 3/2 | 304 547 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)8d$ | $^\circ$ | 1/2,3/2 | 304 609 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)7d$ | $^\circ$ | 1/2,3/2 | 304 767 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)10s$ | $[2]^\circ$ | 3/2 | 304 825 | 7 | 94BAI/MAH | | | |
| | $^\circ$ | 1/2,3/2 | 304 894 | 20 | 81MAR/ZAL | | | |
| $2p^53s(^3P^\circ_2)9d$ | $^\circ$ | 1/2,3/2 | 304 942 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)8s$ | $[0]^\circ$ | 1/2 | 305 047 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)9s$ | $[1]^\circ$ | 1/2,3/2 | 305 143 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)11s$ | $[2]^\circ$ | 3/2 | 305 146 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)10d$ | $^\circ$ | 1/2,3/2 | 305 214 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)8d$ | $^\circ$ | 1/2,3/2 | 305 232 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)7d$ | $[2]^\circ$ | 3/2 | 305 319 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)12s$ | $[2]^\circ$ | 3/2 | 305 357 | 7 | 94BAI/MAH | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^53s(^3P^\circ_2)11d$ | ° | 1/2,3/2 | 305 407 | 7 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)5d$ | ° | 1/2,3/2 | 305 407 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)13s$ | [2]° | 3/2 | 305 506 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)12d$ | ° | 1/2,3/2 | 305 562 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)10s$ | [1]° | 1/2,3/2 | 305 562 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)14s$ | [2]° | 3/2 | 305 647 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)13d$ | ° | 1/2,3/2 | 305 689 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)9s$ | [0]° | 1/2 | 305 689 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)15s$ | [2]° | 3/2 | 305 764 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_2)16s$ | [2]° | 3/2 | 305 848 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)11s$ | [1]° | 1/2,3/2 | 305 897 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)8d$ | [2]° | 3/2 | 305 963 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)12s$ | [1]° | 1/2,3/2 | 306 116 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)10s$ | [0]° | 1/2 | 306 168 | 7 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_1)13s$ | [1]° | 1/2,3/2 | 306 269 | 9 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)9d$ | [2]° | 3/2 | 306 326 | 9 | 94BAI/MAH | | | |
| **Na II ($2p^53s\ ^3P^\circ_2$)** | *Limit* | — | 306 373.8 | 0.2 | 92CIO/BUR,81MAR/ZAL | | | |
| $2p^53s(^1P^\circ_1)7s$ | [1]° | 1/2,3/2 | 306 443 | 8 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)11s$ | [0]° | 1/2 | 306 524 | 8 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)12s$ | [0]° | 1/2 | 306 712 | 8 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)13s$ | [0]° | 1/2 | 306 899 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)6d$ | ° | 1/2,3/2 | 306 899 | 8 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)14s$ | [0]° | 1/2 | 307 031 | 8 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)15s$ | [0]° | 1/2 | 307 112 | 8 | 94BAI/MAH | | | |
| **Na II ($2p^53s\ ^3P^\circ_1$)** | *Limit* | — | 307 139.1 | 0.2 | 92CIO/BUR,81MAR/ZAL | | | |
| $2p^53s(^3P^\circ_0)16s$ | [0]° | 1/2 | 307 204 | 8 | 94BAI/MAH | | | |
| $2p^53s(^3P^\circ_0)17s$ | [0]° | 1/2 | 307 310 | 100 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)8s$ | [1]° | 1/2,3/2 | 307 524 | 8 | 94BAI/MAH | | | |
| **Na II ($2p^53s\ ^3P^\circ_0$)** | *Limit* | — | 307 731.1 | 0.2 | 92CIO/BUR,81MAR/ZAL | | | |
| $2p^53s(^1P^\circ_1)7d$ | ° | 1/2,3/2 | 307 860 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)9s$ | [1]° | 1/2,3/2 | 308 195 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)8d$ | ° | 1/2,3/2 | 308 378 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)10s$ | [1]° | 1/2,3/2 | 308 641 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)9d$ | ° | 1/2,3/2 | 308 773 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)11s$ | [1]° | 1/2,3/2 | 308 948 | 8 | 94BAI/MAH | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^53s(^1P^\circ_1)10d$ | ° | 1/2,3/2 | 309 044 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)12s$ | [1]° | 1/2,3/2 | 309 173 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)11d$ | ° | 1/2,3/2 | 309 247 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)13s$ | [1]° | 1/2,3/2 | 309 346 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)12d$ | ° | 1/2,3/2 | 309 403 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)14s$ | [1]° | 1/2,3/2 | 309 473 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)13d$ | ° | 1/2,3/2 | 309 524 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)15s$ | [1]° | 1/2,3/2 | 309 588 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)14d$ | ° | 1/2,3/2 | 309 613 | 8 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)15d$ | ° | 1/2,3/2 | 309 693 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)16d$ | ° | 1/2,3/2 | 309 751 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)17d$ | ° | 1/2,3/2 | 309 799 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)18d$ | ° | 1/2,3/2 | 309 837 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)19d$ | ° | 1/2,3/2 | 309 885 | 10 | 94BAI/MAH | | | |
| $2p^53s(^1P^\circ_1)20d$ | ° | 1/2,3/2 | 309 914 | 10 | 94BAI/MAH | | | |
| **Na II ($2p^53s$ $^1P^\circ_1$)** | *Limit* | — | 310 212.4 | 0.2 | 92CIO/BUR,81MAR/ZAL | | | |
| $2p^53p^2$ | ° | 1/2,3/2 | 310 977 | 25 | 71CON/GAR | | | |
| $2p^53p^2$ | ° | 1/2,3/2 | 312 188 | 25 | 71CON/GAR | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_14p(I)$ | ° | 1/2,3/2 | 323 830 | 100 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_14p$ | [1]° | 1/2,3/2 | 326 840 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_15p$ | [1]° | 1/2,3/2 | 329 865 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_16p$ | [1]° | 1/2,3/2 | 331 379 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_17p$ | [1]° | 1/2,3/2 | 332 292 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_15p(I)$ | ° | 1/2,3/2 | 332 502 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_18p$ | [1]° | 1/2,3/2 | 332 863 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_24p$ | ° | 1/2,3/2 | 333 059 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_19p$ | [1]° | 1/2,3/2 | 333 240 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_110p$ | [1]° | 1/2,3/2 | 333 518 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_111p$ | [1]° | 1/2,3/2 | 333 728 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_112p$ | [1]° | 1/2,3/2 | 333 866 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_113p$ | [1]° | 1/2,3/2 | 333 985 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_14p$ | ° | 1/2,3/2 | 334 044 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_114p$ | [1]° | 1/2,3/2 | 334 085 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_115p$ | [1]° | 1/2,3/2 | 334 169 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^3S_116p$ | [1]° | 1/2,3/2 | 334 213 | 11 | 94BAI/MAH | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 4p$(II) | ° | 1/2,3/2 | 334 616 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_2 5p$ | ° | 1/2,3/2 | 336 010 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 6p$(I) | ° | 1/2,3/2 | 336 259 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 5p$ | ° | 1/2,3/2 | 336 723 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 5p$(II) | ° | 1/2,3/2 | 337 257 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_2 6p$ | ° | 1/2,3/2 | 337 418 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 6p$ | ° | 1/2,3/2 | 338 149 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 7p$(I) | ° | 1/2,3/2 | 338 169 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_2 7p$ | ° | 1/2,3/2 | 338 301 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 6p$(II) | ° | 1/2,3/2 | 338 845 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_2 8p$ | ° | 1/2,3/2 | 338 857 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 7p$ | ° | 1/2,3/2 | 338 995 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_2 9p$ | ° | 1/2,3/2 | 339 248 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 8p$(I) | ° | 1/2,3/2 | 339 271 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3p\,^1D_2 10p$ | ° | 1/2,3/2 | 339 512 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 8p$ | ° | 1/2,3/2 | 339 570 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 7p$(II) | ° | 1/2,3/2 | 339 628 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 9p$ | ° | 1/2,3/2 | 339 928 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 9p$(I) | ° | 1/2,3/2 | 339 928 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 8p$(II) | ° | 1/2,3/2 | 340 171 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 10p$ | ° | 1/2,3/2 | 340 194 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 10p$(I) | ° | 1/2,3/2 | 340 379 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 11p$ | ° | 1/2,3/2 | 340 402 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 12p$ | ° | 1/2,3/2 | 340 553 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 9p$(II) | ° | 1/2,3/2 | 340 553 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 13p$ | ° | 1/2,3/2 | 340 669 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 11p$(I) | ° | 1/2,3/2 | 340 704 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1P_1 14p$ | ° | 1/2,3/2 | 340 762 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 10p$(II) | ° | 1/2,3/2 | 340 820 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 12p$(I) | ° | 1/2,3/2 | 340 948 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 11p$(II) | ° | 1/2,3/2 | 341 018 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 13p$(I) | ° | 1/2,3/2 | 341 111 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 12p$(II) | ° | 1/2,3/2 | 341 200 | 120 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 13p$(II) | ° | 1/2,3/2 | 341 380 | 120 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 14p$(II) | ° | 1/2,3/2 | 341 410 | 120 | 94BAI/MAH | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^5(^2P^\circ_{1/2})3p\,^3P_1 15p$(II) | $^\circ$ | 1/2,3/2 | 341 530 | 120 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 4p$ | $[1]^\circ$ | 1/2,3/2 | 342 614 | 9 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 5p$ | $[1]^\circ$ | 1/2,3/2 | 345 479 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 6p$ | $[1]^\circ$ | 1/2,3/2 | 347 026 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 7p$ | $[1]^\circ$ | 1/2,3/2 | 347 923 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 8p$ | $[1]^\circ$ | 1/2,3/2 | 348 500 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 9p$ | $[1]^\circ$ | 1/2,3/2 | 348 893 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 10p$ | $[1]^\circ$ | 1/2,3/2 | 349 166 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 11p$ | $[1]^\circ$ | 1/2,3/2 | 349 382 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 12p$ | $[1]^\circ$ | 1/2,3/2 | 349 516 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 13p$ | $[1]^\circ$ | 1/2,3/2 | 349 638 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 14p$ | $[1]^\circ$ | 1/2,3/2 | 349 736 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 15p$ | $[1]^\circ$ | 1/2,3/2 | 349 822 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 16p$ | $[1]^\circ$ | 1/2,3/2 | 349 871 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 17p$ | $[1]^\circ$ | 1/2,3/2 | 349 932 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 18p$ | $[1]^\circ$ | 1/2,3/2 | 349 981 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3p\,^1S_0 19p$ | $[1]^\circ$ | 1/2,3/2 | 350 005 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^3P^\circ_2 4s$ | $[2]^\circ$ | 3/2 | 350 016 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^1P^\circ_1 4s$ | $[1]^\circ$ | 1/2,3/2 | 350 447 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\,^3P^\circ_1 5s$ | $[1]^\circ$ | 1/2,3/2 | 351 753 | 12 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\,^3D^\circ_1 4s$ | $[1]^\circ$ | 1/2,3/2 | 355 619 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^1P^\circ_1 3d$ | $^\circ$ | 1/2,3/2 | 360 826 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\,^3P^\circ_1 3d$ | $^\circ$ | 1/2,3/2 | 361 126 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\,^1P^\circ_1 3d$ | $^\circ$ | 1/2,3/2 | 361 418 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^3P^\circ_2 5s$ | $[2]^\circ$ | 3/2 | 362 050 | 10 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^1P^\circ_1 5s$ | $[1]^\circ$ | 1/2,3/2 | 362 201 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\,^3P^\circ_1 6s$ | $[1]^\circ$ | 1/2,3/2 | 362 858 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^3F^\circ_2 4d$ | $^\circ$ | 1/2,3/2 | 364 766 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\,^3D^\circ_1 5s$ | $[1]^\circ$ | 1/2,3/2 | 364 990 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^3P^\circ_2 6s$ | $[2]^\circ$ | 3/2 | 366 205 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^1P^\circ_1 4d$ | $^\circ$ | 1/2,3/2 | 366 206 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\,^3P^\circ_1 4d$ | $^\circ$ | 1/2,3/2 | 366 425 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\,^1P^\circ_1 6s$ | $[1]^\circ$ | 1/2,3/2 | 366 932 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\,^3P^\circ_1 7s$ | $[1]^\circ$ | 1/2,3/2 | 367 215 | 13 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\,^1P^\circ_1 4d$ | $^\circ$ | 1/2,3/2 | 367 404 | 11 | 94BAI/MAH | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Uncertainty ($cm^{-1}$) | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 5d$ | ° | 1/2,3/2 | 367 954 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3P^\circ_2 7s$ | [2]° | 3/2 | 368 287 | 11 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 5d$ | ° | 1/2,3/2 | 368 745 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 5d$ | ° | 1/2,3/2 | 368 745 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 6s$ | [1]° | 1/2,3/2 | 368 949 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 7s$ | [1]° | 1/2,3/2 | 369 031 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 8s$ | [1]° | 1/2,3/2 | 369 331 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3P^\circ_2 8s$ | [2]° | 3/2 | 369 454 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 6d$ | ° | 1/2,3/2 | 369 645 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 5d$ | ° | 1/2,3/2 | 369 992 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 6d$ | ° | 1/2,3/2 | 370 096 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3P^\circ_2 9s$ | [2]° | 3/2 | 370 137 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 6d$ | ° | 1/2,3/2 | 370 206 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 8s$ | [1]° | 1/2,3/2 | 370 288 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 9s$ | [1]° | 1/2,3/2 | 370 535 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 7d$ | ° | 1/2,3/2 | 370 631 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3P^\circ_2 10s$ | [2]° | 3/2 | 370 645 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 7s$ | [1]° | 1/2,3/2 | 370 824 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 7d$ | ° | 1/2,3/2 | 370 906 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 9s$ | [1]° | 1/2,3/2 | 371 016 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 7d$ | ° | 1/2,3/2 | 371 016 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 8d$ | ° | 1/2,3/2 | 371 237 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 10s$ | [1]° | 1/2,3/2 | 371 237 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 6d$ | ° | 1/2,3/2 | 371 443 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 8d$ | ° | 1/2,3/2 | 371 471 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 10s$ | [1]° | 1/2,3/2 | 371 554 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 8d$ | ° | 1/2,3/2 | 371 568 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 9d$ | ° | 1/2,3/2 | 371 664 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^1P^\circ_1 9d$ | ° | 1/2,3/2 | 371 830 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 10d$ | ° | 1/2,3/2 | 371 941 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 9d$ | ° | 1/2,3/2 | 371 941 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 8s$ | [1]° | 1/2,3/2 | 371 941 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})3d\ ^3F^\circ_2 11d$ | ° | 1/2,3/2 | 372 148 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 10d$ | ° | 1/2,3/2 | 372 218 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 7d$ | ° | 1/2,3/2 | 372 273 | 15 | 94BAI/MAH | | | |

TABLE 2. Energy levels of Na I—Continued

| Configuration | Term | J | Energy $(cm^{-1})$ | Uncertainty $(cm^{-1})$ | Reference | Hyperfine constants A (MHz) | Hyperfine constants B (MHz) | Hyperfine reference |
|---|---|---|---|---|---|---|---|---|
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 11d$ | ° | 1/2,3/2 | 372 398 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 12d$ | ° | 1/2,3/2 | 372 550 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 9s$ | [1]° | 1/2,3/2 | 372 606 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 13d$ | ° | 1/2,3/2 | 372 662 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{3/2})4s\ ^3P^\circ_1 14d$ | ° | 1/2,3/2 | 372 759 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 8d$ | ° | 1/2,3/2 | 372 800 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 10s$ | [1]° | 1/2,3/2 | 373 051 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 9d$ | ° | 1/2,3/2 | 373 176 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 11s$ | [1]° | 1/2,3/2 | 373 371 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 10d$ | ° | 1/2,3/2 | 373 455 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 12s$ | [1]° | 1/2,3/2 | 373 608 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})4s\ ^1P^\circ_1 11d$ | ° | 1/2,3/2 | 373 636 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 13s$ | [1]° | 1/2,3/2 | 373 776 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 14s$ | [1]° | 1/2,3/2 | 373 916 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 15s$ | [1]° | 1/2,3/2 | 374 000 | 15 | 94BAI/MAH | | | |
| $2p^5(^2P^\circ_{1/2})3d\ ^3D^\circ_1 16s$ | [1]° | 1/2,3/2 | 374 070 | 15 | 94BAI/MAH | | | |
| $2s(^2S)2p^6 3s3p(^3P^\circ)$ | $^2P^\circ$ | 1/2,3/2 | 535 330 | 200 | 81LAV/MEH | | | |
| $2s(^2S)2p^6 3s3p(^1P^\circ)$ | $^2P^\circ$ | 1/2,3/2 | 546 600 | 300 | 81LAV/MEH | | | |
| $2s2p^6 3s(^3S)4p$ | $^2P^\circ$ | 1/2,3/2 | 559 600 | 300 | 81LAV/MEH | | | |
| **Na II ($2s2p^6 3s\ ^3S_1$)** | *Limit* | — | 572 350 | 200 | 94DOR | | | |
| **Na II ($2s2p^6 3s\ ^1S_0$)** | *Limit* | — | 575 750 | 200 | 94DOR | | | |
| $2s2p^6 3p(^3P^\circ)4s$ | $^2P^\circ$ | 1/2,3/2 | 586 200 | 300 | 81LAV/MEH | | | |
| $2s2p^6 3p(^1P^\circ)4s$ | $^2P^\circ$ | 1/2,3/2 | 591 400 | 300 | 81LAV/MEH | | | |
| $2s2p^6 3p(^3P^\circ)3d$ | $^2P^\circ$ | 1/2,3/2 | 594 600 | 400 | 81LAV/MEH | | | |
| $2s2p^6 3p(^3P^\circ)5s$ | $^2P^\circ$ | 1/2,3/2 | 596 400 | 400 | 81LAV/MEH | | | |
| $2s2p^6 3p(^3P^\circ)6s$ | $^2P^\circ$ | 1/2,3/2 | 600 000 | 400 | 81LAV/MEH | | | |
| $2s2p^6(^2S)4s4p(^3P^\circ)$ | $^2P^\circ$ | 1/2,3/2 | 618 900 | 400 | 81LAV/MEH | | | |
| $2s2p^6(^2S)4s5p(^3P^\circ)$ | $^2P^\circ$ | 1/2,3/2 | 629 700 | 800 | 81LAV/MEH | | | |
| $2s2p^6(^2S)3d4p(^3P^\circ)$ | $^2P^\circ$ | 1/2,3/2 | 636 600 | 400 | 81LAV/MEH | | | |

## 6.2. Na II

**Ne isoelectronic sequence**
**Ground state** $1s^2 2s^2 2p^6\ ^1S_0$
**Ionization energy** 381 390(2) $cm^{-1}$; 47.2867(3) eV

The foundation of the analysis of the Na II spectrum is the research by Bowen [28BOW] and Frisch [31FRI], who identified the resonance transitions at 375 Å and lines involving the $2s^2 2p^5 3s$, $3p$, and $3d$ configurations between 2500 Å and 3700 Å. The spectrum from 270 Å to 6566 Å was remeasured to greater accuracy by Wu [71WU], who also reanalyzed and extended the known energy levels. The autoionizing $2s2p^6 np\ ^1P^\circ_1$ levels were observed by Lucatorto and McIlrath [76LUC/MCI] in absorption for $3 \leqslant n \leqslant 8$. Electron impact excitation was used by Breuckmann *et al.* [77BRE/

BRE] to locate the $2s2p^6 3s\ ^3S$ and $^1S$ and $2s2p^6 3p\ ^3P^\circ$ levels. More recently Dorn *et al.* [94DOR, 95DOR/NIE, 95DOR/WIN, 97NIE/ZAT] started with neutral sodium and used one- and two-step laser excitations, along with electron impact excitation, to observe higher members of the $2s2p^6 ns$, $np$, and $nd$ series. For many of these, the triplet and singlet states were unresolved and thus only the $3s$, $4s$, and $3p-8p$ levels are included here. In 1981, Martin and Zalubas [81MAR/ZAL] integrated the extant energy level data for Na II into a consistent set of values. Except for the newly available data of [95DOR/NIE, 94DOR], the energy level values and leading percentages are taken from [81MAR/ZAL] (see Tables 3 and 4).

The transition probabilities of allowed transitions of Na II have been calculated by Hibbert *et al.* [93HIB/DOU] using a modified Breit-Pauli Hamiltonian, and Froese Fischer and Tachiev [04FRO/TAC], who used a multiconfiguration Hartree-Fock approach. Träbert [96TRA] measured the lifetimes of the $2p^5 3s\ ^1P^\circ_1$ and $^3P^\circ_1$ levels, from which the transition probabilities can be calculated. Most of these values have been critically evaluated and incorporated into a compilation of sodium transition probabilities by Kelleher and Podobedova [08KEL/POD]. The ionization energy cited above was determined by Wu [71WU] from the $2s^2 2p^5 nf$ series for $n=4-6$.

### References for Na II


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TABLE 3. Observed spectral lines of Na II

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | | |
| 156.88 | 0.05 | 637 430 | | | | $2p^6\ ^1S_0$ | $2s2p^6 8p\ ^1P^\circ_1$ | 76LUC/MCI | |
| 157.55 | 0.05 | 634 720 | | | | $2p^6\ ^1S_0$ | $2s2p^6 7p\ ^1P^\circ_1$ | 76LUC/MCI | |
| 158.67 | 0.05 | 630 240 | | | | $2p^6\ ^1S_0$ | $2s2p^6 6p\ ^1P^\circ_1$ | 76LUC/MCI | |
| 160.66 | 0.05 | 622 430 | | | | $2p^6\ ^1S_0$ | $2s2p^6 5p\ ^1P^\circ_1$ | 76LUC/MCI | |
| 164.92 | 0.05 | 606 360 | | | | $2p^6\ ^1S_0$ | $2s2p^6 4p\ ^1P^\circ_1$ | 76LUC/MCI | |
| 177.24 | 0.05 | 564 210 | | | 5.29E+9 | $2p^6\ ^1S_0$ | $2s2p^6 3p\ ^1P^\circ_1$ | 76LUC/MCI | 93HIB/DOU |
| 263.06 | 0.05 | 380 140 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})13d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 263.06 | 0.05 | 380 140 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})14s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 263.39 | 0.05 | 379 660 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})13s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 263.39 | 0.05 | 379 660 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})12d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 263.81 | 0.05 | 379 060 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})11d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 263.81 | 0.05 | 379 060 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})12s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 264.34 | 0.05 | 378 300 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})13s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 264.34 | 0.05 | 378 300 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})10d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 264.34 | 0.05 | 378 300 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})11s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 264.34 | 0.05 | 378 300 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})12d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 264.76 | 0.05 | 377 700 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})11d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 264.76 | 0.05 | 377 700 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})12s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 265.08 | 0.05 | 377 240 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})9d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 265.08 | 0.05 | 377 240 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})10s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 265.30 | 0.05 | 376 930 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})11s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 265.30 | 0.05 | 376 930 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})10d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 266.06 | 0.05 | 375 860 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})9d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 266.06 | 0.05 | 375 860 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})9s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 266.06 | 0.05 | 375 860 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})10s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 266.06 | 0.05 | 375 860 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})8d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 267.06 | 0.05 | 374 450 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})8d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 267.06 | 0.05 | 374 450 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})9s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 267.61 | 0.05 | 373 680 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})8s\ ^2[1/2]^\circ_1$ | 76LUC/MCI | |
| 267.61 | 0.05 | 373 680 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})7d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 268.88 | 0.05 | 371 910 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})7d\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 268.88 | 0.05 | 371 910 | * | b | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})8s\ ^2[3/2]^\circ_1$ | 76LUC/MCI | |
| 269.993 | 0.003 | 370 380 | 10 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 270.947 | 0.003 | 369 076 | 7 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})7s\ ^2[3/2]^\circ_1$ | 71WU | |
| 271.373 | 0.003 | 368 496 | 5 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})6d\ ^2[1/2]^\circ_1$ | 71WU | |
| 273.940 | 0.003 | 365 043 | 12 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 274.023 | 0.003 | 364 933 | 12 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 274.931 | 0.003 | 363 728 | 20 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_1$ | 71WU | |
| 275.003 | 0.003 | 363 632 | 20 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 275.218 | 0.003 | 363 348 | 5 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_1$ | 71WU | |
| 281.691 | 0.003 | 354 999 | 25 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 281.788 | 0.003 | 354 877 | 25 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 282.709 | 0.003 | 353 721 | 35 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 282.803 | 0.003 | 353 603 | 35 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 283.258 | 0.003 | 353 035 | 15 | | | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 300.153 | 0.003 | 333 163 | 160 | | 1.18E+9 | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 300.202 | 0.003 | 333 109 | 160 | | 1.17E+9 | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 301.318 | 0.003 | 331 875 | 90 | | 3.62E+8 | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 301.436 | 0.003 | 331 745 | 100 | | 3.33E+9 | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 302.446 | 0.003 | 330 638 | 60 | | 5.95E+7 | $2p^6\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 365.584 | 0.003 | 273 535 | 7 | | | | | 71WU | |
| 372.075 | 0.003 | 268 763 | 300 | | 3.13E+9 | $2p^6\ ^1S_0$ | $2p^53s\ ^1P^\circ_1$ | 71WU | 96TRA |
| 375.340 | 0.003 | 266 425 | 40 | | | | | 71WU | |
| 375.730 | 0.003 | 266 149 | 45 | | | | | 71WU | |
| 376.379 | 0.003 | 265 690 | 350 | | 1.7E+8 | $2p^6\ ^1S_0$ | $2p^53s\ ^3P^\circ_1$ | 71WU | 96TRA |
| 376.921 | 0.003 | 265 308 | 45 | | | | | 71WU | |
| 383.399 | 0.003 | 260 825 | 12 | | | | | 71WU | |
| 389.362 | 0.003 | 256 830 | 7 | | | | | 71WU | |
| 394.904 | 0.003 | 253 226 | 2 | | | | | 71WU | |
| 479.385 | 0.003 | 208 601 | 2 | | | | | 71WU | |
| 516.715 | 0.003 | 193 530.3 | 5 | | | | | 71WU | |
| 534.714 | 0.003 | 187 015.9 | 10 | | | | | 71WU | |
| 544.509 | 0.003 | 183 651.7 | 30 | | | | | 71WU | |
| 573.639 | 0.003 | 174 325.7 | 5 | | | | | 71WU | |
| 617.415 | 0.003 | 161 965.6 | 7 | | | | | 71WU | |
| 619.876 | 0.003 | 161 322.6 | 10 | | | | | 71WU | |
| 623.704 | 0.003 | 160 332.5 | 5 | | | | | 71WU | |
| 638.832 | 0.003 | 156 535.7 | 5 | | | | | 71WU | |
| 642.524 | 0.003 | 155 636.2 | 7 | | | | | 71WU | |
| 644.400 | 0.003 | 155 183.1 | 30 | | | | | 71WU | |
| 659.378 | 0.003 | 151 658.1 | 5 | | | | | 71WU | |
| 681.896 | 0.003 | 146 649.9 | 7 | | | | | 71WU | |
| 689.605 | 0.003 | 145 010.5 | 20 | | | | | 71WU | |
| 691.799 | 0.003 | 144 550.7 | 12 | | | | | 71WU | |
| 706.677 | 0.003 | 141 507.4 | 7 | | | | | 71WU | |
| 719.891 | 0.003 | 138 909.9 | 7 | | | | | 71WU | |
| 745.157 | 0.003 | 134 199.9 | 50 | | | | | 71WU | |
| 757.331 | 0.003 | 132 042.7 | 60 | | | | | 71WU | |
| 757.892 | 0.003 | 131 944.9 | 45 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 759.225 | 0.003 | 131 713.3 | 60 | | | | | 71WU | |
| 765.788 | 0.003 | 130 584.4 | 20 | | | | | 71WU | |
| 766.429 | 0.003 | 130 475.2 | 20 | | | | | 71WU | |
| 776.668 | 0.003 | 128 755.1 | 20 | | | | | 71WU | |
| 778.413 | 0.003 | 128 466.5 | 40 | | | | | 71WU | |
| 780.422 | 0.003 | 128 135.8 | 12 | | | | | 71WU | |
| 781.171 | 0.003 | 128 012.9 | 12 | | | | | 71WU | |
| 781.752 | 0.003 | 127 917.8 | 20 | | | | | 71WU | |
| 782.900 | 0.003 | 127 730.2 | 30 | | | | | 71WU | |
| 785.088 | 0.003 | 127 374.3 | 40 | | | | | 71WU | |
| 786.009 | 0.003 | 127 225 | 30 | | | | | 71WU | |
| 786.477 | 0.003 | 127 149.3 | 15 | | | | | 71WU | |
| 788.369 | 0.003 | 126 844.2 | 25 | | | | | 71WU | |
| 789.177 | 0.003 | 126 714.3 | 20 | | | | | 71WU | |
| 790.546 | 0.003 | 126 494.9 | 70 | | | | | 71WU | |
| 796.301 | 0.003 | 125 580.7 | 20 | | | | | 71WU | |
| 798.013 | 0.003 | 125 311.2 | 15 | | | | | 71WU | |
| 802.197 | 0.003 | 124 657.7 | 20 | | | | | 71WU | |
| 809.413 | 0.003 | 123 546.3 | 15 | | | | | 71WU | |
| 815.631 | 0.003 | 122 604.5 | 20 | | | | | 71WU | |
| 830.105 | 0.003 | 120 466.7 | 20 | | | | | 71WU | |
| 831.528 | 0.003 | 120 260.5 | 30 | | | | | 71WU | |
| 844.341 | 0.003 | 118 435.6 | 12 | | | | | 71WU | |
| 868.738 | 0.003 | 115 109.5 | 30 | | | | | 71WU | |
| 871.473 | 0.003 | 114 748.2 | 12 | | | | | 71WU | |
| 893.899 | 0.003 | 111 869.5 | 25 | | | | | 71WU | |
| 895.054 | 0.003 | 111 725.1 | 20 | | | | | 71WU | |
| 899.342 | 0.003 | 111 192.4 | 20 | | | | | 71WU | |
| 900.904 | 0.003 | 110 999.6 | 30 | | | | | 71WU | |
| 902.763 | 0.003 | 110 771 | 25 | | | | | 71WU | |
| 911.067 | 0.003 | 109 761.4 | 25 | | | | | 71WU | |
| 911.815 | 0.003 | 109 671.4 | 20 | | | | | 71WU | |
| 915.217 | 0.003 | 109 263.7 | 20 | | | | | 71WU | |
| 922.829 | 0.003 | 108 362.4 | 25 | | | | | 71WU | |
| 948.887 | 0.003 | 105 386.6 | 20 | | | | | 71WU | |
| 952.570 | 0.003 | 104 979.2 | 25 | | | | | 71WU | |
| 954.299 | 0.003 | 104 789 | 20 | | | | | 71WU | |
| 956.676 | 0.003 | 104 528.6 | 20 | | | | | 71WU | |
| 958.020 | 0.003 | 104 382 | 20 | | | | | 71WU | |
| 958.450 | 0.003 | 104 335.1 | 30 | | | | | 71WU | |
| 960.686 | 0.003 | 104 092.3 | 20 | | | | | 71WU | |
| 966.112 | 0.003 | 103 507.7 | 25 | | | | | 71WU | |
| 969.865 | 0.003 | 103 107.1 | 30 | | | | | 71WU | |
| 978.207 | 0.003 | 102 227.9 | 50 | | | | | 71WU | |
| 990.613 | 0.003 | 100 947.6 | 45 | | | | | 71WU | |
| 993.054 | 0.003 | 100 699.5 | 40 | | | | | 71WU | |
| 1006.185 | 0.003 | 99 385.3 | 30 | | | | | 71WU | |
| 1009.428 | 0.003 | 99 066 | 30 | | | | | 71WU | |
| 1034.162 | 0.003 | 96 696.6 | 45 | | | | | 71WU | |
| 1059.066 | 0.003 | 94 422.8 | 35 | | | | | 71WU | |
| 1067.165 | 0.003 | 93 706.2 | 35 | | | | | 71WU | |
| 1068.016 | 0.003 | 93 631.6 | 40 | | | | | 71WU | |
| 1080.885 | 0.003 | 92 516.8 | 45 | | | | | 71WU | |
| 1081.079 | 0.003 | 92 500.2 | 30 | | | | | 71WU | |
| 1081.836 | 0.003 | 92 435.5 | 35 | | | | | 71WU | |
| 1083.594 | 0.003 | 92 285.5 | 20 | | | | | 71WU | |
| 1085.003 | 0.003 | 92 165.6 | 40 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1087.238 | 0.003 | 91 976.2 | 20 | | | | | 71WU | |
| 1087.701 | 0.003 | 91 937 | 15 | | | | | 71WU | |
| 1087.895 | 0.003 | 91 920.6 | 25 | | | | | 71WU | |
| 1088.699 | 0.003 | 91 852.8 | 50 | | | | | 71WU | |
| 1093.447 | 0.003 | 91 453.9 | 25 | | | | | 71WU | |
| 1125.502 | 0.003 | 88 849.2 | 50 | | | | | 71WU | |
| 1133.390 | 0.003 | 88 230.9 | 160 | | | | | 71WU | |
| 1137.020 | 0.003 | 87 949.2 | 60 | | | | | 71WU | |
| 1143.185 | 0.003 | 87 474.9 | 60 | | | | | 71WU | |
| 1146.157 | 0.003 | 87 248.1 | 60 | | | | | 71WU | |
| 1147.967 | 0.003 | 87 110.5 | 60 | | | | | 71WU | |
| 1157.291 | 0.003 | 86 408.7 | 40 | | | | | 71WU | |
| 1165.548 | 0.003 | 85 796.6 | 60 | | | | | 71WU | |
| 1170.046 | 0.003 | 85 466.7 | 35 | | | | | 71WU | |
| 1172.698 | 0.003 | 85 273.4 | 50 | | | | | 71WU | |
| 1172.969 | 0.003 | 85 253.7 | 40 | | | | | 71WU | |
| 1176.794 | 0.003 | 84 976.6 | 160 | | | | | 71WU | |
| 1177.238 | 0.003 | 84 944.6 | 60 | | | | | 71WU | |
| 1177.426 | 0.003 | 84 931 | 60 | | | | | 71WU | |
| 1178.256 | 0.003 | 84 871.2 | 130 | | | | | 71WU | |
| 1178.777 | 0.003 | 84 833.7 | 60 | | | | | 71WU | |
| 1179.212 | 0.003 | 84 802.4 | 60 | | | | | 71WU | |
| 1179.623 | 0.003 | 84 772.8 | 40 | | | | | 71WU | |
| 1180.153 | 0.003 | 84 734.8 | 60 | | | | | 71WU | |
| 1183.109 | 0.003 | 84 523.1 | 70 | | | | | 71WU | |
| 1183.498 | 0.003 | 84 495.3 | 30 | | | | | 71WU | |
| 1184.421 | 0.003 | 84 429.4 | 70 | | | | | 71WU | |
| 1198.237 | 0.003 | 83 455.9 | 25 | | | | | 71WU | |
| 1198.767 | 0.003 | 83 419 | 40 | | | | | 71WU | |
| 1199.941 | 0.003 | 83 337.4 | 35 | | | | | 71WU | |
| 1200.079 | 0.003 | 83 327.8 | 30 | | | | | 71WU | |
| 1213.998 | 0.003 | 82 372.5 | 30 | | | | | 71WU | |
| 1217.472 | 0.003 | 82 137.4 | 45 | | | | | 71WU | |
| 1242.048 | 0.003 | 80 512.2 | 15 | | | | | 71WU | |
| 1242.650 | 0.003 | 80 473.2 | 20 | | | | | 71WU | |
| 1243.427 | 0.003 | 80 422.9 | 30 | | | | | 71WU | |
| 1244.511 | 0.003 | 80 352.8 | 20 | | | | | 71WU | |
| 1254.813 | 0.003 | 79 693.1 | 30 | | | | | 71WU | |
| 1255.354 | 0.003 | 79 658.8 | 25 | | | | | 71WU | |
| 1264.891 | 0.003 | 79 058.2 | 12 | | | | | 71WU | |
| 1268.947 | 0.003 | 78 805.5 | 25 | | | | | 71WU | |
| 1282.348 | 0.003 | 77 982 | 15 | | | | | 71WU | |
| 1285.384 | 0.003 | 77 797.8 | 30 | | | | | 71WU | |
| 1293.974 | 0.003 | 77 281.3 | 60 | | | $2p^53s\ ^3P^\circ_1$ | $2p^5(^2P^\circ_{1/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1294.696 | 0.003 | 77 238.2 | 15 | | | | | 71WU | |
| 1295.164 | 0.003 | 77 210.3 | 30 | | | | | 71WU | |
| 1297.856 | 0.003 | 77 050.2 | 12 | | | $2p^53s\ ^3P^\circ_1$ | $2p^5(^2P^\circ_{1/2})4p\ ^2[3/2]_1$ | 71WU | |
| 1298.142 | 0.003 | 77 033.2 | 15 | | | | | 71WU | |
| 1299.018 | 0.003 | 76 981.2 | 30 | | | $2p^53s\ ^3P^\circ_2$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[3/2]_2$? | 71WU | |
| 1299.895 | 0.003 | 76 929.3 | 60 | | | | | 71WU | |
| 1303.957 | 0.003 | 76 689.6 | 15 | | | $2p^53s^3P^\circ_0$ | $2p^5(^2P^\circ_{1/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1304.546 | 0.003 | 76 655 | 15 | | | | | 71WU | |
| 1306.618 | 0.003 | 76 533.5 | 20 | | | $2p^53s\ ^3P^\circ_2$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[5/2]_2$ | 71WU | |
| 1307.936 | 0.003 | 76 456.3 | 10 | | | $2p^53s\ ^3P^\circ_0$ | $2p^5(^2P^\circ_{1/2})4p\ ^2[3/2]_1$ | 71WU | |
| 1310.078 | 0.003 | 76 331.3 | 45 | | | | | 71WU | |
| 1311.158 | 0.003 | 76 268.5 | 10 | | | | | 71WU | |
| 1312.026 | 0.003 | 76 218 | 30 | | | $2p^53s\ ^3P^\circ_1$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[3/2]_2$? | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1312.587 | 0.003 | 76 185.4 | 20 | | | | | 71WU | |
| 1316.530 | 0.003 | 75 957.3 | 12 | | | | | 71WU | |
| 1319.815 | 0.003 | 75 768.2 | 30 | | | $2p^53s\ ^3P^\circ_1$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[5/2]_2$ | 71WU | |
| 1322.295 | 0.003 | 75 626.1 | 12 | | | | | 71WU | |
| 1327.742 | 0.003 | 75 315.8 | 50 | | | $2p^53s\ ^2P^\circ_2$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1328.497 | 0.003 | 75 273 | 12 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})6d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1329.354 | 0.003 | 75 224.5 | 30 | | | | | 71WU | |
| 1336.112 | 0.003 | 74 844 | 25 | | | | | 71WU | |
| 1338.575 | 0.003 | 74 706.3 | 35 | | | | | 71WU | |
| 1341.369 | 0.003 | 74 550.7 | 35 | | | $2p^53s\ ^3P^\circ_1$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1342.401 | 0.003 | 74 493.4 | 20 | | | | | 71WU | |
| 1347.210 | 0.003 | 74 227.5 | 35 | | | | | 71WU | |
| 1347.543 | 0.003 | 74 209.1 | 45 | | | $2p^53s\ ^1P^\circ_1$ | $2p^5(^2P^\circ_{1/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1349.602 | 0.003 | 74 095.9 | 15 | | | | | 71WU | |
| 1349.876 | 0.003 | 74 080.9 | 25 | | | | | 71WU | |
| 1351.799 | 0.003 | 73 975.5 | 12 | | | $2p^53s\ ^1P^\circ_1$ | $2p^5(^2P^\circ_{1/2})4p\ ^2[3/2]_1$ | 71WU | |
| 1352.118 | 0.003 | 73 958 | 35 | | | $2p^53s\ ^3P^\circ_0$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1352.904 | 0.003 | 73 915.1 | 130 | | | | | 71WU | |
| 1359.055 | 0.003 | 73 580.5 | 20 | | | | | 71WU | |
| 1361.217 | 0.003 | 73 463.7 | 15 | | | | | 71WU | |
| 1366.242 | 0.003 | 73 193.5 | 15 | | | | | 71WU | |
| 1373.451 | 0.003 | 72 809.3 | 15 | | | | | 71WU | |
| 1374.688 | 0.003 | 72 743.8 | 90 | | | $2p^53p\ ^2D_2$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1375.618 | 0.003 | 72 694.6 | 15 | | | $2p^53s\ ^1P^\circ_1$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[5/2]_2$ | 71WU | |
| 1380.623 | 0.003 | 72 431.1 | 12 | | | | | 71WU | |
| 1381.236 | 0.003 | 72 398.9 | 30 | | | $2p^53p\ ^2D_2$ | $2p^5(^2P^\circ_{1/2})6d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1381.633 | 0.003 | 72 378.1 | 12 | | | | | 71WU | |
| 1384.794 | 0.003 | 72 212.9 | 10 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1385.296 | 0.003 | 72 186.7 | 10 | | | | | 71WU | |
| 1385.465 | 0.003 | 72 177.9 | 12 | | | | | 71WU | |
| 1386.076 | 0.003 | 72 146.1 | 10 | | | | | 71WU | |
| 1392.072 | 0.003 | 71 835.4 | 15 | | | | | 71WU | |
| 1392.316 | 0.003 | 71 822.8 | 10 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1392.940 | 0.003 | 71 790.6 | 15 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1395.193 | 0.003 | 71 674.7 | 10 | | | | | 71WU | |
| 1398.143 | 0.003 | 71 523.4 | 12 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1399.070 | 0.003 | 71 476.1 | 30 | | | $2p^53s\ ^1P^\circ_1$ | $2p^5(^2P^\circ_{3/2})4p\ ^2[1/2]_1$ | 71WU | |
| 1399.860 | 0.003 | 71 435.7 | 12 | | | $2p^53p\ ^2D_2$ | $2p^5(^2P^\circ_{3/2})7s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1404.675 | 0.003 | 71 190.8 | 90 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1406.850 | 0.003 | 71 080.8 | 15 | | | | | 71WU | |
| 1407.308 | 0.003 | 71 057.7 | 25 | | | | | 71WU | |
| 1410.374 | 0.003 | 70 903.2 | 12 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})7s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1411.536 | 0.003 | 70 844.8 | 7 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})6d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1415.762 | 0.003 | 70 633.3 | 10 | | | | | 71WU | |
| 1418.579 | 0.003 | 70 493.1 | 20 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1419.311 | 0.003 | 70 456.7 | 15 | | | | | 71WU | |
| 1420.216 | 0.003 | 70 411.8 | 12 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1421.889 | 0.003 | 70 329 | 7 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})6d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1422.996 | 0.003 | 70 274.3 | 12 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1425.499 | 0.003 | 70 150.9 | 7 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})6d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1426.048 | 0.003 | 70 123.9 | 7 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1428.889 | 0.003 | 69 984.4 | 7 | | | | | 71WU | |
| 1429.963 | 0.003 | 69 931.9 | 10 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})6d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1430.166 | 0.003 | 69 922.0 | 7 | | | | | 71WU | |
| 1431.015 | 0.003 | 69 880.5 | 7 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})7s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1431.228 | 0.003 | 69 870.1 | 15 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})7s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1435.054 | 0.003 | 69 683.8 | 10 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1435.776 | 0.003 | 69 648.7 | 10 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{1/2})6d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1442.907 | 0.003 | 69 304.5 | 30 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})6d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1454.976 | 0.003 | 68 729.7 | 15 | | | | | 71WU | |
| 1455.969 | 0.003 | 68 682.8 | 12 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})7s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1459.748 | 0.003 | 68 505.0 | 15 | | | | | 71WU | |
| 1460.775 | 0.003 | 68 456.8 | 10 | | | | | 71WU | |
| 1462.160 | 0.003 | 68 392.0 | 10 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})6d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1470.916 | 0.003 | 67 984.8 | 10 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})6d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1472.642 | 0.003 | 67 905.2 | 7 | | | | | 71WU | |
| 1473.826 | 0.003 | 67 850.6 | 12 | | | | | 71WU | |
| 1474.687 | 0.003 | 67 811.0 | 12 | | | | | 71WU | |
| 1475.411 | 0.003 | 67 777.7 | 15 | | | | | 71WU | |
| 1475.530 | 0.003 | 67 772.3 | 15 | | | | | 71WU | |
| 1476.301 | 0.003 | 67 736.9 | 10 | | | | | 71WU | |
| 1476.673 | 0.003 | 67 719.8 | 10 | | | | | 71WU | |
| 1481.578 | 0.003 | 67 495.6 | 15 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1483.570 | 0.003 | 67 405.0 | 15 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1485.443 | 0.003 | 67 320.0 | 20 | | | | | 71WU | |
| 1485.987 | 0.003 | 67 295.3 | 25 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1486.300 | 0.003 | 67 281.2 | 25 | | | | | 71WU | |
| 1489.261 | 0.003 | 67 147.4 | 50 | | | | | 71WU | |
| 1492.371 | 0.003 | 67 007.5 | 20 | | | | | 71WU | |
| 1494.943 | 0.003 | 66 892.2 | 20 | | | | | 71WU | |
| 1495.212 | 0.003 | 66 880.1 | 45 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1496.011 | 0.003 | 66 844.4 | 40 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1497.731 | 0.003 | 66 767.7 | 45 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1500.006 | 0.003 | 66 666.4 | 25 | | | | | 71WU | |
| 1501.427 | 0.003 | 66 603.3 | 35 | | | | | 71WU | |
| 1501.995 | 0.003 | 66 578.1 | 25 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1502.661 | 0.003 | 66 548.6 | 30 | | | | | 71WU | |
| 1503.469 | 0.003 | 66 512.8 | 35 | | | | | 71WU | |
| 1506.407 | 0.003 | 66 383.1 | 80 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1506.914 | 0.003 | 66 360.8 | 60 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1507.869 | 0.003 | 66 318.8 | 35 | | | | | 71WU | |
| 1508.981 | 0.003 | 66 269.9 | 30 | | | | | 71WU | |
| 1510.518 | 0.003 | 66 202.5 | 35 | | | | | 71WU | |
| 1510.701 | 0.003 | 66 194.4 | 35 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1511.040 | 0.003 | 66 179.6 | 40 | | | | | 71WU | |
| 1513.102 | 0.003 | 66 089.4 | 70 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1513.487 | 0.003 | 66 072.6 | 50 | | | | | 71WU | |
| 1513.953 | 0.003 | 66 052.2 | 35 | | | | | 71WU | |
| 1514.21 | 0.10 | 66 041.0 | | | | | | 71WU | |
| 1514.241 | 0.003 | 66 039.7 | 30 | | | | | 71WU | |
| 1514.632 | 0.003 | 66 022.6 | 30 | | | | | 71WU | |
| 1515.229 | 0.003 | 65 996.6 | 30 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1515.709 | 0.003 | 65 975.7 | 30 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1516.219 | 0.003 | 65 953.5 | 25 | | | | | 71WU | |
| 1517.604 | 0.003 | 65 893.3 | 30 | | | | | 71WU | |
| 1518.042 | 0.003 | 65 874.3 | 30 | | | | | 71WU | |
| 1518.505 | 0.003 | 65 854.2 | 35 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1518.664 | 0.003 | 65 847.4 | 35 | | | | | 71WU | |
| 1519.005 | 0.003 | 65 832.6 | 40 | | | | | 71WU | |
| 1519.629 | 0.003 | 65 805.5 | 60 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1523.388 | 0.003 | 65 643.2 | 30 | | | | | 71WU | |
| 1525.311 | 0.003 | 65 560.4 | 30 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1526.021 | 0.003 | 65 529.9 | 15 | | | | | 71WU | |
| 1527.555 | 0.003 | 65 464.1 | 15 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1527.985 | 0.003 | 65 445.7 | 20 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1528.532 | 0.003 | 65 422.2 | 20 | | | | | 71WU | |
| 1529.208 | 0.003 | 65 393.3 | 15 | | | | | 71WU | |
| 1531.497 | 0.003 | 65 295.6 | 20 | | | | | 71WU | |
| 1533.176 | 0.003 | 65 224.1 | 10 | | | | | 71WU | |
| 1534.163 | 0.003 | 65 182.1 | 10 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1534.538 | 0.003 | 65 166.2 | 25 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_0$ | 71WU | |
| 1534.737 | 0.003 | 65 157.7 | 12 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1539.895 | 0.003 | 64 939.5 | 12 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1540.688 | 0.003 | 64 906.1 | 7 | | | | | 71WU | |
| 1543.665 | 0.003 | 64 780.9 | 12 | | | | | 71WU | |
| 1547.066 | 0.003 | 64 638.5 | 15 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1549.392 | 0.003 | 64 541.4 | 20 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1549.507 | 0.003 | 64 536.7 | 20* | b | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1549.507 | 0.003 | 64 536.7 | 20* | b | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1550.095 | 0.003 | 64 512.2 | 15 | | | | | 71WU | |
| 1550.348 | 0.003 | 64 501.6 | 20 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1551.793 | 0.003 | 64 441.6 | 20 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1552.203 | 0.003 | 64 424.6 | 20 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1556.370 | 0.003 | 64 252.1 | 15 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1556.753 | 0.003 | 64 236.3 | 12 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1557.557 | 0.003 | 64 203.1 | 7 | | | | | 71WU | |
| 1558.678 | 0.003 | 64 156.9 | 7 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1565.838 | 0.003 | 63 863.6 | 12 | | | | | 71WU | |
| 1566.262 | 0.003 | 63 846.3 | 12 | | | | | 71WU | |
| 1568.673 | 0.003 | 63 748.1 | 10 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1569.264 | 0.003 | 63 724.1 | 20 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1570.024 | 0.003 | 63 693.3 | 12 | | | | | 71WU | |
| 1571.205 | 0.003 | 63 645.4 | 7 | | | | | 71WU | |
| 1573.430 | 0.003 | 63 555.4 | 10 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1574.110 | 0.003 | 63 528.0 | 12 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1574.664 | 0.003 | 63 505.6 | 7 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1575.039 | 0.003 | 63 490.5 | 10 | | | | | 71WU | |
| 1575.749 | 0.003 | 63 461.9 | 15 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1576.118 | 0.003 | 63 447.0 | 12 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_0$ | 71WU | |
| 1578.807 | 0.003 | 63 339.0 | 12* | b | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1578.807 | 0.003 | 63 339.0 | 12* | b | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1579.180 | 0.003 | 63 324.0 | 15 | | | | | 71WU | |
| 1579.408 | 0.003 | 63 314.9 | 12 | | | | | 71WU | |
| 1579.993 | 0.003 | 63 291.4 | 20 | | | | | 71WU | |
| 1581.108 | 0.003 | 63 246.8 | 25 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1581.835 | 0.003 | 63 217.7 | 20 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})6s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1584.173 | 0.003 | 63 124.4 | 20 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1587.080 | 0.003 | 63 008.8 | 30 | | | | | 71WU | |
| 1587.807 | 0.003 | 62 979.9 | 5 | | | | | 71WU | |
| 1588.764 | 0.003 | 62 942.0 | 15 | | | | | 71WU | |
| 1588.983 | 0.003 | 62 933.3 | 7 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1591.321 | 0.003 | 62 840.9 | 15 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1591.712 | 0.003 | 62 825.4 | 7 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})5d\ ^2[1/2]^\circ_0$ | 71WU | |
| 1594.752 | 0.003 | 62 705.7 | 2 | | | | | 71WU | |
| 1604.888 | 0.003 | 62 309.6 | 25 | | | | | 71WU | |
| 1607.514 | 0.003 | 62 207.9 | 45 | | | | | 71WU | |
| 1617.896 | 0.003 | 61 808.7 | 10 | | | | | 71WU | |
| 1621.940 | 0.003 | 61 654.6 | 12 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1622.347 | 0.003 | 61 639.1 | 12 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1626.372 | 0.003 | 61 486.5 | 20 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1630.579 | 0.003 | 61 327.9 | 1 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | $\sigma$ ($cm^{-1}$) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1634.057 | 0.003 | 61 197.4 | 15 | | | | | 71WU | |
| 1635.194 | 0.003 | 61 154.8 | 20 | | | | | 71WU | |
| 1635.948 | 0.003 | 61 126.6 | 10 | | | | | 71WU | |
| 1637.293 | 0.003 | 61 076.4 | 10 | | | | | 71WU | |
| 1639.260 | 0.003 | 61 003.1 | 12 | | | | | 71WU | |
| 1646.018 | 0.003 | 60 752.7 | 12 | | | | | 71WU | |
| 1651.601 | 0.003 | 60 547.3 | 5 | | | | | 71WU | |
| 1652.921 | 0.003 | 60 499.0 | 20 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1657.918 | 0.003 | 60 316.6 | 60 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1668.569 | 0.003 | 59 931.6 | 35 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1669.817 | 0.003 | 59 886.8 | 20 | | | | | 71WU | |
| 1671.886 | 0.003 | 59 812.7 | 35 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1673.649 | 0.003 | 59 749.7 | 15 | | | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_0$ | 71WU | |
| 1743.309 | 0.003 | 57 362.2 | 15 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1746.996 | 0.003 | 57 241.1 | 0 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1752.185 | 0.003 | 57 071.6 | 12 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1759.572 | 0.003 | 56 832.0 | 30 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1763.325 | 0.003 | 56 711.0 | 7 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1763.841 | 0.003 | 56 694.5 | 30 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1768.603 | 0.003 | 56 541.8 | 7 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1769.878 | 0.003 | 56 501.1 | 30 | | | | | 71WU | |
| 1773.550 | 0.003 | 56 384.1 | 12 | | | | | 71WU | |
| 1776.571 | 0.003 | 56 288.21 | 90 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1778.243 | 0.003 | 56 235.28 | 40 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_3$ | 71WU | |
| 1778.905 | 0.003 | 56 214.36 | 0 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1779.906 | 0.003 | 56 182.74 | 0 | | | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})6s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1783.043 | 0.003 | 56 083.90 | 60 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1783.475 | 0.003 | 56 070.31 | 15 | | | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})5d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1785.989 | 0.003 | 55 991.39 | 12 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[7/2]^\circ_3$ | 71WU | |
| 1787.189 | 0.003 | 55 953.79 | 80 | | | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[7/2]^\circ_4$ | 71WU | |
| 1788.846 | 0.003 | 55 901.96 | 45 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1790.565 | 0.003 | 55 848.29 | 2 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_3$ | 71WU | |
| 1791.224 | 0.003 | 55 827.75 | 35 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1791.862 | 0.003 | 55 807.87 | 30 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1795.772 | 0.003 | 55 686.36 | 1 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1798.410 | 0.003 | 55 604.67 | 80 | | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[7/2]^\circ_3$ | 71WU | |
| 1800.048 | 0.003 | 55 554.07 | 25 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1801.256 | 0.003 | 55 516.82 | 45* | b | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1801.256 | 0.003 | 55 516.82 | 45* | b | | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1804.623 | 0.003 | 55 413.24 | 30 | | | | | 71WU | |
| 1805.998 | 0.003 | 55 371.05 | 12 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1806.061 | 0.003 | 55 369.12 | 10 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[5/2]^\circ_3$ | 71WU | |
| 1807.092 | 0.003 | 55 337.53 | 90 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1808.375 | 0.003 | 55 298.27 | 60 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1814.474 | 0.003 | 55 112.39 | 25 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1818.473 | 0.003 | 54 991.19 | 5 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1818.628 | 0.003 | 54 986.51 | 7 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1819.024 | 0.003 | 54 974.54 | 20 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1821.695 | 0.003 | 54 893.93 | 50 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1822.568 | 0.003 | 54 867.64 | 5 | | | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1824.098 | 0.003 | 54 821.62 | 0 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1825.730 | 0.003 | 54 772.61 | 7 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1830.124 | 0.003 | 54 641.11 | 20 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1831.172 | 0.003 | 54 609.83 | 12 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 1831.402 | 0.003 | 54 602.98 | 1 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1833.873 | 0.003 | 54 529.40 | 45 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1835.217 | 0.003 | 54 489.47 | 80 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1836.367 | 0.003 | 54 455.35 | 2 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[5/2]^\circ_3$ | 71WU | |
| 1837.522 | 0.003 | 54 421.12 | 15 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1837.890 | 0.003 | 54 410.22 | 45 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1839.270 | 0.003 | 54 369.40 | 20 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1839.835 | 0.003 | 54 352.70 | 25 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_0$ | 71WU | |
| 1840.032 | 0.003 | 54 346.88 | 20 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1841.822 | 0.003 | 54 294.06 | 60 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_3$ | 71WU | |
| 1845.016 | 0.003 | 54 200.07 | 70 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1850.150 | 0.003 | 54 049.67 | 45 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[7/2]^\circ_3$ | 71WU | |
| 1851.194 | 0.003 | 54 019.19 | 70 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1853.166 | 0.003 | 53 961.71 | 80 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1857.265 | 0.003 | 53 842.61 | 25 | | | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1857.576 | 0.003 | 53 833.60 | 40 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1862.832 | 0.003 | 53 681.71 | 20 | | | | | 71WU | |
| 1863.090 | 0.003 | 53 674.27 | 25 | | | | | 71WU | |
| 1863.898 | 0.003 | 53 651.00 | 15 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1865.139 | 0.003 | 53 615.31 | 35 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1865.433 | 0.003 | 53 606.86 | 20 | | | | | 71WU | |
| 1866.452 | 0.003 | 53 577.59 | 45 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1871.517 | 0.003 | 53 432.59 | 40 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1873.369 | 0.003 | 53 379.77 | 45 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_3$ | 71WU | |
| 1874.098 | 0.003 | 53 359.00 | 15 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[5/2]^\circ_2$ | 71WU | |
| 1875.075 | 0.003 | 53 331.20 | 60 | | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1877.365 | 0.003 | 53 266.15 | 20 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1879.240 | 0.003 | 53 213.00 | 30* | b | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1879.240 | 0.003 | 53 213.00 | 30* | b | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 1880.040 | 0.003 | 53 190.36 | 25 | | | | | 71WU | |
| 1881.090 | 0.003 | 53 160.67 | 35 | | | | | 71WU | |
| 1881.912 | 0.003 | 53 137.45 | 160 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[7/2]^\circ_3$ | 71WU | |
| 1883.460 | 0.003 | 53 093.77 | 20 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 1883.804 | 0.003 | 53 084.08 | 20 | | | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_0$ | 71WU | |
| 1885.091 | 0.003 | 53 047.84 | 50 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1885.742 | 0.003 | 53 029.52 | 45 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_2$ | 71WU | |
| 1889.317 | 0.003 | 52 929.18 | 30 | | | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1899.523 | 0.003 | 52 644.80 | 30* | b | | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1899.523 | 0.003 | 52 644.80 | 30* | b | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[3/2]^\circ_2$ | 71WU | |
| 1903.831 | 0.003 | 52 525.67 | 15 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_1$ | 71WU | |
| 1906.112 | 0.003 | 52 462.81 | 15 | | | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})4d\ ^2[1/2]^\circ_0$ | 71WU | |
| 1946.206 | 0.003 | 51 382.02 | 35 | | | | | 71WU | |
| 1948.531 | 0.003 | 51 320.71 | 7 | | | | | 71WU | |
| 1967.634 | 0.003 | 50 822.46 | 90 | | | | | 71WU | |
| 1991.001 | 0.003 | 50 225.99 | 60 | | | | | 71WU | |
| 1991.718 | 0.003 | 50 207.91 | 20 | | | | | 71WU | |
| 2000.455 | 0.003 | 49 988.63 | 30 | | | | | 71WU | |
| *Air* | | | | | | | | | |
| 2009.567 | 0.003 | 49 745.881 | 7 | | | | | 71WU | |
| 2010.093 | 0.003 | 49 732.865 | 10 | | | | | 71WU | |
| 2017.137 | 0.003 | 49 559.219 | 160 | | | | | 71WU | |
| 2018.409 | 0.003 | 49 527.991 | 40 | | | | | 71WU | |
| 2019.219 | 0.003 | 49 508.126 | 25 | | | | | 71WU | |
| 2050.877 | 0.003 | 48 744.008 | 80 | | | | | 71WU | |
| 2059.617 | 0.003 | 48 537.190 | 2 | | | | | 71WU | |
| 2077.178 | 0.003 | 48 126.897 | 20 | | | | | 71WU | |
| 2104.516 | 0.003 | 47 501.798 | 7 | | | | | 71WU | |
| 2109.585 | 0.003 | 47 387.673 | 7 | | | | | 71WU | |
| 2114.551 | 0.003 | 47 276.396 | 20 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2116.143 | 0.003 | 47 240.834 | 60 | | | | | 71WU | |
| 2119.428 | 0.003 | 47 167.622 | 15 | | | | | 71WU | |
| 2127.627 | 0.003 | 46 985.878 | 35 | | | | | 71WU | |
| 2155.774 | 0.003 | 46 372.473 | 60 | | | | | 71WU | |
| 2166.769 | 0.003 | 46 137.188 | 50 | | | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})5s\ ^2[1/2]^\circ_1$ | 71WU | |
| 2172.490 | 0.003 | 46 015.704 | 0 | | | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | 71WU | |
| 2213.281 | 0.003 | 45 167.717 | 5 | | | | | 71WU | |
| 2216.560 | 0.003 | 45 100.906 | 7 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2228.529 | 0.003 | 44 858.702 | 80 | | | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | 71WU | |
| 2229.156 | 0.003 | 44 846.086 | 30 | | | | | 71WU | |
| 2231.399 | 0.003 | 44 801.011 | 15 | | | | | 71WU | |
| 2235.549 | 0.003 | 44 717.852 | 15 | | | | | 71WU | |
| 2247.464 | 0.003 | 44 480.802 | 25 | | | | | 71WU | |
| 2260.495 | 0.003 | 44 224.409 | 10* | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[7/2]_3$ | 71WU | |
| 2260.495 | 0.003 | 44 224.409 | 10* | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2262.665 | 0.003 | 44 182.000 | 5* | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2262.665 | 0.003 | 44 182.000 | 5* | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2273.808 | 0.003 | 43 965.502 | 10 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[3/2]_1$ | 71WU | |
| 2286.264 | 0.003 | 43 725.991 | 15 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[3/2]_{1,2}$ | 71WU | |
| 2287.822 | 0.003 | 43 696.217 | 7 | | | | | 71WU | |
| 2291.198 | 0.003 | 43 631.838 | 2 | | | | | 71WU | |
| 2302.923 | 0.003 | 43 409.712 | 20 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2303.263 | 0.003 | 43 403.305 | 20 | | | | | 71WU | |
| 2303.582 | 0.003 | 43 397.295 | 80 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[9/2]_{4,5}$ | 71WU | |
| 2306.968 | 0.003 | 43 333.605 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[9/2]_4$ | 71WU | |
| 2315.647 | 0.003 | 43 171.206 | 300 | | 1.05E+7 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^1S_0$ | 71WU | 08KEL/POD |
| 2318.687 | 0.003 | 43 114.609 | 7 | | | | | 71WU | |
| 2320.130 | 0.003 | 43 087.797 | 30* | b | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2320.130 | 0.003 | 43 087.797 | 30* | b | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[7/2]_3$ | 71WU | |
| 2322.264 | 0.003 | 43 048.205 | 40* | b | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2322.264 | 0.003 | 43 048.205 | 40* | b | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2324.927 | 0.003 | 42 998.902 | 15 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})7f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2328.805 | 0.003 | 42 927.305 | 30 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2331.444 | 0.003 | 42 878.719 | 15 | | | | | 71WU | |
| 2332.109 | 0.003 | 42 866.493 | 30 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[7/2]_3$ | 71WU | |
| 2334.403 | 0.003 | 42 824.372 | 40 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2337.377 | 0.003 | 42 769.888 | 15 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})8f\ ^2[3/2]_{1,2}$ | 71WU | |
| 2339.724 | 0.003 | 42 726.989 | 20 | | | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{1/2})8f\ ^2[5/2]_2$ | 71WU | |
| 2355.743 | 0.003 | 42 436.470 | 15 | | | | | 71WU | |
| 2368.510 | 0.003 | 42 207.743 | 20 | | | | | 71WU | |
| 2372.658 | 0.003 | 42 133.959 | 20 | | | | | 71WU | |
| 2373.329 | 0.003 | 42 122.048 | 25 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})7f\ ^2[7/2]_3$ | 71WU | |
| 2375.731 | 0.003 | 42 079.464 | 35 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})7f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2378.039 | 0.003 | 42 038.627 | 20 | | | | | 71WU | |
| 2379.218 | 0.003 | 42 017.797 | 20 | | | | | 71WU | |
| 2382.291 | 0.003 | 41 963.601 | 25 | | | | | 71WU | |
| 2383.918 | 0.003 | 41 934.963 | 25 | | | | | 71WU | |
| 2385.609 | 0.003 | 41 905.241 | 25 | | | | | 71WU | |
| 2386.289 | 0.003 | 41 893.300 | 35 | | | | | 71WU | |
| 2387.022 | 0.003 | 41 880.437 | 350 | | | | | 71WU | |
| 2387.817 | 0.003 | 41 866.494 | 35 | | | | | 71WU | |
| 2388.289 | 0.003 | 41 858.221 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})7f\ ^2[3/2]_1$ | 71WU | |
| 2390.452 | 0.003 | 41 820.348 | 30 | | | | | 71WU | |
| 2392.324 | 0.003 | 41 787.626 | 35 | | | | | 71WU | |
| 2393.275 | 0.003 | 41 771.023 | 130* | b | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})7f\ ^2[3/2]_2$ | 71WU | |
| 2393.275 | 0.003 | 41 771.023 | 130* | b | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})7f\ ^2[3/2]_1$ | 71WU | |
| 2393.612 | 0.003 | 41 765.142 | 350 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2395.642 | 0.003 | 41 729.754 | 30 | | | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[5/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{3/2})8f\ ^2[7/2]_3$ | 71WU | |
| 2396.559 | 0.003 | 41 713.788 | 30 | | | | | 71WU | |
| 2401.014 | 0.003 | 41 636.396 | 100 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[3/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2402.019 | 0.003 | 41 618.977 | 45 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[3/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[3/2]_2$ | 71WU | |
| 2403.299 | 0.003 | 41 596.812 | 30 | | | | | 71WU | |
| 2405.938 | 0.003 | 41 551.189 | 30 | | | | | 71WU | |
| 2409.098 | 0.003 | 41 496.691 | 30 | | | | | 71WU | |
| 2410.549 | 0.003 | 41 471.715 | 30 | | | | | 71WU | |
| 2412.544 | 0.003 | 41 437.423 | 30 | | | | | 71WU | |
| 2417.121 | 0.003 | 41 358.964 | 30 | | | | | 71WU | |
| 2419.965 | 0.003 | 41 310.362 | 70 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[7/2]^{\circ}_4$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2420.991 | 0.003 | 41 292.856 | 300 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[7/2]^{\circ}_4$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[9/2]_{4,5}$ | 71WU | |
| 2422.071 | 0.003 | 41 274.445 | 35 | | | | | 71WU | |
| 2423.724 | 0.003 | 41 246.298 | 60 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[7/2]^{\circ}_3$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2424.729 | 0.003 | 41 229.203 | 300 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[7/2]^{\circ}_3$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[9/2]_4$ | 71WU | |
| 2427.437 | 0.003 | 41 183.212 | 35 | | | | | 71WU | |
| 2427.968 | 0.003 | 41 174.206 | 35 | | | | | 71WU | |
| 2429.322 | 0.003 | 41 151.259 | 35 | | | | | 71WU | |
| 2433.840 | 0.003 | 41 074.875 | 35 | | | | | 71WU | |
| 2434.541 | 0.003 | 41 063.048 | 35 | | | | | 71WU | |
| 2437.112 | 0.003 | 41 019.733 | 35 | | | | | 71WU | |
| 2439.144 | 0.003 | 40 985.563 | 200 | | | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[5/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{1/2})7f\ ^2[7/2]_3$ | 71WU | |
| 2441.495 | 0.003 | 40 946.099 | 250 | | | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[5/2]^{\circ}_3$ | $2p^5(^2P^{\circ}_{1/2})7f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2442.513 | 0.003 | 40 929.035 | 80 | | | | | 71WU | |
| 2443.541 | 0.003 | 40 911.817 | 45 | | | | | 71WU | |
| 2444.439 | 0.003 | 40 896.789 | 35 | | | | | 71WU | |
| 2445.779 | 0.003 | 40 874.384 | 40 | | | | | 71WU | |
| 2446.200 | 0.003 | 40 867.349 | 40 | | | | | 71WU | |
| 2447.195 | 0.003 | 40 850.735 | 35 | | | | | 71WU | |
| 2448.715 | 0.003 | 40 825.379 | 200 | | | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[3/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{1/2})7f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2449.773 | 0.003 | 40 807.749 | 40 | | | | | 71WU | |
| 2452.180 | 0.003 | 40 767.696 | 200 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[5/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[7/2]_3$ | 71WU | |
| 2452.657 | 0.003 | 40 759.768 | 100 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[5/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2453.718 | 0.003 | 40 742.144 | 15 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[5/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[3/2]_1$ | 71WU | |
| 2454.628 | 0.003 | 40 727.041 | 60 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[5/2]^{\circ}_3$ | $2p^5(^2P^{\circ}_{3/2})7f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2457.477 | 0.003 | 40 679.829 | 20 | | | | | 71WU | |
| 2460.776 | 0.003 | 40 625.296 | 40 | | | $2p^5(^2P^{\circ}_{1/2})4s\ ^2[1/2]^{\circ}_1$ | $2p^5(^2P^{\circ}_{1/2})7f\ ^2[5/2]_2$ | 71WU | |
| 2466.368 | 0.003 | 40 533.193 | 20 | | | | | 71WU | |
| 2493.149 | 0.003 | 40 097.822 | 1000 | | 4.15E+8 | $2p^53s\ ^1P^{\circ}_1$ | $2p^53p\ ^1S_0$ | 71WU | 08KEL/POD |
| 2494.661 | 0.003 | 40 073.521 | 130 | | | | | 71WU | |
| 2497.84 | 0.10 | 40 022.523 | 130 | | | | | 71WU | |
| 2498.124 | 0.003 | 40 017.973 | 70 | | | | | 71WU | |
| 2502.839 | 0.003 | 39 942.590 | 300 | | 2.74E+7 | $2p^53p\ ^3S_1$ | $2p^5(^2P^{\circ}_{1/2})4s\ ^2[1/2]^{\circ}_1$ | 71WU | 04FRO/TAC |
| 2504.285 | 0.003 | 39 919.529 | 25 | | | | | 71WU | |
| 2504.791 | 0.003 | 39 911.465 | 25 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[1/2]^{\circ}_1$ | $2p^5(^2P^{\circ}_{1/2})6f\ ^2[5/2]_2$ | 71WU | |
| 2506.301 | 0.003 | 39 887.421 | 450 | | 2.73E+7 | $2p^53p\ ^3S_1$ | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[3/2]^{\circ}_1$ | 71WU | 08KEL/POD |
| 2514.412 | 0.003 | 39 758.760 | 45 | | | $2p^5(^2P^{\circ}_{3/2})3d\ ^2[3/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{1/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2515.455 | 0.003 | 39 742.276 | 600 | | 2.25E+7 | $2p^53p\ ^3S_1$ | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[3/2]^{\circ}_2$ | 71WU | 08KEL/POD |
| 2525.647 | 0.003 | 39 581.911 | 50 | | 2.78E+5 | $2p^53p\ ^3S_1$ | $2p^5(^2P^{\circ}_{1/2})3d\ ^2[5/2]^{\circ}_2$ | 71WU | 08KEL/POD |
| 2527.705 | 0.003 | 39 549.686 | 40 | | | | | 71WU | |
| 2531.538 | 0.003 | 39 489.808 | 600 | | 8.44E+7 | $2p^53p\ ^3S_1$ | $2p^5(^2P^{\circ}_{1/2})4s\ ^2[1/2]^{\circ}_0$ | 71WU | 08KEL/POD |
| 2545.095 | 0.003 | 39 279.471 | 25 | | | | | 71WU | |
| 2546.279 | 0.003 | 39 261.207 | 35 | | | | | 71WU | |
| 2546.939 | 0.003 | 39 251.034 | 20 | | | | | 71WU | |
| 2558.022 | 0.003 | 39 080.984 | 15 | | | | | 71WU | |
| 2559.971 | 0.003 | 39 051.233 | 10 | | | $2p^5(^2P^{\circ}_{3/2})4s\ ^2[3/2]^{\circ}_2$ | $2p^5(^2P^{\circ}_{1/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2565.476 | 0.003 | 38 967.442 | 15 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2568.104 | 0.003 | 38 927.568 | 12 | | | | | 71WU | |
| 2571.103 | 0.003 | 38 882.165 | 30 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[7/2]_3$ | 71WU | |
| 2573.910 | 0.003 | 38 839.764 | 35 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2575.703 | 0.003 | 38 812.729 | 15 | | | | | 71WU | |
| 2577.645 | 0.003 | 38 783.489 | 15 | | | | | 71WU | |
| 2586.308 | 0.003 | 38 653.590 | 550 | | 5.81E+7 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2589.269 | 0.003 | 38 609.389 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_1$ | 71WU | |
| 2593.269 | 0.003 | 38 549.840 | 40 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_2$ | 71WU | |
| 2594.958 | 0.003 | 38 524.750 | 600 | | 3.71E+7 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 2600.325 | 0.003 | 38 445.241 | 45 | | 4.93E+5 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2602.974 | 0.003 | 38 406.118 | 25 | | | | | 71WU | |
| 2603.563 | 0.003 | 38 397.430 | 130 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2605.388 | 0.003 | 38 370.536 | 45 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_2$ | 71WU | |
| 2607.393 | 0.003 | 38 341.032 | 80 | | | | | 71WU | |
| 2608.856 | 0.003 | 38 319.532 | 30 | | | | | 71WU | |
| 2611.812 | 0.003 | 38 276.166 | 850 | | 2.16E+8 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 2613.486 | 0.003 | 38 251.650 | 60 | | | | | 71WU | |
| 2616.833 | 0.003 | 38 202.728 | 25 | | | | | 71WU | |
| 2625.515 | 0.003 | 38 076.408 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2626.368 | 0.003 | 38 064.042 | 40 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2627.414 | 0.003 | 38 048.889 | 300 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[9/2]_5$ | 71WU | |
| 2629.909 | 0.003 | 38 012.794 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2630.766 | 0.003 | 38 000.412 | 35 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2631.812 | 0.003 | 37 985.310 | 300 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[9/2]_4$ | 71WU | |
| 2636.127 | 0.003 | 37 923.137 | 35 | | | | | 71WU | |
| 2637.505 | 0.003 | 37 903.324 | 90 | | | | | 71WU | |
| 2647.785 | 0.003 | 37 756.174 | 30 | | | | | 71WU | |
| 2648.532 | 0.003 | 37 745.525 | 160 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[7/2]_3$ | 71WU | |
| 2650.534 | 0.003 | 37 717.017 | 35 | | | | | 71WU | |
| 2651.313 | 0.003 | 37 705.936 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[7/2]_4$ | 71WU | |
| 2652.430 | 0.003 | 37 690.058 | 80 | | | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2654.331 | 0.003 | 37 663.066 | 50 | | | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_2$ | 71WU | |
| 2659.029 | 0.003 | 37 596.527 | 60 | | | | | 71WU | |
| 2659.810 | 0.003 | 37 585.488 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2660.997 | 0.003 | 37 568.723 | 850 | | 1.65E+8 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2662.394 | 0.003 | 37 549.011 | 70 | | | | | 71WU | |
| 2663.460 | 0.003 | 37 533.984 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[7/2]_3$ | 71WU | |
| 2664.358 | 0.003 | 37 521.334 | 80 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_{2,3}$ | 71WU | |
| 2666.458 | 0.003 | 37 491.785 | 350 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[7/2]_4$ | 71WU | |
| 2667.395 | 0.003 | 37 478.616 | 90 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2669.372 | 0.003 | 37 450.860 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_2$ | 71WU | |
| 2670.027 | 0.003 | 37 441.673 | 100 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_2$ | 71WU | |
| 2670.406 | 0.003 | 37 436.360 | 130 | | | | | 71WU | |
| 2671.826 | 0.003 | 37 416.464 | 1000 | | 2.64E+8 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 2672.027 | 0.003 | 37 413.650 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_1$ | 71WU | |
| 2674.035 | 0.003 | 37 385.557 | 200 | | | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[5/2]_2$ | 71WU | |
| 2675.266 | 0.003 | 37 368.355 | 50 | | | | | 71WU | |
| 2675.941 | 0.003 | 37 358.930 | 60 | | | | | 71WU | |
| 2678.085 | 0.003 | 37 329.023 | 850 | | 3.01E+8 | $2p^53p\ ^3S_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 2679.252 | 0.003 | 37 312.764 | 150 | | | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_2$ | 71WU | |
| 2682.194 | 0.003 | 37 271.840 | 45 | | | | | 71WU | |
| 2683.622 | 0.003 | 37 252.008 | 25 | | | | | 71WU | |
| 2685.083 | 0.003 | 37 231.739 | 20 | | | | | 71WU | |
| 2693.712 | 0.003 | 37 112.479 | 15 | | | | | 71WU | |
| 2698.048 | 0.003 | 37 052.839 | 15 | | | | | 71WU | |
| 2710.08 | 0.10 | 36 888 | 25 | | | | | 71WU | |
| 2714.73 | 0.10 | 36 825 | 70 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2720.50 | 0.10 | 36 747 | 25 | | | | | 71WU | |
| 2723.93 | 0.10 | 36 701 | 45 | | | | | 71WU | |
| 2731.82 | 0.10 | 36 594 | 25 | | | | | 71WU | |
| 2738.74 | 0.10 | 36 502 | 15 | | | | | 71WU | |
| 2741.27 | 0.10 | 36 469 | 25 | | | | | 71WU | |
| 2746.77 | 0.10 | 36 396 | 130 | | | | | 71WU | |
| 2748.98 | 0.10 | 36 366 | 25 | | | | | 71WU | |
| 2749.649 | 0.003 | 36 357.528 | 130* | b | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[7/2]_{3,4}$ | 71WU | |
| 2749.649 | 0.003 | 36 357.528 | 130* | b | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_2$ | 71WU | |
| 2750.51 | 0.10 | 36 346 | 60 | | | | | 71WU | |
| 2759.797 | 0.003 | 36 223.846 | 35 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_3$ | 71WU | |
| 2761.861 | 0.003 | 36 196.776 | 25 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_2$ | 71WU | |
| 2762.78 | 0.10 | 36 185 | 25 | | | | | 71WU | |
| 2767.61 | 0.10 | 36 122 | 35 | | | | | 71WU | |
| 2775.113 | 0.003 | 36 023.935 | 20 | | | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_2$ | 71WU | |
| 2781.70 | 0.10 | 35 939 | 15 | | | | | 71WU | |
| 2785.78 | 0.10 | 35 886 | 15 | | | | | 71WU | |
| 2786.11 | 0.10 | 35 882 | 15 | | | | | 71WU | |
| 2788.49 | 0.10 | 35 851 | 70 | | | | | 71WU | |
| 2789.35 | 0.10 | 35 840 | 20 | | | | | 71WU | |
| 2792.86 | 0.10 | 35 795 | 15 | | | | | 71WU | |
| 2799.211 | 0.003 | 35 713.826 | 80 | | 2.64E+6 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2806.94 | 0.10 | 35 615 | 60 | | | | | 71WU | |
| 2807.75 | 0.10 | 35 605 | 90 | | | | | 71WU | |
| 2808.706 | 0.003 | 35 593.099 | 650 | | 1.93E+6 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 08KEL/POD |
| 2809.520 | 0.003 | 35 582.787 | 850 | | 5.95E+7 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^3P_1$ | 71WU | 08KEL/POD |
| 2810.64 | 0.10 | 35 569 | 130 | | | | | 71WU | |
| 2811.43 | 0.10 | 35 559 | 80 | | | | | 71WU | |
| 2811.840 | 0.003 | 35 553.430 | 160 | | 1.01E+6 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2813.900 | 0.003 | 35 527.403 | 250 | | 1.24E+7 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2817.21 | 0.10 | 35 486 | 50 | | | | | 71WU | |
| 2818.288 | 0.003 | 35 472.091 | 350 | | 6.92E+6 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2820.71 | 0.10 | 35 442 | 25 | | | | | 71WU | |
| 2821.49 | 0.10 | 35 432 | 25 | | | | | 71WU | |
| 2824.41 | 0.10 | 35 395 | 25 | | | | | 71WU | |
| 2828.35 | 0.10 | 35 346 | 35 | | | | | 71WU | |
| 2829.868 | 0.003 | 35 326.944 | 600 | | 3.35E+7 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2831.92 | 0.10 | 35 301 | 35 | | | | | 71WU | |
| 2832.26 | 0.10 | 35 297 | 35 | | | | | 71WU | |
| 2833.61 | 0.10 | 35 280 | 45 | | | | | 71WU | |
| 2836.07 | 0.10 | 35 250 | 80 | | | | | 71WU | |
| 2839.564 | 0.003 | 35 206.322 | 800 | | 1.11E+8 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 08KEL/POD |
| 2841.724 | 0.003 | 35 179.563 | 1000 | | 8.92E+7 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^3P_2$ | 71WU | 08KEL/POD |
| 2842.762 | 0.003 | 35 166.718 | 30 | | 5.23E+5 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2848.63 | 0.10 | 35 094 | 60 | | | | | 71WU | |
| 2849.11 | 0.10 | 35 088 | 40 | | | | | 71WU | |
| 2850.02 | 0.10 | 35 077 | 35 | | | | | 71WU | |
| 2850.72 | 0.10 | 35 069 | 35 | | | | | 71WU | |
| 2851.16 | 0.10 | 35 063 | 40 | | | | | 71WU | |
| 2856.508 | 0.003 | 34 997.498 | 650 | | 8.02E+6 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2859.488 | 0.003 | 34 961.027 | 800 | | 2.19E+7 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^1P_1$ | 71WU | 08KEL/POD |
| 2861.019 | 0.003 | 34 942.320 | 350 | | 6.43E+7 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 2862.96 | 0.10 | 34 919 | 40 | | | | | 71WU | |
| 2863.66 | 0.10 | 34 910 | 60 | | | | | 71WU | |
| 2867.96 | 0.10 | 34 858 | 50 | | | | | 71WU | |
| 2868.31 | 0.10 | 34 854 | 60 | | | | | 71WU | |
| 2869.30 | 0.10 | 34 841 | 50 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2871.275 | 0.003 | 34 817.514 | 750 | | 2.75E+7 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^3P_1$ | 71WU | 08KEL/POD |
| 2872.954 | 0.003 | 34 797.167 | 650 | | 2.63E+7 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2875.73 | 0.10 | 34 764 | 50 | | | | | 71WU | |
| 2877.38 | 0.10 | 34 744 | 70 | | | | | 71WU | |
| 2879.041 | 0.003 | 34 723.601 | 130 | | | | | 71WU | |
| 2881.146 | 0.003 | 34 698.233 | 900 | | 2.50E+8 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^3P_0$ | 71WU | 08KEL/POD |
| 2884.249 | 0.003 | 34 660.904 | 90 | | | | | 71WU | |
| 2886.257 | 0.003 | 34 636.792 | 850 | | 1.07E+8 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2887.95 | 0.10 | 34 616 | 100 | | | | | 71WU | |
| 2888.95 | 0.10 | 34 605 | 80 | | | | | 71WU | |
| 2889.61 | 0.10 | 34 597 | 70 | | | | | 71WU | |
| 2890.51 | 0.10 | 34 586 | 50 | | | | | 71WU | |
| 2891.21 | 0.10 | 34 577 | 70 | | | | | 71WU | |
| 2893.949 | 0.003 | 34 544.733 | 700 | | 1.48E+8 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 2896.61 | 0.10 | 34 513 | 60 | | | | | 71WU | |
| 2897.40 | 0.10 | 34 504 | 70 | | | | | 71WU | |
| 2901.139 | 0.003 | 34 459.123 | 900 | | 1.48E+8 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 08KEL/POD |
| 2904.716 | 0.003 | 34 416.691 | 800 | | 1.04E+7 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2904.915 | 0.003 | 34 414.333 | 1100 | | 7.30E+7 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^3P_2$ | 71WU | 08KEL/POD |
| 2907.40 | 0.10 | 34 385 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})5f\ ^2[5/2]_3$ | 71WU | |
| 2907.52 | 0.10 | 34 384 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})5f\ ^2[7/2]_3$ | 71WU | |
| 2908.56 | 0.10 | 34 371 | 160 | | | | | 71WU | |
| 2917.52 | 0.10 | 34 266 | 1100 | | 7.92E+7 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^1D_2$ | 71WU | 08KEL/POD |
| 2919.049 | 0.003 | 34 247.707 | 1100 | | 1.60E+8 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 2919.850 | 0.003 | 34 238.312 | 1200 | | 1.33E+8 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2920.945 | 0.003 | 34 225.477 | 1300 | | 6.66E+7 | $2p^53s\ ^3P^\circ_0$ | $2p^53p\ ^3P_1$ | 71WU | 08KEL/POD |
| 2923.485 | 0.003 | 34 195.743 | 1000 | | 1.41E+7 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^1P_1$ | 71WU | 08KEL/POD |
| 2930.882 | 0.003 | 34 109.443 | 750 | | 9.83E+7 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 2934.079 | 0.003 | 34 072.279 | 850 | | 9.20E+8 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 93HIB/DOU |
| 2935.55 | 0.10 | 34 055 | 130 | | | | | 71WU | |
| 2937.735 | 0.003 | 34 029.878 | 950 | | 1.28E+8 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2942.657 | 0.003 | 33 972.961 | 450 | | 7.08E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2945.702 | 0.003 | 33 937.844 | 800 | | 2.50E+6 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | 71WU | 08KEL/POD |
| 2947.449 | 0.003 | 33 917.729 | 950 | | 1.03E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2951.235 | 0.003 | 33 874.220 | 1200 | | 4.33E+8 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | 71WU | 08KEL/POD |
| 2952.396 | 0.003 | 33 860.900 | 1100 | | 1.80E+7 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 2960.116 | 0.003 | 33 772.594 | 850 | | 5.60E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2961.67 | 0.10 | 33 755 | 80 | | | | | 71WU | |
| 2965.742 | 0.003 | 33 708.531 | 450 | | 4.61E+5 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 2968.48 | 0.10 | 33 677 | 80 | | | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})5f\ ^2[5/2]_3$ | 71WU | |
| 2968.97 | 0.10 | 33 672 | 90 | | | | | 71WU | |
| 2970.727 | 0.003 | 33 651.969 | 500 | | 1.03E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 08KEL/POD |
| 2972.72 | 0.10 | 33 629 | 160 | | | | | 71WU | |
| 2974.235 | 0.003 | 33 612.279 | 600 | | 2.02E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2974.988 | 0.003 | 33 603.772 | 750 | | 6.47E+7 | $2p^53s\ ^3P^\circ_0$ | $2p^53p\ ^1P_1$ | 71WU | 08KEL/POD |
| 2976.686 | 0.003 | 33 584.604 | 400 | | | | | 71WU | |
| 2977.125 | 0.003 | 33 579.652 | 1000 | | 1.05E+7 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 2979.657 | 0.003 | 33 551.118 | 1100 | | 1.96E+8 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | 71WU | 08KEL/POD |
| 2980.627 | 0.003 | 33 540.200 | 1100 | | 3.30E+5 | $2p^53p\ ^3D_3$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2984.186 | 0.003 | 33 500.201 | 1300* | b | 1.74E+7 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^1D_2$ | 71WU | 08KEL/POD |
| 2984.186 | 0.003 | 33 500.201 | 1300* | b | 2.36E+8 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 2986.451 | 0.003 | 33 474.795 | 300 | | | | | 71WU | |
| 2987.213 | 0.003 | 33 466.256 | 300 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})5f\ ^2[5/2]_3$ | 71WU | |
| 2996.89 | 0.10 | 33 358 | 40 | | | | | 71WU | |
| 3 000.86 | 0.10 | 33 314.1 | 130 | | | | | 71WU | |
| 3 002.92 | 0.10 | 33 291.2 | 130 | | | | | 71WU | |
| 3004.149 | 0.003 | 33 277.597 | 550 | | 2.97E+7 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 3007.442 | 0.003 | 33 241.161 | 750 | | 1.68E+7 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^3D_1$ | 71WU | 08KEL/POD |
| 3009.137 | 0.003 | 33 222.438 | 750 | | 1.73E+7 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3009.482 | 0.003 | 33 218.629 | 450 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[3/2]_1$ | 71WU | |
| 3011.51 | 0.10 | 33 196.3 | 60 | | | | | 71WU | |
| 3013.10 | 0.10 | 33 178.7 | 160 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[5/2]_2$ | 71WU | |
| 3015.395 | 0.003 | 33 153.493 | 600 | | 1.51E+7 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3017.341 | 0.003 | 33 132.111 | 450 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[3/2]_2$ | 71WU | |
| 3018.324 | 0.003 | 33 121.322 | 160 | | | | | 71WU | |
| 3019.98 | 0.10 | 33 103.2 | 80 | | | | | 71WU | |
| 3021.37 | 0.10 | 33 087.9 | 200 | | | | | 71WU | |
| 3022.348 | 0.003 | 33 077.225 | 160 | | 6.91E+5 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3024.00 | 0.10 | 33 059.2 | 130 | | 9.89E+7 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 3025.31 | 0.10 | 33 044.8 | 60 | | | | | 71WU | |
| 3027.062 | 0.003 | 33 025.717 | 300 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[5/2]_3$ | 71WU | |
| 3029.070 | 0.003 | 33 003.824 | 400 | | 2.33E+6 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 3029.320 | 0.003 | 33 001.101 | 40 | | 6.32E+6 | $2p^53p\ ^3D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3031.26 | 0.10 | 32 980.0 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[3/2]_2$ | 71WU | |
| 3037.076 | 0.003 | 32 916.827 | 400 | | 2.55E+8 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3038.72 | 0.10 | 32 899.0 | 350 | | | | | 71WU | |
| 3040.13 | 0.10 | 32 883.8 | 160 | | | | | 71WU | |
| 3042.461 | 0.003 | 32 858.568 | 350 | | 7.49E+5 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3043.10 | 0.10 | 32 851.7 | 200 | | | | | 71WU | |
| 3045.600 | 0.003 | 32 824.703 | 400 | | 6.92E+7 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 3048.95 | 0.10 | 32 788.6 | 200 | | | | | 71WU | |
| 3050.210 | 0.003 | 32 775.095 | 350 | | 8.80E+6 | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3053.666 | 0.003 | 32 738.003 | 550 | | 2.99E+8 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 08KEL/POD |
| 3055.347 | 0.003 | 32 719.992 | 550 | | 1.34E+8 | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3055.822 | 0.003 | 32 714.906 | 45 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[7/2]_4$ | 71WU | |
| 3056.161 | 0.003 | 32 711.278 | 550 | | 7.46E+7 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^3D_2$ | 71WU | 08KEL/POD |
| 3057.375 | 0.003 | 32 698.289 | 550 | | 4.51E+7 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3057.95 | 0.10 | 32 692.1 | 550 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[5/2]_3$ | 71WU | |
| 3058.720 | 0.003 | 32 683.912 | 550 | | 2.18E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3060.251 | 0.003 | 32 667.561 | 700 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[9/2]_5$ | 71WU | |
| 3061.350 | 0.003 | 32 655.834 | 800 | | 3.75E+7 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 3061.792 | 0.003 | 32 651.120 | 25 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[7/2]_3$ | 71WU | |
| 3064.375 | 0.003 | 32 623.599 | 500 | | 7.62E+6 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3066.223 | 0.003 | 32 603.938 | 500 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[9/2]_4$ | 71WU | |
| 3066.535 | 0.003 | 32 600.621 | 500 | | 1.25E+8 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 3070.829 | 0.003 | 32 555.037 | 350 | | 8.70E+6 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 93HIB/DOU |
| 3074.334 | 0.003 | 32 517.922 | 550 | | 1.41E+8 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_3$ | 71WU | 93HIB/DOU |
| 3078.318 | 0.003 | 32 475.839 | 550* | b | 1.17E+8 | $2p^53s\ ^3P^\circ_1$ | $2p^53p\ ^3D_1$ | 71WU | 08KEL/POD |
| 3078.318 | 0.003 | 32 475.839 | 550* | b | 3.57E+5 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 93HIB/DOU |
| 3078.752 | 0.003 | 32 471.261 | 170 | | 3.59E+6 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3080.254 | 0.003 | 32 455.428 | 550 | | 2.81E+8 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3082.93 | 0.10 | 32 427.3 | 30 | | | | | 71WU | |
| 3083.57 | 0.10 | 32 420.5 | 25 | | | | | 71WU | |
| 3085.57 | 0.10 | 32 399.5 | 35 | | | | | 71WU | |
| 3087.060 | 0.003 | 32 383.877 | 450 | | 1.66E+7 | $2p^53p\ ^3D_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 3088.263 | 0.003 | 32 371.263 | 450 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})5f\ ^2[7/2]_3$ | 71WU | |
| 3089.99 | 0.10 | 32 353.2 | 130 | | | | | 71WU | |
| 3092.035 | 0.003 | 32 331.774 | 550 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})5f\ ^2[7/2]_4$ | 71WU | |
| 3092.732 | 0.003 | 32 324.488 | 550 | | 2.09E+8 | $2p^53s\ ^3P^\circ_2$ | $2p^53p\ ^3D_3$ | 71WU | 08KEL/POD |
| 3093.089 | 0.003 | 32 320.757 | 400 | | | | | 71WU | |
| 3094.449 | 0.003 | 32 306.553 | 650 | | 1.10E+6 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 3094.67 | 0.10 | 32 304.2 | 200 | | | | | 71WU | |
| 3095.552 | 0.003 | 32 295.042 | 650 | | 3.97E+5 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3096.48 | 0.10 | 32 285.4 | 70 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 3096.71 | 0.10 | 32 283.0 | 70 | | | | | 71WU | |
| 3097.73 | 0.10 | 32 272.3 | 60 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\,^2[3/2]_2$ | 71WU | |
| 3099.02 | 0.10 | 32 258.9 | 60 | | | | | 71WU | |
| 3099.80 | 0.10 | 32 250.8 | 45 | | | | | 71WU | |
| 3102.77 | 0.10 | 32 219.9 | 40 | | | | | 71WU | |
| 3103.578 | 0.003 | 32 211.529 | 500 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})5f\,^2[5/2]_3$ | 71WU | |
| 3104.403 | 0.003 | 32 202.969 | 500 | | 5.63E+7 | $2p^53p\,^3P_1$ | $2p^5(^2P^\circ_{1/2})4s\,^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 3107.370 | 0.003 | 32 172.222 | 350 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\,^2[7/2]_3$ | 71WU | |
| 3109.538 | 0.003 | 32 149.792 | 300 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\,^2[5/2]_2$ | 71WU | |
| 3110.23 | 0.10 | 32 142.6 | 130 | | | | | 71WU | |
| 3111.453 | 0.003 | 32 130.005 | 450 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\,^2[7/2]_4$ | 71WU | |
| 3112.924 | 0.003 | 32 114.823 | 70 | | | | | 71WU | |
| 3113.693 | 0.003 | 32 106.892 | 500 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\,^2[5/2]_3$ | 71WU | |
| 3114.130 | 0.003 | 32 102.387 | 10 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\,^2[3/2]_1$ | 71WU | |
| 3116.01 | 0.10 | 32 083.0 | 60 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\,^2[9/2]_4$ | 71WU | |
| 3117.231 | 0.003 | 32 070.453 | 300 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})5f\,^2[5/2]_2$ | 71WU | |
| 3118.134 | 0.003 | 32 061.165 | 15 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\,^2[3/2]_2$ | 71WU | |
| 3119.15 | 0.10 | 32 050.7 | 40 | | | | | 71WU | |
| 3121.759 | 0.003 | 32 023.937 | 350 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})5f\,^2[3/2]_2$ | 71WU | |
| 3122.935 | 0.003 | 32 011.879 | 400 | | | | | 71WU | |
| 3124.415 | 0.003 | 31 996.716 | 1700 | | 7.12E+7 | $2p^53p\,^1D_2$ | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_3$ | 71WU | 04FRO/TAC |
| 3125.212 | 0.003 | 31 988.556 | 600 | | 9.72E+6 | $2p^53p\,^1P_1$ | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3126.44 | 0.10 | 31 976.0 | 100 | | | | | 71WU | |
| 3129.377 | 0.003 | 31 945.983 | 600 | | 1.28E+8 | $2p^53s\,^3P^\circ_1$ | $2p^53p\,^3D_2$ | 71WU | 08KEL/POD |
| 3129.821 | 0.003 | 31 941.451 | 80 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})5f\,^2[5/2]_2$ | 71WU | |
| 3132.30 | 0.10 | 31 916.2 | 80 | | | | | 71WU | |
| 3135.483 | 0.003 | 31 883.774 | 2500 | | 7.42E+7 | $2p^53s\,^3P^\circ_0$ | $2p^53p\,^3D_1$ | 71WU | 08KEL/POD |
| 3137.861 | 0.003 | 31 859.612 | 1700 | | 1.41E+8 | $2p^53p\,^1P_1$ | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3138.94 | 0.10 | 31 848.7 | 100 | | | | | 71WU | |
| 3140.52 | 0.10 | 31 832.6 | 35 | | | | | 71WU | |
| 3140.95 | 0.10 | 31 828.3 | 35 | | | | | 71WU | |
| 3141.21 | 0.10 | 31 825.6 | 35 | | | | | 71WU | |
| 3141.82 | 0.10 | 31 819.5 | 30 | | | | | 71WU | |
| 3142.67 | 0.10 | 31 810.9 | 35 | | | | | 71WU | |
| 3145.706 | 0.003 | 31 780.161 | 950 | | 4.48E+7 | $2p^53p\,^1P_1$ | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 3146.94 | 0.10 | 31 767.7 | 45 | | | | | 71WU | |
| 3149.283 | 0.003 | 31 744.066 | 2000 | | 8.24E+7 | $2p^53s\,^1P^\circ_1$ | $2p^53p\,^1P_1$ | 71WU | 08KEL/POD |
| 3150.49 | 0.10 | 31 731.9 | 60 | | | | | 71WU | |
| 3150.78 | 0.10 | 31 729.0 | 55 | | | | | 71WU | |
| 3151.44 | 0.10 | 31 722.3 | 50 | | | | | 71WU | |
| 3152.03 | 0.10 | 31 716.4 | 40 | | | | | 71WU | |
| 3153.24 | 0.10 | 31 704.2 | 40 | | | | | 71WU | |
| 3153.77 | 0.10 | 31 698.9 | 60 | | | | | 71WU | |
| 3154.98 | 0.10 | 31 686.7 | 45 | | | | | 71WU | |
| 3155.48 | 0.10 | 31 681.7 | 45 | | | | | 71WU | |
| 3155.85 | 0.10 | 31 678.0 | 45 | | | | | 71WU | |
| 3158.42 | 0.10 | 31 652.2 | 250 | | | | | 71WU | |
| 3159.527 | 0.003 | 31 641.148 | 70 | | 1.38E+5 | $2p^53p\,^3P_2$ | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3161.154 | 0.003 | 31 624.863 | 250 | | 4.36E+6 | $2p^53s\,^1P^\circ_1$ | $2p^53p\,^3P_0$ | 71WU | 08KEL/POD |
| 3162.53 | 0.10 | 31 611.1 | 90 | | 7.16E+5 | $2p^53p\,^1P_1$ | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 3163.246 | 0.003 | 31 603.949 | 350 | | 6.10E+6 | $2p^53p\,^3P_2$ | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | 71WU | 04FRO/TAC |
| 3163.736 | 0.003 | 31 599.054 | 2000 | | 1.05E+8 | $2p^53p\,^1D_2$ | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3165.25 | 0.10 | 31 583.9 | 70 | | | | | 71WU | |
| 3166.36 | 0.10 | 31 572.9 | 30 | | | | | 71WU | |
| 3166.77 | 0.10 | 31 568.8 | 30 | | | | | 71WU | |
| 3167.484 | 0.003 | 31 561.665 | 200 | | 9.26E+6 | $2p^53p\,^3P_2$ | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3169.58 | 0.10 | 31 540.8 | 300 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 3171.62 | 0.10 | 31 520.5 | 25 | | | | | 71WU | |
| 3172.70 | 0.10 | 31 509.8 | 25 | | | | | 71WU | |
| 3173.42 | 0.10 | 31 502.6 | 15 | | | | | 71WU | |
| 3175.086 | 0.003 | 31 486.101 | 700 | | 6.25E+7 | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 3179.064 | 0.003 | 31 446.703 | 1000 | | 3.94E+7 | $2p^53p\ ^1D_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3180.94 | 0.10 | 31 428.2 | 160 | | | | | 71WU | |
| 3186.24 | 0.10 | 31 375.9 | 40 | | | | | 71WU | |
| 3187.78 | 0.10 | 31 360.7 | 80 | | | | | 71WU | |
| 3188.127 | 0.003 | 31 357.312 | 80 | | 6.66E+7 | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3189.002 | 0.003 | 31 348.709 | 200 | | | | | 71WU | |
| 3189.790 | 0.003 | 31 340.965 | 1700 | | 7.30E+7 | $2p^53s\ ^1P^\circ_1$ | $2p^53p\ ^3P_2$ | 71WU | 08KEL/POD |
| 3192.06 | 0.10 | 31 318.7 | 40 | | | | | 71WU | |
| 3192.21 | 0.10 | 31 317.2 | 35 | | | | | 71WU | |
| 3194.14 | 0.10 | 31 298.3 | 80 | | | | | 71WU | |
| 3195.79 | 0.10 | 31 282.1 | 25 | | | | | 71WU | |
| 3198.93 | 0.10 | 31 251.4 | 20 | | | | | 71WU | |
| 3200.300 | 0.003 | 31 238.042 | 60 | | 1.54E+6 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 93HIB/DOU |
| 3204.21 | 0.10 | 31 199.9 | 45 | | | | | 71WU | |
| 3204.89 | 0.10 | 31 193.3 | 25 | | | | | 71WU | |
| 3208.51 | 0.10 | 31 158.1 | 20 | | | | | 71WU | |
| 3212.190 | 0.003 | 31 122.418 | 1600 | | 1.12E+8 | $2p^53s\ ^1P^\circ_1$ | $2p^53p\ ^1P_1$ | 71WU | 08KEL/POD |
| 3212.820 | 0.003 | 31 116.316 | 200 | | | | | 71WU | |
| 3214.77 | 0.10 | 31 097.4 | 130 | | | | | 71WU | |
| 3216.283 | 0.003 | 31 082.814 | 450 | | 1.45E+7 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[7/2]^\circ_3$ | 71WU | 08KEL/POD |
| 3217.52 | 0.10 | 31 070.9 | 35 | | | | | 71WU | |
| 3221.175 | 0.003 | 31 035.610 | 60 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[7/2]_3$ | 71WU | |
| 3221.47 | 0.10 | 31 032.8 | 30 | | | | | 71WU | |
| 3222.34 | 0.10 | 31 024.4 | 40 | | | | | 71WU | |
| 3223.506 | 0.003 | 31 013.168 | 60 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[5/2]_2$ | 71WU | |
| 3224.37 | 0.10 | 31 004.9 | 50 | | | | | 71WU | |
| 3225.290 | 0.003 | 30 996.014 | 35 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[7/2]_4$ | 71WU | |
| 3225.977 | 0.003 | 30 989.414 | 450 | | 1.83E+7 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_2$ | 71WU | 04FRO/TAC |
| 3229.11 | 0.10 | 30 959.3 | 80 | | | | | 71WU | |
| 3231.41 | 0.10 | 30 937.3 | 45 | | | | | 71WU | |
| 3234.927 | 0.003 | 30 903.679 | 700 | | 1.83E+7 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3236.70 | 0.10 | 30 886.8 | 20 | | | | | 71WU | |
| 3238.20 | 0.10 | 30 872.4 | 12 | | | | | 71WU | |
| 3239.22 | 0.10 | 30 862.7 | 15 | | | | | 71WU | |
| 3240.324 | 0.003 | 30 852.208 | 40 | | | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})5f\ ^2[5/2]_3$ | 71WU | |
| 3242.06 | 0.10 | 30 835.7 | 15 | | | | | 71WU | |
| 3244.52 | 0.10 | 30 812.3 | 15 | | | | | 71WU | |
| 3244.88 | 0.10 | 30 808.9 | 20 | | | | | 71WU | |
| 3247.42 | 0.10 | 30 784.8 | 40 | | | | | 71WU | |
| 3247.91 | 0.10 | 30 780.2 | 20 | | | | | 71WU | |
| 3248.46 | 0.10 | 30 774.9 | 35 | | | | | 71WU | |
| 3250.949 | 0.003 | 30 751.378 | 400 | | 9.65E+6 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3251.68 | 0.10 | 30 744.5 | 300 | | | | | 71WU | |
| 3254.39 | 0.10 | 30 718.9 | 30 | | | | | 71WU | |
| 3254.71 | 0.10 | 30 715.8 | 30 | | | | | 71WU | |
| 3255.11 | 0.10 | 30 712.1 | 40 | | | | | 71WU | |
| 3257.964 | 0.003 | 30 685.167 | 1500 | | 1.03E+8 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3260.210 | 0.003 | 30 664.029 | 650 | | 4.65E+7 | $2p^53p\ ^1P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 3261.67 | 0.10 | 30 650.3 | 30 | | | | | 71WU | |
| 3262.38 | 0.10 | 30 643.6 | 30 | | | | | 71WU | |
| 3263.59 | 0.10 | 30 632.3 | 130 | | | | | 71WU | |
| 3268.31 | 0.10 | 30 588.0 | 25 | | | | | 71WU | |
| 3271.58 | 0.10 | 30 557.5 | 25 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 3272.74 | 0.10 | 30 546.6 | 70 | | | | | 71WU | |
| 3274.220 | 0.003 | 30 532.825 | 950 | | 4.29E+7 | $2p^53p\ ^3P_2$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3278.02 | 0.10 | 30 497.4 | 40 | | | | | 71WU | |
| 3278.77 | 0.10 | 30 490.5 | 35 | | | | | 71WU | |
| 3280.25 | 0.10 | 30 476.7 | 35 | | | | | 71WU | |
| 3282.78 | 0.10 | 30 453.2 | 90 | | | | | 71WU | |
| 3285.602 | 0.003 | 30 427.057 | 1700 | | 1.10E+8 | $2p^53s\ ^1P^\circ_1$ | $2p^53p\ ^1D_2$ | 71WU | 08KEL/POD |
| 3289.34 | 0.10 | 30 392.5 | 60 | | | | | 71WU | |
| 3290.44 | 0.10 | 30 382.3 | 80 | | | | | 71WU | |
| 3291.37 | 0.10 | 30 373.7 | 50 | | | | | 71WU | |
| 3292.50 | 0.10 | 30 363.3 | 80 | | | | | 71WU | |
| 3294.74 | 0.10 | 30 342.7 | 60 | | | | | 71WU | |
| 3295.65 | 0.10 | 30 334.3 | 60 | | | | | 71WU | |
| 3297.14 | 0.10 | 30 320.6 | 70 | | | | | 71WU | |
| 3298.31 | 0.10 | 30 309.8 | 70 | | | | | 71WU | |
| 3299.68 | 0.10 | 30 297.2 | 130 | | | | | 71WU | |
| 3301.349 | 0.003 | 30 281.929 | 1700 | | 4.54E+6 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_2$ | 71WU | 08KEL/POD |
| 3304.957 | 0.003 | 30 248.871 | 1500 | | 3.60E+7 | $2p^53p\ ^3P_0$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3307.88 | 0.10 | 30 222.1 | 200 | | | | | 71WU | |
| 3312.68 | 0.10 | 30 178.4 | 60 | | | | | 71WU | |
| 3313.76 | 0.10 | 30 168.5 | 90 | | | | | 71WU | |
| 3314.08 | 0.10 | 30 165.6 | 70 | | | | | 71WU | |
| 3318.039 | 0.003 | 30 129.613 | 1000 | | 4.14E+7 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_1$ | 71WU | 08KEL/POD |
| 3320.22 | 0.10 | 30 109.8 | 60 | | | | | 71WU | |
| 3320.59 | 0.10 | 30 106.5 | 60 | | | | | 71WU | |
| 3323.93 | 0.10 | 30 076.2 | 60 | | | | | 71WU | |
| 3326.42 | 0.10 | 30 053.7 | 60 | | | | | 71WU | |
| 3326.890 | 0.003 | 30 049.458 | 100 | | | | | 71WU | |
| 3327.689 | 0.003 | 30 042.243 | 950 | | 9.47E+7 | $2p^53p\ ^3P_1$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[1/2]^\circ_0$ | 71WU | 08KEL/POD |
| 3333.07 | 0.10 | 29 993.7 | 60 | | | | | 71WU | |
| 3333.68 | 0.10 | 29 988.3 | 60 | | | | | 71WU | |
| 3334.45 | 0.10 | 29 981.3 | 70 | | | | | 71WU | |
| 3338.01 | 0.10 | 29 949.4 | 70 | | | | | 71WU | |
| 3338.71 | 0.10 | 29 943.1 | 50 | | | | | 71WU | |
| 3339.21 | 0.10 | 29 938.6 | 40 | | | | | 71WU | |
| 3339.82 | 0.10 | 29 933.1 | 45 | | | | | 71WU | |
| 3341.77 | 0.10 | 29 915.7 | 80 | | | | | 71WU | |
| 3342.26 | 0.10 | 29 911.3 | 100 | | | | | 71WU | |
| 3343.17 | 0.10 | 29 903.1 | 70 | | | | | 71WU | |
| 3346.29 | 0.10 | 29 875.3 | 60 | | | | | 71WU | |
| 3347.57 | 0.10 | 29 863.8 | 50 | | | | | 71WU | |
| 3349.47 | 0.10 | 29 846.9 | 60 | | | | | 71WU | |
| 3351.96 | 0.10 | 29 824.7 | 90 | | | | | 71WU | |
| 3353.89 | 0.10 | 29 807.6 | 300 | | | | | 71WU | |
| 3354.16 | 0.10 | 29 805.2 | 300 | | | | | 71WU | |
| 3355.76 | 0.10 | 29 790.9 | 50 | | | | | 71WU | |
| 3360.19 | 0.10 | 29 751.7 | 500 | | | | | 71WU | |
| 3362.33 | 0.10 | 29 732.7 | 160 | | | | | 71WU | |
| 3362.79 | 0.10 | 29 728.7 | 160 | | | | | 71WU | |
| 3364.01 | 0.10 | 29 717.9 | 130 | | | | | 71WU | |
| 3364.74 | 0.10 | 29 711.4 | 130 | | | | | 71WU | |
| 3368.632 | 0.003 | 29 677.116 | 160 | | | | | 71WU | |
| 3369.39 | 0.10 | 29 670.4 | 200 | | | | | 71WU | |
| 3372.22 | 0.10 | 29 645.5 | 160 | | | | | 71WU | |
| 3374.80 | 0.10 | 29 622.9 | 50 | | | | | 71WU | |
| 3375.48 | 0.10 | 29 616.9 | 50 | | | | | 71WU | |
| 3378.71 | 0.10 | 29 588.6 | 35 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 3380.33 | 0.10 | 29 574.4 | 40 | | | | | 71WU | |
| 3384.75 | 0.10 | 29 535.8 | 35 | | | | | 71WU | |
| 3387.27 | 0.10 | 29 513.8 | 25 | | | | | 71WU | |
| 3387.85 | 0.10 | 29 508.8 | 50 | | | | | 71WU | |
| 3395.38 | 0.10 | 29 443.3 | 40 | | | | | 71WU | |
| 3395.78 | 0.10 | 29 439.9 | 40 | | | | | 71WU | |
| 3398.80 | 0.10 | 29 413.7 | 50 | | | | | 71WU | |
| 3399.26 | 0.10 | 29 409.7 | 60 | | | | | 71WU | |
| 3400.093 | 0.003 | 29 402.522 | 200 | | 1.24E+6 | $2p^53s\ ^1P^°_1$ | $2p^53p\ ^3D_1$ | 71WU | 08KEL/POD |
| 3410.83 | 0.10 | 29 310.0 | 12 | | | | | 71WU | |
| 3421.35 | 0.10 | 29 219.8 | 60 | | | | | 71WU | |
| 3423.59 | 0.10 | 29 200.7 | 70 | | | | | 71WU | |
| 3424.03 | 0.10 | 29 197.0 | 130 | | | | | 71WU | |
| 3425.30 | 0.10 | 29 186.2 | 30 | | | | | 71WU | |
| 3431.71 | 0.10 | 29 131.6 | 25 | | | | | 71WU | |
| 3433.49 | 0.10 | 29 116.5 | 40 | | | | | 71WU | |
| 3439.25 | 0.10 | 29 067.8 | 30 | | | | | 71WU | |
| 3440.12 | 0.10 | 29 060.4 | 35 | | | | | 71WU | |
| 3443.36 | 0.10 | 29 033.1 | 50 | | | | | 71WU | |
| 3450.17 | 0.10 | 28 975.8 | 20 | | | | | 71WU | |
| 3450.88 | 0.10 | 28 969.8 | 20 | | | | | 71WU | |
| 3455.28 | 0.10 | 28 932.9 | 25 | | | | | 71WU | |
| 3457.03 | 0.10 | 28 918.3 | 15 | | | | | 71WU | |
| 3458.95 | 0.10 | 28 902.2 | 15 | | | | | 71WU | |
| 3462.491 | 0.003 | 28 872.672 | 450 | | 3.61E+6 | $2p^53s\ ^1P^°_1$ | $2p^53p\ ^3D_2$ | 71WU | 08KEL/POD |
| 3468.71 | 0.10 | 28 820.9 | 25 | | | | | 71WU | |
| 3473.21 | 0.10 | 28 783.6 | 35 | | | | | 71WU | |
| 3475.81 | 0.10 | 28 762.0 | 70 | | | | | 71WU | |
| 3482.00 | 0.10 | 28 710.9 | 40 | | | | | 71WU | |
| 3483.02 | 0.10 | 28 702.5 | 40 | | | | | 71WU | |
| 3485.74 | 0.10 | 28 680.1 | 20 | | | | | 71WU | |
| 3498.26 | 0.10 | 28 577.5 | 160 | | | | | 71WU | |
| 3516.95 | 0.10 | 28 425.6 | 60 | | | | | 71WU | |
| 3525.29 | 0.10 | 28 358.4 | 60 | | | | | 71WU | |
| 3527.97 | 0.10 | 28 336.8 | 80 | | | | | 71WU | |
| 3529.11 | 0.10 | 28 327.7 | 130 | | | | | 71WU | |
| 3530.48 | 0.10 | 28 316.7 | 160 | | | | | 71WU | |
| 3533.052 | 0.003 | 28 296.053 | 1500 | | 8.81E+7 | $2p^53s\ ^3P^°_2$ | $2p^53p\ ^3S_1$ | 71WU | 08KEL/POD |
| 3540.23 | 0.10 | 28 238.7 | 70 | | | | | 71WU | |
| 3541.36 | 0.10 | 28 229.7 | 60 | | | | | 71WU | |
| 3550.57 | 0.10 | 28 156.4 | 60 | | | | | 71WU | |
| 3551.92 | 0.10 | 28 145.7 | 45 | | | | | 71WU | |
| 3552.50 | 0.10 | 28 141.2 | 60 | | | | | 71WU | |
| 3554.12 | 0.10 | 28 128.3 | 60 | | | | | 71WU | |
| 3566.18 | 0.10 | 28 033.2 | 130 | | | | | 71WU | |
| 3570.48 | 0.10 | 27 999.4 | 130 | | | | | 71WU | |
| 3597.42 | 0.10 | 27 789.8 | 35 | | | | | 71WU | |
| 3598.37 | 0.10 | 27 782.4 | 25 | | | | | 71WU | |
| 3609.55 | 0.10 | 27 696.4 | 60 | | | | | 71WU | |
| 3615.58 | 0.10 | 27 650.2 | 40 | | | | | 71WU | |
| 3631.272 | 0.003 | 27 530.711 | 1200 | | 3.72E+7 | $2p^53s\ ^3P^°_1$ | $2p^53p\ ^3S_1$ | 71WU | 08KEL/POD |
| 3668.65 | 0.10 | 27 250.2 | 30 | | | | | 71WU | |
| 3694.20 | 0.10 | 27 061.8 | 25 | | | | | 71WU | |
| 3701.00 | 0.10 | 27 012.0 | 30 | | | | | 71WU | |
| 3701.58 | 0.10 | 27 007.8 | 30 | | | | | 71WU | |
| 3711.070 | 0.003 | 26 938.742 | 850 | | 1.02E+7 | $2p^53s\ ^3P^°_0$ | $2p^53p\ ^3S_1$ | 71WU | 08KEL/POD |
| 3743.33 | 0.10 | 26 706.6 | 45 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 3798.25 | 0.10 | 26 320.4 | 130 | | | | | 71WU | |
| 3806.53 | 0.10 | 26 263.2 | 130 | | | | | 71WU | |
| 3813.12 | 0.10 | 26 217.8 | 100 | | | | | 71WU | |
| 3814.61 | 0.10 | 26 207.6 | 60 | | | | | 71WU | |
| 3820.50 | 0.10 | 26 167.2 | 70 | | | | | 71WU | |
| 3858.32 | 0.10 | 25 910.7 | 500 | | | | | 71WU | |
| 3871.26 | 0.10 | 25 824.1 | 300 | | | | | 71WU | |
| 3878.96 | 0.10 | 25 772.8 | 160 | | | | | 71WU | |
| 3887.22 | 0.10 | 25 718.0 | 90 | | | | | 71WU | |
| 3888.87 | 0.10 | 25 707.1 | 130 | | | | | 71WU | |
| 3895.78 | 0.10 | 25 661.5 | 130 | | | | | 71WU | |
| 3896.92 | 0.10 | 25 654.0 | 70 | | | | | 71WU | |
| 3901.67 | 0.10 | 25 622.8 | 90 | | | | | 71WU | |
| 3903.69 | 0.10 | 25 609.5 | 80 | | | | | 71WU | |
| 3904.74 | 0.10 | 25 602.6 | 100 | | | | | 71WU | |
| 3910.26 | 0.10 | 25 566.5 | 100 | | | | | 71WU | |
| 3926.71 | 0.10 | 25 459.4 | 100 | | | | | 71WU | |
| 3936.96 | 0.10 | 25 393.1 | 100 | | | | | 71WU | |
| 3939.45 | 0.10 | 25 377.1 | 60 | | | | | 71WU | |
| 3941.50 | 0.10 | 25 363.9 | 80 | | | | | 71WU | |
| 3942.98 | 0.10 | 25 354.4 | 130 | | | | | 71WU | |
| 3985.85 | 0.10 | 25 081.7 | 30 | | | | | 71WU | |
| 3996.97 | 0.10 | 25 011.9 | 130 | | | | | 71WU | |
| 3998.78 | 0.10 | 25 000.6 | 70 | | | | | 71WU | |
| 4003.63 | 0.10 | 24 970.3 | 45 | | | | | 71WU | |
| 4004.98 | 0.10 | 24 961.9 | 100 | | | | | 71WU | |
| 4027.93 | 0.10 | 24 819.6 | 40 | | | | | 71WU | |
| 4056.007 | 0.003 | 24 647.828 | 50 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4059.67 | 0.10 | 24 625.6 | 45 | | | | | 71WU | |
| 4081.369 | 0.003 | 24 494.667 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_3$ | 71WU | |
| 4087.603 | 0.003 | 24 457.311 | 130 | | 3.81E+5 | $2p^53s\ ^1P^\circ_1$ | $2p^53p\ ^3S_1$ | 71WU | 08KEL/POD |
| 4107.35 | 0.10 | 24 339.7 | 35 | | | | | 71WU | |
| 4113.704 | 0.003 | 24 302.136 | 300 | | 2.70E+7 | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})4s\ ^2[1/2]^\circ_1$ | 71WU | 04FRO/TAC |
| 4123.082 | 0.003 | 24 246.861 | 250 | | 3.71E+7 | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{1/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 4127.03 | 0.10 | 24 223.7 | 80 | | | | | 71WU | |
| 4149.07 | 0.10 | 24 095.0 | 90 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_4$ | 71WU | |
| 4165.27 | 0.10 | 24 001.3 | 40 | | | | | 71WU | |
| 4168.03 | 0.10 | 23 985.4 | 60 | | | | | 71WU | |
| 4171.93 | 0.10 | 23 963.0 | 160 | | | | | 71WU | |
| 4172.88 | 0.10 | 23 957.5 | 160 | | | | | 71WU | |
| 4174.13 | 0.10 | 23 950.3 | 150 | | | | | 71WU | |
| 4194.02 | 0.10 | 23 836.8 | 60 | | | | | 71WU | |
| 4202.764 | 0.003 | 23 787.163 | 130 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_3$ | 71WU | |
| 4204.84 | 0.10 | 23 775.4 | 60 | | | | | 71WU | |
| 4208.72 | 0.10 | 23 753.5 | 80 | | | | | 71WU | |
| 4216.27 | 0.10 | 23 711.0 | 160 | | | | | 71WU | |
| 4230.96 | 0.10 | 23 628.6 | 50 | | | | | 71WU | |
| 4232.72 | 0.10 | 23 618.8 | 130 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4233.26 | 0.10 | 23 615.8 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_3$ | 71WU | |
| 4240.37 | 0.10 | 23 576.2 | 200* | b | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4240.37 | 0.10 | 23 576.2 | 200* | b | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_3$ | 71WU | |
| 4240.903 | 0.003 | 23 573.246 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_4$ | 71WU | |
| 4242.81 | 0.10 | 23 562.7 | 70 | | | | | 71WU | |
| 4243.41 | 0.10 | 23 559.3 | 70 | | | | | 71WU | |
| 4246.83 | 0.10 | 23 540.3 | 50 | | | | | 71WU | |
| 4260.58 | 0.10 | 23 464.4 | 200 | | | | | 71WU | |
| 4290.38 | 0.10 | 23 301.4 | 60 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | $\sigma$ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 4292.488 | 0.003 | 23 289.960 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4292.864 | 0.003 | 23 287.920 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_1$ | 71WU | |
| 4302.19 | 0.10 | 23 237.4 | 70 | | | | | 71WU | |
| 4304.53 | 0.10 | 23 224.8 | 60 | | | | | 71WU | |
| 4305.87 | 0.10 | 23 217.6 | 60 | | | | | 71WU | |
| 4306.75 | 0.10 | 23 212.8 | 70 | | | | | 71WU | |
| 4308.817 | 0.003 | 23 201.700 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4309.043 | 0.003 | 23 200.484 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_1$ | 71WU | |
| 4320.751 | 0.003 | 23 137.618 | 5 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4320.913 | 0.003 | 23 136.751 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4326.98 | 0.10 | 23 104.3 | 130 | | | | | 71WU | |
| 4334.42 | 0.10 | 23 064.7 | 80 | | | | | 71WU | |
| 4337.294 | 0.003 | 23 049.370 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4337.520 | 0.003 | 23 048.169 | 5 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_1$ | 71WU | |
| 4344.108 | 0.003 | 23 013.216 | 250 | | 4.32E+7 | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})4s\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 4353.60 | 0.10 | 22 963.0 | 60 | | | | | 71WU | |
| 4368.600 | 0.003 | 22 884.198 | 200 | | 3.59E+7 | $2p^53p\ ^1S_0$ | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | 71WU | 08KEL/POD |
| 4375.215 | 0.003 | 22 849.599 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_4$ | 71WU | |
| 4378.19 | 0.10 | 22 834.1 | 60 | | | | | 71WU | |
| 4384.194 | 0.003 | 22 802.803 | 160 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4387.489 | 0.003 | 22 785.678 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_3$ | 71WU | |
| 4392.814 | 0.003 | 22 758.058 | 250 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})4f\,^2[9/2]_5$ | 71WU | |
| 4396.317 | 0.003 | 22 739.925 | 160 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4401.41 | 0.10 | 22 713.6 | 90 | | | | | 71WU | |
| 4405.113 | 0.003 | 22 694.519 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[9/2]_4$ | 71WU | |
| 4435.18 | 0.10 | 22 540.7 | 60 | | | | | 71WU | |
| 4438.47 | 0.10 | 22 524.0 | 130 | | | | | 71WU | |
| 4441.00 | 0.10 | 22 511.1 | 100 | | | | | 71WU | |
| 4442.59 | 0.10 | 22 503.1 | 160 | | | | | 71WU | |
| 4443.20 | 0.10 | 22 500.0 | 130 | | | | | 71WU | |
| 4445.928 | 0.003 | 22 486.180 | 160 | | | | | 71WU | |
| 4446.695 | 0.003 | 22 482.301 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4447.411 | 0.003 | 22 478.682 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_3$ | 71WU | |
| 4451.83 | 0.10 | 22 456.4 | 60 | | | | | 71WU | |
| 4454.564 | 0.003 | 22 442.587 | 5 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4454.736 | 0.003 | 22 441.720 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_3$ | 71WU | |
| 4455.224 | 0.003 | 22 439.262 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_4$ | 71WU | |
| 4457.025 | 0.003 | 22 430.195 | 20 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4457.223 | 0.003 | 22 429.199 | 200 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4459.51 | 0.10 | 22 417.7 | 80 | | | | | 71WU | |
| 4472.10 | 0.10 | 22 354.6 | 100 | | | | | 71WU | |
| 4472.74 | 0.10 | 22 351.4 | 90 | | | | | 71WU | |
| 4474.633 | 0.003 | 22 341.932 | 200 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4478.623 | 0.003 | 22 322.028 | 100 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4478.797 | 0.003 | 22 321.161 | 200 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_3$ | 71WU | |
| 4480.423 | 0.003 | 22 313.060 | 130 | | | | | 71WU | |
| 4481.664 | 0.003 | 22 306.882 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_3$ | 71WU | |
| 4487.79 | 0.10 | 22 276.4 | 130 | | | | | 71WU | |
| 4490.162 | 0.003 | 22 264.665 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_4$ | 71WU | |
| 4490.869 | 0.003 | 22 261.160 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4491.037 | 0.003 | 22 260.327 | 10 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4496.15 | 0.10 | 22 235.0 | 130 | | | | | 71WU | |
| 4499.431 | 0.003 | 22 218.800 | 20 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4499.615 | 0.003 | 22 217.891 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4503.693 | 0.003 | 22 197.774 | 130 | | | | | 71WU | |
| 4506.972 | 0.003 | 22 181.624 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4508.997 | 0.003 | 22 171.663 | 130 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_1$ | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 4510.475 | 0.003 | 22 164.397 | 160 | | | | | 71WU | |
| 4514.41 | 0.10 | 22 145.1 | 60 | | | | | 71WU | |
| 4517.380 | 0.003 | 22 130.519 | 130 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4519.201 | 0.003 | 22 121.601 | 200 | | | $2p^5(^2P^\circ_{1/2})4s\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | 71WU | |
| 4524.977 | 0.003 | 22 093.364 | 200 | | | $2p^5(^2P^\circ_{3/2})3d\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4526.61 | 0.10 | 22 085.4 | 40 | | | | | 71WU | |
| 4529.31 | 0.10 | 22 072.2 | 90 | | | $2p^5(^2P^\circ_{1/2})4p\,^2[1/2]_1$ | $2p^5(^2P^\circ_{1/2})6s\,^2[1/2]^\circ_1$ | 71WU | |
| 4533.323 | 0.003 | 22 052.690 | 200 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4538.03 | 0.10 | 22 029.8 | 60 | | | | | 71WU | |
| 4547.845 | 0.003 | 21 982.274 | 80 | | | | | 71WU | |
| 4549.50 | 0.10 | 21 974.3 | 45 | | | | | 71WU | |
| 4551.518 | 0.003 | 21 964.535 | 200 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4551.787 | 0.003 | 21 963.237 | 80 | | | $2p^5(^2P^\circ_{3/2})4s\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_1$ | 71WU | |
| 4558.32 | 0.10 | 21 931.8 | 50 | | | | | 71WU | |
| 4569.07 | 0.10 | 21 880.2 | 70 | | | | | 71WU | |
| 4570.443 | 0.003 | 21 873.587 | 130 | | | | | 71WU | |
| 4573.55 | 0.10 | 21 858.7 | 50 | | | | | 71WU | |
| 4578.42 | 0.10 | 21 835.5 | 60 | | | | | 71WU | |
| 4584.383 | 0.003 | 21 807.076 | 80 | | | | | 71WU | |
| 4590.933 | 0.003 | 21 775.963 | 160 | | 1.98E+6 | $2p^53p\,^1S_0$ | $2p^5(^2P^\circ_{3/2})3d\,^2[1/2]^\circ_1$ | 71WU | 93HIB/DOU |
| 4598.19 | 0.10 | 21 741.6 | 50 | | | | | 71WU | |
| 4599.74 | 0.10 | 21 734.3 | 60 | | | | | 71WU | |
| 4613.38 | 0.10 | 21 670.0 | 130 | | | | | 71WU | |
| 4614.55 | 0.10 | 21 664.5 | 50 | | | | | 71WU | |
| 4633.94 | 0.10 | 21 573.9 | 50 | | | | | 71WU | |
| 4646.20 | 0.10 | 21 516.9 | 70 | | | | | 71WU | |
| 4689.64 | 0.10 | 21 317.6 | 50 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})8f\,^2[9/2]_5$ | 71WU | |
| 4722.333 | 0.003 | 21 170.051 | 160 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_3$ | 71WU | |
| 4728.60 | 0.10 | 21 142.0 | 40 | | | | | 71WU | |
| 4731.141 | 0.003 | 21 130.640 | 160 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_4$ | 71WU | |
| 4732.502 | 0.003 | 21 124.563 | 100 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4733.74 | 0.10 | 21 119.0 | 45 | | | | | 71WU | |
| 4741.669 | 0.003 | 21 083.724 | 160 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4749.85 | 0.10 | 21 047.4 | 40 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})8f\,^2[7/2]_4$ | 71WU | |
| 4757.71 | 0.10 | 21 012.6 | 50 | | | $2p^5(^2P^\circ_{1/2})4d\,^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{1/2})8f\,^2[5/2]_2$ | 71WU | |
| 4761.31 | 0.10 | 20 996.8 | 45 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4768.902 | 0.003 | 20 963.326 | 160 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | 71WU | |
| 4788.79 | 0.10 | 20 876.3 | 100 | | | $2p^5(^2P^\circ_{1/2})3d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4794.49 | 0.10 | 20 851.4 | 45 | | | | | 71WU | |
| 4802.82 | 0.10 | 20 815.3 | 45 | | | | | 71WU | |
| 4810.03 | 0.10 | 20 784.1 | 45 | | | | | 71WU | |
| 4814.75 | 0.10 | 20 763.7 | 50 | | | $2p^5(^2P^\circ_{1/2})4s\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | 71WU | |
| 4835.259 | 0.003 | 20 675.638 | 50 | | | $2p^5(^2P^\circ_{1/2})4s\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | 71WU | |
| 4841.88 | 0.10 | 20 647.4 | 45 | | | | | 71WU | |
| 4885.40 | 0.10 | 20 463.4 | 45 | | | | | 71WU | |
| 4907.93 | 0.10 | 20 369.5 | 40 | | | | | 71WU | |
| 4923.80 | 0.10 | 20 303.8 | 45 | | | | | 71WU | |
| 4973.26 | 0.10 | 20 101.9 | 60 | | | | | 71WU | |
| 5133.75 | 0.10 | 19 473.5 | 100 | | | | | 71WU | |
| 5143.11 | 0.10 | 19 438.1 | 60 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})7f\,^2[3/2]_1$ | 71WU | |
| 5187.15 | 0.10 | 19 273.0 | 45 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})7f\,^2[5/2]_{2,3}$ | 71WU | |
| 5191.65 | 0.10 | 19 256.3 | 100 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})7f\,^2[3/2]_2$ | 71WU | |
| 5195.23 | 0.10 | 19 243.1 | 100 | | | | | 71WU | |
| 5203.33 | 0.10 | 19 213.1 | 50 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})7f\,^2[9/2]_{4,5}$ | 71WU | |
| 5206.08 | 0.10 | 19 203.0 | 45 | | | | | 71WU | |
| 5208.55 | 0.10 | 19 193.9 | 80 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})7f\,^2[7/2]_{3,4}$ | 71WU | |
| 5209.94 | 0.10 | 19 188.7 | 40 | | | | | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 5213.49 | 0.10 | 19 175.7 | 45 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})7f\,^2[9/2]_4$ | 71WU | |
| 5228.19 | 0.10 | 19 121.8 | 35 | | | | | 71WU | |
| 5235.31 | 0.10 | 19 095.8 | 45 | | | | | 71WU | |
| 5239.43 | 0.10 | 19 080.7 | 45 | | | $2p^5(^2P^\circ_{1/2})4d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})7f\,^2[7/2]_3$ | 71WU | |
| 5260.66 | 0.10 | 19 003.7 | 50 | | | | | 71WU | |
| 5275.72 | 0.10 | 18 949.5 | 45 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})7f\,^2[7/2]_{3,4}$ | 71WU | |
| 5291.65 | 0.10 | 18 892.4 | 70 | | | | | 71WU | |
| 5304.47 | 0.10 | 18 846.8 | 40 | | | | | 71WU | |
| 5307.36 | 0.10 | 18 836.5 | 45 | | | | | 71WU | |
| 5309.14 | 0.10 | 18 830.2 | 50 | | | | | 71WU | |
| 5360.41 | 0.10 | 18 650.1 | 50 | | | | | 71WU | |
| 5362.46 | 0.10 | 18 643.0 | 40 | | | | | 71WU | |
| 5379.02 | 0.10 | 18 585.6 | 45* | b | | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_1$ | $2p^5(^2P^\circ_{3/2})7g\,^2[5/2]^\circ_2$ | 71WU | |
| 5379.02 | 0.10 | 18 585.6 | 200* | b | | $2p^5(^2P^\circ_{3/2})4f\,^2[3/2]_2$ | $2p^5(^2P^\circ_{3/2})7g\,^2[5/2]^\circ_{2,3}$ | 71WU | |
| 5390.63 | 0.10 | 18 545.6 | 60 | | | $2p^5(^2P^\circ_{3/2})4f\,^2[9/2]_{4,5}$ | $2p^5(^2P^\circ_{3/2})7g\,^2[11/2]^\circ_{5,6}$ | 71WU | |
| 5399.41 | 0.10 | 18 515.4 | 45* | b | | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_{3,4}$ | $2p^5(^2P^\circ_{1/2})7g\,^2[7/2]^\circ_{3,4}$ | 71WU | |
| 5399.41 | 0.10 | 18 515.4 | 45* | b | | $2p^5(^2P^\circ_{1/2})4f\,^2[7/2]_{3,4}$ | $2p^5(^2P^\circ_{1/2})7g\,^2[9/2]^\circ_{4,5}$ | 71WU | |
| 5400.464 | 0.003 | 18 511.781 | 70 | | | $2p^5(^2P^\circ_{1/2})4f\,^2[5/2]_2$ | $2p^5(^2P^\circ_{1/2})7g\,^2[7/2]^\circ_3$ | 71WU | |
| 5402.07 | 0.10 | 18 506.3 | 45* | b | | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_3$ | $2p^5(^2P^\circ_{3/2})7g\,^2[7/2]^\circ_{3,4}$ | 71WU | |
| 5402.07 | 0.10 | 18 506.3 | 45* | b | | $2p^5(^2P^\circ_{3/2})4f\,^2[5/2]_2$ | $2p^5(^2P^\circ_{3/2})7g\,^2[7/2]^\circ_3$ | 71WU | |
| 5414.546 | 0.003 | 18 463.636 | 90 | | | $2p^5(^2P^\circ_{3/2})4f\,^2[7/2]_{3,4}$ | $2p^5(^2P^\circ_{3/2})7g\,^2[9/2]^\circ_{4,5}$ | 71WU | |
| 5441.20 | 0.10 | 18 373.2 | 80 | | | | | 71WU | |
| 5485.90 | 0.10 | 18 223.5 | 35 | | | | | 71WU | |
| 5521.11 | 0.10 | 18 107.3 | 80 | | | | | 71WU | |
| 5533.72 | 0.10 | 18 066.0 | 50 | | | | | 71WU | |
| 5598.30 | 0.10 | 17 857.6 | 50 | | | | | 71WU | |
| 5607.74 | 0.10 | 17 827.5 | 50 | | | | | 71WU | |
| 5655.63 | 0.10 | 17 676.6 | 80 | | | | | 71WU | |
| 5664.78 | 0.10 | 17 648.0 | 100 | | | | | 71WU | |
| 5700.07 | 0.10 | 17 538.8 | 130 | | | | | 71WU | |
| 5706.00 | 0.10 | 17 520.6 | 130 | | | | | 71WU | |
| 5708.12 | 0.10 | 17 514.0 | 130 | | | | | 71WU | |
| 5709.61 | 0.10 | 17 509.5 | 130 | | | | | 71WU | |
| 5716.17 | 0.10 | 17 489.4 | 100 | | | | | 71WU | |
| 5721.38 | 0.10 | 17 473.5 | 100 | | | | | 71WU | |
| 5731.94 | 0.10 | 17 441.3 | 60 | | | | | 71WU | |
| 5748.11 | 0.10 | 17 392.2 | 50 | | | | | 71WU | |
| 5765.37 | 0.10 | 17 340.1 | 60 | | | | | 71WU | |
| 5826.84 | 0.10 | 17 157.2 | 70 | | | | | 71WU | |
| 5836.87 | 0.10 | 17 127.7 | 90 | | | | | 71WU | |
| 5921.35 | 0.10 | 16 883.4 | 130 | | | | | 71WU | |
| 5940.90 | 0.10 | 16 827.8 | 130 | | | | | 71WU | |
| 5973.59 | 0.10 | 16 735.7 | 70 | | | | | 71WU | |
| 6026.67 | 0.10 | 16 588.3 | 50 | | | | | 71WU | |
| 6063.27 | 0.10 | 16 488.2 | 60 | | | | | 71WU | |
| 6121.46 | 0.10 | 16 331.5 | 50 | | | | | 71WU | |
| 6175.25 | 0.10 | 16 189.2 | 60 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[1/2]^\circ_0$ | $2p^5(^2P^\circ_{3/2})6f\,^2[3/2]_1$ | 71WU | |
| 6187.66 | 0.10 | 16 156.7 | 60 | | | | | 71WU | |
| 6199.26 | 0.10 | 16 126.5 | 70 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[1/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\,^2[3/2]_2$ | 71WU | |
| 6232.22 | 0.10 | 16 041.2 | 60 | | | | | 71WU | |
| 6234.68 | 0.10 | 16 034.9 | 70 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\,^2[5/2]_2$ | 71WU | |
| 6260.01 | 0.10 | 15 970.0 | 80 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[7/2]^\circ_4$ | $2p^5(^2P^\circ_{3/2})6f\,^2[9/2]_5$ | 71WU | |
| 6274.74 | 0.10 | 15 932.5 | 80 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[7/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\,^2[9/2]_4$ | 71WU | |
| 6294.66 | 0.10 | 15 882.1 | 70 | | | | | 71WU | |
| 6310.80 | 0.10 | 15 841.5 | 60 | | | $2p^5(^2P^\circ_{1/2})4d\,^2[3/2]^\circ_2$ | $2p^5(^2P^\circ_{1/2})6f\,^2[5/2]_2$ | 71WU | |
| 6352.83 | 0.10 | 15 736.7 | 60 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\,^2[7/2]_3$ | 71WU | |
| 6358.05 | 0.10 | 15 723.7 | 60 | | | $2p^5(^2P^\circ_{3/2})4d\,^2[5/2]^\circ_2$ | $2p^5(^2P^\circ_{3/2})6f\,^2[5/2]_{2,3}$ | 71WU | |

TABLE 3. Observed spectral lines of Na II—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 6361.15 | 0.10 | 15 716.1 | 70 | | | $2p^5(^2P^\circ_{3/2})4d^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[7/2]_{3,4}$ | 71WU | |
| 6366.41 | 0.10 | 15 703.1 | 70 | | | $2p^5(^2P^\circ_{3/2})4d^2[5/2]^\circ_3$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[5/2]_{2,3}$ | 71WU | |
| 6378.91 | 0.10 | 15 672.3 | 60 | | | $2p^5(^2P^\circ_{1/2})4d\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{1/2})6f\ ^2[5/2]_2$ | 71WU | |
| 6404.79 | 0.10 | 15 609.0 | 60 | | | | | 71WU | |
| 6438.75 | 0.10 | 15 526.7 | 50 | | | | | 71WU | |
| 6444.85 | 0.10 | 15 512.0 | 50 | | | | | 71WU | |
| 6450.76 | 0.10 | 15 497.8 | 45 | | | | | 71WU | |
| 6462.21 | 0.10 | 15 470.3 | 60 | | | | | 71WU | |
| 6471.33 | 0.10 | 15 448.5 | 50 | | | | | 71WU | |
| 6475.290 | 0.003 | 15 439.057 | 50 | | | $2p^5(^2P^\circ_{3/2})5s\ ^2[3/2]^\circ_1$ | $2p^5(^2P^\circ_{3/2})6f\ ^2[3/2]_1$ | 71WU | |
| 6514.210 | 0.003 | 15 346.815 | 90 | | | $2p^5(^2P^\circ_{3/2})4f^2[3/2]_1$ | $2p^5(^2P^\circ_{3/2})6g^2[5/2]^\circ_2$ | 71WU | |
| 6524.68 | 0.10 | 15 322.2 | 80 | | | $2p^5(^2P^\circ_{3/2})4f^2[9/2]_{4,5}$ | $2p^5(^2P^\circ_{3/2})6g\ ^2[9/2]^\circ_{4,5}$ | 71WU | |
| 6530.698 | 0.003 | 15 308.070 | 130 | | | $2p^5(^2P^\circ_{3/2})4f^2[9/2]_{4,5}$ | $2p^5(^2P^\circ_{3/2})6g\ ^2[11/2]^\circ_{5,6}$ | 71WU | |
| 6544.036 | 0.003 | 15 276.869 | 130 | | | $2p^5(^2P^\circ_{1/2})4f^2[5/2]_3$ | $2p^5(^2P^\circ_{1/2})6g\ ^2[7/2]^\circ_{3,4}$ | 71WU | |
| 6545.753 | 0.003 | 15 272.862 | 130 | | | $2p^5(^2P^\circ_{3/2})4f^2[5/2]_3$ | $2p^5(^2P^\circ_{3/2})6g\ ^2[7/2]^\circ_{3,4}$ | 71WU | |
| 6552.432 | 0.003 | 15 257.294 | 80 | | | $2p^5(^2P^\circ_{3/2})4f^2[5/2]_2$ | $2p^5(^2P^\circ_{3/2})6g^2[5/2]^\circ_{2,3}$ | 71WU | |
| 6565.850 | 0.003 | 15 226.115 | 15 | | | $2p^5(^2P^\circ_{3/2})4f^2[7/2]_{3,4}$ | $2p^5(^2P^\circ_{3/2})6g\ ^2[7/2]^\circ_{3,4}$ | 71WU | |
| 6609.30 | 0.10 | 15 126.0 | 60 | | | | | 71WU | |
| 6651.50 | 0.10 | 15 030.1 | 70 | | | | | 71WU | |
| 6689.00 | 0.10 | 14 945.8 | 45 | | | | | 71WU | |
| 6774.10 | 0.10 | 14 758.0 | 45 | | | | | 71WU | |
| 6789.50 | 0.10 | 14 724.6 | 40 | | | | | 71WU | |
| 6837.80 | 0.10 | 14 620.6 | 25 | | | | | 71WU | |

TABLE 4. Energy levels of Na II

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^6$ | $^1S$ | 0 | 0.00 | 2 | | 81MAR/ZAL |
| $2s^22p^53s$ | $^3P^\circ$ | 2 | 264 924.32 | 0.10 | 100% | 81MAR/ZAL |
| | | 1 | 265 689.62 | 0.10 | 96% | 81MAR/ZAL |
| | | 0 | 266 281.62 | 0.10 | 100% | 81MAR/ZAL |
| $2s^22p^53s$ | $^1P^\circ$ | 1 | 268 762.96 | 0.10 | 96% | 81MAR/ZAL |
| $2s^22p^53p$ | $^3S$ | 1 | 293 220.33 | 0.10 | 99% | 81MAR/ZAL |
| $2s^22p^53p$ | $^3D$ | 3 | 297 248.82 | 0.10 | 100% | 81MAR/ZAL |
| | | 2 | 297 635.61 | 0.10 | 88% | 81MAR/ZAL |
| | | 1 | 298 165.44 | 0.10 | 91% | 81MAR/ZAL |
| $2s^22p^53p$ | $^1D$ | 2 | 299 189.96 | 0.10 | 65% | 81MAR/ZAL |
| $2s^22p^53p$ | $^1P$ | 1 | 299 885.37 | 0.10 | 60% | 81MAR/ZAL |
| $2s^22p^53p$ | $^3P$ | 2 | 300 103.92 | 0.10 | 67% | 81MAR/ZAL |
| | | 0 | 300 387.82 | 0.10 | 100% | 81MAR/ZAL |
| | | 1 | 300 507.11 | 0.10 | 66% | 81MAR/ZAL |
| $2s^22p^53p$ | $^1S$ | 0 | 308 860.80 | 0.10 | 100% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})3d$ | $^2[1/2]^\circ$ | 0 | 330 549.35 | 0.10 | 97% | 81MAR/ZAL |
| | | 1 | 330 636.75 | 0.10 | 74% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})3d$ | $^2[3/2]^\circ$ | 2 | 330 789.05 | 0.10 | 56% | 81MAR/ZAL |
| | | 1 | 331 745.06 | 0.10 | 52% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})3d$ | $^2[7/2]^\circ$ | 4 | 331 123.04 | 0.10 | 100% | 81MAR/ZAL |
| | | 3 | 331 186.70 | 0.10 | 99% | 81MAR/ZAL |

TABLE 4. Energy levels of Na II—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^5(^2P^\circ_{3/2})4s$ | $^2[3/2]^\circ$ | 2 | 331 496.51 | 0.10 | 68% | 81MAR/ZAL |
| | | 1 | 331 873.93 | 0.10 | 63% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})3d$ | $^2[5/2]^\circ$ | 2 | 331 665.59 | 0.10 | 88% | 81MAR/ZAL |
| | | 3 | 331 707.90 | 0.10 | 89% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})4s$ | $^2[1/2]^\circ$ | 0 | 332 710.11 | 0.10 | 97% | 81MAR/ZAL |
| | | 1 | 333 162.94 | 0.10 | 79% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})3d$ | $^2[5/2]^\circ$ | 2 | 332 802.21 | 0.10 | 88% | 81MAR/ZAL |
| | | 3 | 332 841.93 | 0.10 | 89% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})3d$ | $^2[3/2]^\circ$ | 2 | 332 962.57 | 0.10 | 85% | 81MAR/ZAL |
| | | 1 | 333107.74 | 0.10 | 83% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4p$ | $^2[1/2]$ | 1 | 340 239.8 | 0.5 | 87% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4p$ | $^2[5/2]^\circ$ | 3 | 341 255.6 | 0.5 | 100% | 81MAR/ZAL |
| | | 2 | 341 457.7 | 0.5 | 81% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4p$ | $^2[3/2]$ | 2? | 341 907.0 | 0.5 | 83% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})4p$ | $^2[3/2]$ | 1 | 342 738.6 | 0.5 | 94% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})4p$ | $^2[1/2]$ | 1 | 342 971.0 | 0.5 | 87% | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4d$ | $^2[1/2]^\circ$ | 0 | 352 969.8 | 0.5 | | 81MAR/ZAL |
| | | 1 | 353 032.9 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4d$ | $^2[3/2]^\circ$ | 2 | 353 151.8 | 0.5 | | 81MAR/ZAL |
| | | 1 | 353 600.6 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4d$ | $^2[7/2]^\circ$ | 4 | 353 202.6 | 0.5 | | 81MAR/ZAL |
| | | 3 | 353 240.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4d$ | $^2[5/2]^\circ$ | 2 | 353 463.2 | 0.5 | | 81MAR/ZAL |
| | | 3 | 353 483.8 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5s$ | $^2[3/2]^\circ$ | 2 | 353 536.7 | 0.5 | | 81MAR/ZAL |
| | | 1 | 353 719.3 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4f$ | $^2[3/2]$ | 1 | 353 837.23 | 0.10 | | 81MAR/ZAL |
| | | 2 | 353 838.44 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4f$ | $^2[9/2]$ | 5 | 353 881.13 | 0.10 | | 81MAR/ZAL |
| | | 4 | 353 881.16 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4f$ | $^2[5/2]$ | 3 | 353 925.81 | 0.10 | | 81MAR/ZAL |
| | | 2 | 353 926.69 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})4f$ | $^2[7/2]$ | 3 | 353 972.42 | 0.10 | | 81MAR/ZAL |
| | | 4 | 353 972.63 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})4d$ | $^2[5/2]^\circ$ | 2 | 354 526.3 | 0.5 | | 81MAR/ZAL |
| | | 3 | 354 559.2? | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})4d$ | $^2[3/2]^\circ$ | 2 | 354 707.0 | 0.5 | | 81MAR/ZAL |
| | | 1 | 354 876.5 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})5s$ | $^2[1/2]^\circ$ | 0 | 354 859.8 | 0.5 | | 81MAR/ZAL |
| | | 1 | 354 997.8 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})4f$ | $^2[7/2]^\circ$ | 3 | 355 280.89 | 0.10 | | 81MAR/ZAL |
| | | 4 | 355 281.16 | 0.10 | | 81MAR/ZAL |

TABLE 4. Energy levels of Na II—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^5(^2P^\circ_{1/2})4f$ | $^2[5/2]^\circ$ | 3 | 355 283.70 | 0.10 | | 81MAR/ZAL |
| | | 2 | 355 284.53 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5d$ | $^2[1/2]^\circ$ | 0 | 363 332.2 | 0.5 | | 81MAR/ZAL |
| | | 1 | 363 347.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5d$ | $^2[3/2]^\circ$ | 2 | 363 441.7 | 0.5 | | 81MAR/ZAL |
| | | 1 | 363 631.9 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6s$ | $^2[3/2]^\circ$ | 2 | 363 610.2 | 0.5 | | 81MAR/ZAL |
| | | 1 | 363 725.8 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5f$ | $^2[3/2]^\circ$ | 1 | 363 767.98 | 0.5 | | 81MAR/ZAL |
| | | 2 | 363 769.03 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5f$ | $^2[9/2]^\circ$ | 5 | 363 790.60 | 0.5 | | 81MAR/ZAL |
| | | 4 | 363 790.64 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5f$ | $^2[5/2]^\circ$ | 3 | 363 814.78 | 0.5 | | 81MAR/ZAL |
| | | 2 | 363 815.38 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})5f$ | $^2[7/2]^\circ$ | 3 | 363 837.82 | 0.5 | | 81MAR/ZAL |
| | | 4 | 363 837.94 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})5d$ | $^2[3/2]^\circ$ | 2 | 364 744.1 | 0.5 | | 81MAR/ZAL |
| | | 1 | 364 931.1 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})6s$ | $^2[1/2]^\circ$ | 0 | 365 009.9 | 0.5 | | 81MAR/ZAL |
| | | 1 | 365 043.5 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})5f$ | $^2[7/2]^\circ$ | 3 | 365 173.42 | 0.10 | | 81MAR/ZAL |
| | | 4 | 365 173.7 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})5f$ | $^2[5/2]^\circ$ | 3 | 365 174.10 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6d$ | $^2[1/2]^\circ$ | 1 | 368 494.1 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7s$ | $^2[3/2]^\circ$ | 1 | 369 070.5 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6f$ | $^2[3/2]^\circ$ | 1 | 369 158.71 | 0.10 | | 81MAR/ZAL |
| | | 2 | 369 159.46 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6f$ | $^2[9/2]^\circ$ | 5 | 369 171.93 | 0.10 | | 81MAR/ZAL |
| | | 4 | 369 172.01 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6g$ | $^2[5/2]^\circ$ | 2,3 | 369 184.02 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6f$ | $^2[5/2]^\circ$ | 3 | 369 186.50 | 0.10 | | 81MAR/ZAL |
| | | 2 | 369 186.73 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6g$ | $^2[11/2]^\circ$ | 5,6 | 369 189.22 | 0.10 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6g$ | $^2[7/2]^\circ$ | 3,4 | 369 198.7 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6f$ | $^2[7/2]^\circ$ | 3,4 | 369 199.6 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})6g$ | $^2[9/2]^\circ$ | 4,5 | 369 203.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})6d$ | $^2[3/2]^\circ$ | 1 | 370 035.6 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})7s$ | $^2[1/2]^\circ$ | 1 | 370 378.6 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})6f$ | $^2[7/2]^\circ$ | 3,4 | 370 547.8 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})6f$ | $^2[5/2]^\circ$ | 3 | 370 548.06? | 0.10 | | 81MAR/ZAL |
| | | 2 | 370 548.50? | 0.10 | | 81MAR/ZAL |

TABLE 4. Energy levels of Na II—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^5(^2P^\circ_{1/2})6g$ | $^2[9/2]^\circ$ | 4,5 | 370 560.6 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})6g$ | $^2[7/2]^\circ$ | 3,4 | 370 560.6 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7f$ | $^2[3/2]^\circ$ | 1 | 372 407.6 | 0.5 | | 81MAR/ZAL |
| | | 2 | 372 407.9 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7f$ | $^2[9/2]^\circ$ | 4,5 | 372 415.9 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7g$ | $^2[5/2]^\circ$ | 2,3 | 372 423.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7f$ | $^2[5/2]^\circ$ | 2,3 | 372 425.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7g$ | $^2[11/2]^\circ$ | 5,6 | 372 426.7 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7g$ | $^2[7/2]^\circ$ | 3,4 | 372 432.3 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7f$ | $^2[7/2]^\circ$ | 3,4 | 372 433.3 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})7g$ | $^2[9/2]^\circ$ | 4,5 | 372 436.2 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})7f$ | $^2[7/2]^\circ$ | 3,4 | 373 787.8 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})7f$ | $^2[5/2]^\circ$ | 2,3 | 373 788.1 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})7g$ | $^2[9/2]^\circ$ | 4,5 | 373 796.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})7g$ | $^2[7/2]^\circ$ | 3,4 | 373 796.4 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})8f$ | $^2[3/2]^\circ$ | 1,2 | 374 514.9 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})8f$ | $^2[9/2]^\circ$ | 4,5 | 374 520.3 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{3/2})8f$ | $^2[7/2]^\circ$ | 3,4 | 374 532.1 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})8f$ | $^2[7/2]^\circ$ | 3,4 | 375 890.0 | 0.5 | | 81MAR/ZAL |
| $2s^22p^5(^2P^\circ_{1/2})8f$ | $^2[5/2]^\circ$ | 2,3 | 375 890.0 | 0.5 | | 81MAR/ZAL |
| **Na III ($2s^22p^5$ $^2P^\circ_{3/2}$)** | *Limit* | — | 381 390.2 | 2 | | 81MAR/ZAL |
| **Na III ($2s^22p^5$ $^2P^\circ_{1/2}$)** | *Limit* | — | 382 756.5 | 2 | | 81MAR/ZAL |
| $2s2p^63s$ | $^3S$ | 1 | 530 900 | 200 | | 94DOR |
| $2s2p^63s$ | $^1S$ | 0 | 534 300 | 200 | | 94DOR |
| $2s2p^63p$ | $^3P^\circ$ | 0,1,2 | 562 300 | 200 | | 95DOR/NIE |
| $2s2p^63p$ | $^1P^\circ$ | 1 | 564 200 | 200 | | 95DOR/NIE |
| $2s2p^64s$ | $^3S$ | 1 | 596 000 | 200 | | 94DOR |
| $2s2p^64s$ | $^1S$ | 0 | 597 000 | 200 | | 94DOR |
| $2s2p^64p$ | $^3P^\circ$ | 0,1,2 | 605 800 | 200 | | 95DOR/NIE |
| $2s2p^64p$ | $^1P^\circ$ | 1 | 606 500 | 200 | | 95DOR/NIE |
| $2s2p^65p$ | $^1P^\circ$ | 1 | 622 400 | 200 | | 81MAR/ZAL |
| $2s2p^66p$ | $^1P^\circ$ | 1 | 630200 | 200 | | 81MAR/ZAL |
| $2s2p^67p$ | $^1P^\circ$ | 1 | 634700 | 200 | | 81MAR/ZAL |
| $2s2p^68p$ | $^1P^\circ$ | 1 | 637 400 | 200 | | 81MAR/ZAL |
| **Na III ($2s2p^6$ $^2S_{1/2}$)** | *Limit* | — | 645 800 | 200 | | 81MAR/ZAL |

### 6.3. Na III

**F isoelectronic sequence**
**Ground state** $1s^2 2s^2 2p^5\ ^2\mathrm{P}^\circ_{3/2}$
**Ionization energy** [557 654(10) cm$^{-1}$]; [71.6205(12) eV]

A flurry of early activity established many levels of the Na III spectrum. Mack and Sawyer [30MAC/SAW] reported two lines which determined the ground state splitting and the location of the $2s^2 2p^6\ ^2\mathrm{S}_{1/2}$ level. Vance [32VAN] measured 11 lines between 230 Å and 380 Å and Söderqvist [32SOD, 34SOD] added a further 27 transitions and extended the range of measurements down to 183 Å. The analysis of the spectrum was enhanced even more by Tomboulian [38TOM] who observed transitions in the 1100 Å–2560 Å region between levels of the $2s^2 2p^4 nl$ configurations. The Na III spectrum has been remeasured and analyzed by Lundström and Minnhagen [72LUN/MIN], Minnhagen and Nietsche [72MIN/NIE], and Minnhagen [75MIN]. Lundström and Minnhagen [72LUN/MIN] gave wavelengths for 90 Na III lines in the 180 Å–380 Å range and a measurement of the $2s2p^6\ ^2\mathrm{S}_{1/2}$-$2s^2 2p^4(^4\mathrm{P})3p\,^2\mathrm{P}^\circ_{3/2}$ line. Minnhagen and Nietsche [72MIN/NIE] reported classifications of 177 lines in the region 1325 Å–2638 Å. Minnhagen [75MIN] measured 80 lines between 1755 and 2010 Å which are classified as $2s^2 2p^4 3d$-$4f$ transitions. The energy levels reported below have been compiled by Martin and Zalubas [81MAR/ZAL], while the leading percentages for $3d$ and $3p$ levels are from [72MIN/NIE] and those for $4f$ levels are from [75MIN]. The forbidden transition between levels in the ground state has recently been observed by Feuchtgruber *et al.* [97FEU/LUT], resulting in an improved value for the $2s^2 2p^5\ ^2\mathrm{P}^\circ_{1/2}$ level. Because there is a large amount of configuration mixing, the terms for the $J=5/2$ levels at 464 390 cm$^{-1}$, 49 495 cm$^{-1}$, and 465 398 cm$^{-1}$ cannot be unambiguously assigned; hence the term designations are chosen so each level has a unique name, even though the name given might not be that of the largest component. The uncertainty of the $n=3$ and $4s$ and $4f$ levels with respect to the ground term is about $\pm 3$ cm$^{-1}$; however, their internal consistency is much better, as indicated by the uncertainties in the table. Johannesson and Lundström [73JOH/LUN] derived the ionization energy cited above using isoelectronic interpolation. No estimate of the error was given, but it is probably close to the $\pm 10$ cm$^{-1}$ which they gave for their Mg IV limit determination (see Tables 5 and 6).

The transition probabilities of allowed transitions of Na III have been calculated by McPeake and Hibbert [00MCP/HIB] using a modified Breit–Pauli Hamiltonian and compiled by Kelleher and Podobedova [08KEL/POD] along with multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb]. For transitions to levels with $n=4$, Kelleher and Podobedova [08KEL/POD] reported the Opacity Project values of Butler and Zeippen [95BUT/ZEI] since these transitions were not calculated by the more accurate methods. Values for the $2s^2 2p^4(^3\mathrm{P})3s\ ^2\mathrm{P}$-$2s^2 2p^4(^3\mathrm{P})3p\ ^2\mathrm{D}^\circ$ transition probabilities have been taken from Froese Fischer and Tachiev [04FRO/TAC], which were also obtained using the multiconfiguration Hartree-Fock method.

#### References for Na III


| | |
|---|---|
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| 08KEL/POD | D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data **37**, 267 (2008). |

TABLE 5. Observed spectral lines of Na III

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | | |
| 181.023 | 0.002 | 552 416. | | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)5s\ ^2D_{5/2}$ | 72LUN/MIN | |
| 181.023 | 0.002 | 552 416. | 3* | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)5s\ ^2D_{3/2}$ | 72LUN/MIN | |
| 181.476 | 0.002 | 551 037. | 3 | w | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)5s\ ^2D_{3/2}$ | 72LUN/MIN | |
| 182.511 | 0.002 | 547 912. | 1 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1S)4s\ ^2S_{1/2}$ | 72LUN/MIN | |
| 182.968 | 0.002 | 546 544. | 1 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1S)4s\ ^2S_{1/2}$ | 72LUN/MIN | |
| 183.515 | 0.002 | 544 915. | 1 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4d\ ^2F_{5/2}$ | 72LUN/MIN | |
| 183.556 | 0.002 | 544 793. | 3 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4d\ ^2D_{3/2}$ | 72LUN/MIN | |
| 183.571 | 0.002 | 544 748. | 4 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4d\ ^2D_{5/2}$ | 72LUN/MIN | |
| 183.729 | 0.002 | 544 280. | 3 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4d\ ^2P_{1/2}$ | 72LUN/MIN | |
| 183.747 | 0.002 | 544 227. | 4 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4d^2P_{3/2}$ | 72LUN/MIN | |
| 183.946 | 0.002 | 543 638. | 5 | w | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4d\ ^2S_{1/2}$ | 72LUN/MIN | |
| 184.019 | 0.002 | 543 422. | 4 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)4d\ ^2D_{3/2}$ | 72LUN/MIN | |
| 184.193 | 0.002 | 542 909. | 4 | b | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)4d\ ^2P_{1/2}$ | 72LUN/MIN | |
| 184.206 | 0.002 | 542 870. | 4 | w | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)4d\ ^2P_{3/2}$ | 72LUN/MIN | |
| 184.409 | 0.002 | 542 273. | 4 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)4d\ ^2S_{1/2}$ | 72LUN/MIN | |
| 188.858 | 0.002 | 529 498. | 3 | b | 5.42E+8 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1S)3d\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 188.8739 | 0.002 | 529 454. | 4 | b | 3.34E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1S)3d\ ^2D_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 189.3488 | 0.002 | 528 126. | 5 | | 3.07E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1S)3d\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 191.000 | 0.002 | 523 560. | 5 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)5s\ ^2P_{1/2}$ | 72LUN/MIN | |
| 191.3070 | 0.002 | 522 720. | 4 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)5s\ ^2P_{3/2}$ | 72LUN/MIN | |
| 191.5118 | 0.002 | 522 161. | 3 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)5s\ ^2P_{1/2}$ | 72LUN/MIN | |
| 191.808 | 0.002 | 521 355. | 2 | w | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)5s\ ^2P_{3/2}$ | 72LUN/MIN | |
| 193.8043 | 0.002 | 515 984. | 5 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^2P_{3/2}$ | 72LUN/MIN | |
| 194.0372 | 0.002 | 515 365. | 5 | w | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^2D_{5/2}$ | 72LUN/MIN | |
| 194.1213 | 0.002 | 515 142. | 4 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^2P_{1/2}$ | 72LUN/MIN | |
| 194.1689 | 0.002 | 515 016. | 5 | w | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^2D_{3/2}$ | 72LUN/MIN | |
| 194.2926 | 0.002 | 514 688. | 5 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^2F_{5/2}$ | 72LUN/MIN | |
| 194.3228 | 0.002 | 514 608. | 4* | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4d\ ^2P_{3/2}$ | 72LUN/MIN | |
| 194.3228 | 0.002 | 514 608. | 4* | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^4P_{5/2}$ | 72LUN/MIN | |
| 194.4617 | 0.002 | 514 240. | 5 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^4F_{3/2}$ | 72LUN/MIN | |
| 194.530 | 0.002 | 514 060. | 2 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^4P_{3/2}$ | 72LUN/MIN | |
| 194.550 | 0.002 | 514 007. | 5 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4d\ ^4F_{5/2}$ | 72LUN/MIN | |
| 194.6392 | 0.002 | 513 771. | 5 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4d\ ^2P_{1/2}$ | 72LUN/MIN | |
| 194.6842 | 0.002 | 513 652. | 6 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4d\ ^2D_{3/2}$ | 72LUN/MIN | |
| 194.9795 | 0.002 | 512 874. | 5 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4d\ ^4F_{3/2}$ | 72LUN/MIN | |
| 195.0447 | 0.002 | 512 703. | 3 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4d\ ^4P_{3/2}$ | 72LUN/MIN | |
| 195.5321 | 0.002 | 511 425. | 6* | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4s\ ^2D_{5/2}$ | 72LUN/MIN | |
| 195.5321 | 0.002 | 511 425. | 6* | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72LUN/MIN | |
| 196.0546 | 0.002 | 510 062. | 5 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72LUN/MIN | |
| 201.845 | 0.002 | 495 430. | 2 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2F_{5/2}$ | 72LUN/MIN | |
| 202.1499 | 0.002 | 494 682. | 6 | | 1.40E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 202.1862 | 0.002 | 494 594. | 6 | | 7.21E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2D_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 202.4947 | 0.002 | 493 840. | 8 | | 1.59E+10 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2S_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 202.709 | 0.002 | 493 318. | 5 | b | 6.40E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 202.721 | 0.002 | 493 289. | 7 | b | 6.72E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 202.7645 | 0.002 | 493 183. | 8 | | 1.26E+10 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 203.055 | 0.002 | 492 477. | 8 | b | 1.03E+10 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2S_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 203.284 | 0.002 | 491 923. | 8 | | 9.24E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 203.326 | 0.002 | 491 821. | 3 | | 2.73E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 206.8743 | 0.002 | 483 385. | 6 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^2P_{1/2}$ | 72LUN/MIN | |
| 207.297 | 0.002 | 482 400. | 10 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^2P_{3/2}$ | 72LUN/MIN | |
| 207.4609 | 0.002 | 482 019. | 6 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^2P_{1/2}$ | 72LUN/MIN | |
| 207.746 | 0.002 | 481 357. | 1 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s^4P_{1/2}$ | 72LUN/MIN | |
| 207.8859 | 0.002 | 481 033. | 7 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^2P_{3/2}$ | 72LUN/MIN | |
| 207.9964 | 0.002 | 480 778. | 5 | | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72LUN/MIN | |
| 208.338 | 0.002 | 479 989. | 1 | b | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^4P_{1/2}$ | 72LUN/MIN | |

TABLE 5. Observed spectral lines of Na III—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 208.343 | 0.002 | 479 978. | 1 | b,w | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{5/2}$ | 72LUN/MIN | |
| 208.591 | 0.002 | 479 407. | 2 | | | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72LUN/MIN | |
| 214.2237 | 0.002 | 466 802. | 7 | | 5.16E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 214.5885 | 0.002 | 466 008. | 8 | | 3.33E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 214.860 | 0.002 | 465 419. | 6 | b | 5.65E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 214.874 | 0.002 | 465 389. | 8 | b | | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72LUN/MIN | |
| 215.047 | 0.002 | 465 015. | 8 | b | 4.49E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.082 | 0.002 | 464 939. | 8 | b | 6.06E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.218 | 0.002 | 464 645. | 3 | b | 6.06E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.228 | 0.002 | 464 624. | 15 | b | 1.65E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.324 | 0.002 | 464 416. | 2 | b | 6.36E+7 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.340 | 0.002 | 464 382. | 10 | b | 5.31E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.4819 | 0.002 | 464 076. | 8 | | 6.98E+8 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.659 | 0.002 | 463 695. | 7 | b | 2.21E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.683 | 0.002 | 463 643. | 7 | b | 9.78E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.8607 | 0.002 | 463 262. | 12 | | 1.72E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 215.964 | 0.002 | 463 040. | 1 | | 3.03E+7 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 216.1187 | 0.002 | 462 709. | 12 | | 1.57E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 217.043 | 0.002 | 460 738. | 1 | | 1.23E+7 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 217.1140 | 0.002 | 460 588. | 3 | | 2.44E+7 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 217.1982 | 0.002 | 460 409. | 2 | h | 6.79E+6 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 217.6861 | 0.002 | 459 377. | 2 | | 2.55E+7 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 217.757 | 0.002 | 459 227. | 1 | | 4.92E+6 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 229.8693 | 0.002 | 435 030. | 15 | | 2.91E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1S)3s\ ^2S_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 230.5933 | 0.002 | 433 664. | 12 | | 1.59E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1S)3s\ ^2S_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 250.5168 | 0.002 | 399 175. | 50* | s | 6.10E+8 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 250.5168 | 0.002 | 399 175. | 50* | s | 4.49E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3s\ ^2D_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 251.3720 | 0.002 | 397 817. | 30 | | 3.87E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 266.8965 | 0.002 | 374 677. | 25 | | 3.90E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 267.6458 | 0.002 | 373 628. | 70 | | 9.67E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 267.8740 | 0.002 | 373 310. | 50 | | 7.56E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 268.6261 | 0.002 | 372 265. | 50 | | 1.77E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 272.076 | 0.002 | 367 544. | 20 | b | 1.27E+6 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 272.4492 | 0.002 | 367 041. | 20 | | 3.37E+7 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 273.0896 | 0.002 | 366 180. | 3 | b,w | 1.46E+7 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 273.103 | 0.002 | 366 162. | 2 | b | 2.04E+6 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3s\ ^4P_{5/2}$ | 72LUN/MIN | 08KEL/POD |
| 273.4677 | 0.002 | 365 674. | 3 | | 3.46E+6 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | 72LUN/MIN | 08KEL/POD |
| 378.136 | 0.002 | 264 455.1 | 100 | | 8.42E+9 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s2p^6\ ^2S_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 380.100 | 0.002 | 263 088.7 | 70 | | 4.13E+9 | $2s^22p^5\ ^2P^\circ_{1/2}$ | $2s2p^6\ ^2S_{1/2}$ | 72LUN/MIN | 08KEL/POD |
| 1 325.70 | 0.010 | 75 431.8 | 3 | | 2.29E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2S_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 336.76 | 0.010 | 74 807.7 | 7 | | 4.27E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 337.358 | 0.005 | 74 774.3 | 7 | | 1.61E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 337.995 | 0.005 | 74 738.7 | 2 | | 1.28E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 340.674 | 0.005 | 74 589.3 | 8 | | 2.29E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 342.390 | 0.005 | 74 494.0 | 9 | b | 8.44E+7 | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^4P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 342.729 | 0.005 | 74 475.2 | 10 | | 1.06E+8 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 355.281 | 0.005 | 73 785.4 | 11 | | 3.44E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)4s\ ^4P_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 361.896 | 0.005 | 73 427.0 | 12* | | 2.24E+8 | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 361.896 | 0.005 | 73 427.0 | 12* | | 1.45E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 372.340 | 0.005 | 72 868.2 | 11 | | 5.81E+7 | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 418.559 | 0.005 | 70 494.1 | 9* | b | 2.87E+7 | $2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$ | $2s^22p^4(^1D)4s\ ^2D_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 418.559 | 0.005 | 70 494.1 | 9* | b | 6.02E+8 | $2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 420.885 | 0.005 | 70 378.7 | 10 | | 5.73E+8 | $2s^22p^4(^1D)3p\ ^2F^\circ_{7/2}$ | $2s^22p^4(^1D)4s\ ^2D_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 440.775 | 0.005 | 69 407.1 | 7 | | 3.26E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 444.194 | 0.005 | 69 242.8 | 0 | | 4.07E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 445.731 | 0.005 | 69 169.2 | 7 | | 3.22E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^4P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 447.85 | 0.010 | 69 067.9 | 2 | | 3.28E+8 | $2s^22p^4(^1S)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1S)4s\ ^2S_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |

TABLE 5. Observed spectral lines of Na III—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1 448.73 | 0.010 | 69 026.0 | 3 | | 6.55E+8 | $2s^22p^4(^1S)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1S)4s\ ^2S_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 449.311 | 0.005 | 68 998.3 | 2 | | 5.12E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$ | $2s^22p^4(^3P)4s\ ^4P_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 452.911 | 0.005 | 68 827.3 | 8 | | 2.03E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 457.939 | 0.005 | 68 590.0 | 2 | | 3.14E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 461.153 | 0.005 | 68 439.1 | 7 | | 1.12E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | $2s^22p^4(^3P)4s\ ^4P_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 465.926 | 0.005 | 68 216.3 | 9 | | 6.04E+8 | $2s^22p^4(^3P)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^2P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 468.000 | 0.005 | 68 119.9 | 1 | b | 5.43E+8 | $2s^22p^4(^3P)3p\ ^2D^\circ_{5/2}$ | $2s^22p^4(^3P)4s\ ^2P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 487.438 | 0.005 | 67 229.7 | 5 | | 5.79E+7 | $2s^22p^4(^3P)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^2P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 523.548 | 0.005 | 65 636.3 | 7* | | 1.88E+7 | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^1D)4s\ ^2D_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 523.548 | 0.005 | 65 636.3 | 7* | | 2.54E+8 | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 525.301 | 0.005 | 65 560.8 | 9* | | 2.63E+8 | $2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$ | $2s^22p^4(^1D)4s\ ^2D_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 525.301 | 0.005 | 65 560.8 | 9* | | 2.82E+7 | $2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 526.883 | 0.005 | 65 492.9 | 6 | | | $2s^22p^4(^3P)3p\ ^2S^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^2P_{3/2}$ | 72MIN/NIE | |
| 1 539.145 | 0.005 | 64 971.1 | 7 | b | 1.24E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^2P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 542.46 | 0.010 | 64 831.5 | 9 | b | 2.47E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)4s\ ^2P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 562.870 | 0.005 | 63 984.8 | 11 | | 2.98E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^2P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 563.61 | 0.010 | 63 954.6 | 3 | | 8.51E+7 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{1/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 565.294 | 0.005 | 63 885.8 | 10* | | 2.38E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4s\ ^2D_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 565.294 | 0.005 | 63 885.8 | 10* | | 3.95E+7 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 577.90 | 0.010 | 63 375.4 | 9 | b | 8.25E+7 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 579.117 | 0.005 | 63 326.5 | 8 | | 1.93E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)4s\ ^2D_{3/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 598.177 | 0.005 | 62 571.3 | 10 | | 7.96E+7 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)4s\ ^4P_{5/2}$ | 72MIN/NIE | 95BUT/ZEI |
| 1 688.942 | 0.005 | 59 208.7 | 11 | | | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72MIN/NIE | |
| 1 699.293 | 0.005 | 58 848.0 | 10 | | | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72MIN/NIE | |
| 1 701.970 | 0.005 | 58 755.4 | 8 | | 1.35E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 711.124 | 0.005 | 58 441.1 | 10 | | 1.52E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 712.482 | 0.005 | 58 394.8 | 9 | | 8.91E+7 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 728.273 | 0.005 | 57 861.2 | 11 | | 4.10E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 728.923 | 0.005 | 57 839.5 | 1 | | 8.00E+6 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 730.71 | 0.010 | 57 779.8 | 0 | | 2.47E+6 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 731.113 | 0.005 | 57 766.3 | 10 | | 1.87E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 737.711 | 0.005 | 57 547.0 | 8 | | 1.13E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 755.475 | 0.005 | 56 964.6 | 10 | | | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 761.018 | 0.005 | 56 785.3 | 3 | | | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 761.428 | 0.005 | 56 772.1 | 3 | | | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 766.700 | 0.005 | 56 602.7 | 8 | | | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{9/2}$ | 75MIN | |
| 1 771.35 | 0.010 | 56 454.1 | 2 | | | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 778.402 | 0.005 | 56 230.3 | 7 | | | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 783.460 | 0.005 | 56 070.8 | 9 | | | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{3/2}$ | 75MIN | |
| 1 801.267 | 0.005 | 55 516.5 | 3 | b | | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 805.02 | 0.010 | 55 401.0 | 1 | | | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[1]^\circ_{1/2}$ | 75MIN | |
| 1 805.764 | 0.005 | 55 378.2 | 7 | | | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 806.229 | 0.005 | 55 364.0 | 7 | | | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 806.684 | 0.005 | 55 350.0 | 7 | | | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 807.070 | 0.005 | 55 338.2 | 15 | | | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{9/2}$ | 75MIN | |
| 1 810.071 | 0.005 | 55 246.5 | 2 | | | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[1]^\circ_{1/2}$ | 75MIN | |
| 1 810.767 | 0.005 | 55 225.2 | 10* | | | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 810.767 | 0.005 | 55 225.2 | 10* | | | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 811.671 | 0.005 | 55 197.7 | 11 | | | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 812.555 | 0.005 | 55 170.7 | 8 | | | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^\circ_{3/2}$ | 75MIN | |
| 1 816.812 | 0.005 | 55 041.5 | 10 | | | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 817.617 | 0.005 | 55 017.1 | 8 | | | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^\circ_{3/2}$ | 75MIN | |
| 1 832.39 | 0.010 | 54 573.5 | 7 | b | | $2s^22p^4(^1D)3d\ ^2G_{9/2}$ | $2s^22p^4(^1D_2)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 835.223 | 0.0055 | 4 489.3 | 10 | b | 3.31E+8 | $2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$ | $2s^22p^4(^1D)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 838.122 | 0.005 | 54 403.4 | 8 | b | 6.77E+7 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 838.944 | 0.005 | 54 379.0 | 10 | | 3.31E+8 | $2s^22p^4(^1D)3p\ ^2F^\circ_{7/2}$ | $2s^22p^4(^1D)3d\ ^3F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 844.362 | 0.005 | 54 219.3 | 11 | | 3.00E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72MIN/NIE | 08KEL/POD |

TABLE 5. Observed spectral lines of Na III—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1 845.149 | 0.005 | 54 196.2 | 9 | | 1.69E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 847.527 | 0.005 | 54 126.4 | 10 | b | | $2s^22p^4(^1D)3d\ ^2G_{9/2}$ | $2s^22p^4(^1D_2)4f\ ^2[5]^\circ_{11/2}$ | 75MIN | |
| 1 847.589 | 0.005 | 54 124.6 | 10 | b | | $2s^22p^4(^1D)3d\ ^2G_{7/2}$ | $2s^22p^4(^1D_2)4f\ ^2[5]^\circ_{9/2}$ | 75MIN | |
| 1 849.564 | 0.005 | 54 066.8 | 15 | | 6.87E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 850.379 | 0.005 | 54 043.0 | 12 | | 4.37E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 855.92 | 0.010 | 53 881.6 | 10 | b | 5.77E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 856.71 | 0.010 | 53 858.7 | 10 | b | 4.22E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 860.610 | 0.005 | 53 745.8 | 1 | | 4.97E+7 | $2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 861.211 | 0.005 | 53 613.2 | 10 | | 2.34E+8 | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 865.177 | 0.005 | 53 614.2 | 8 | | | $2s^22p^4(^3P)3d^4F_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{9/2}$ | 75MIN | |
| 1 867.517 | 0.005 | 53 547.0 | 1 | | 4.31E+7 | $2s^22p^4(^1D)3p\ ^2F^\circ_{7/2}$ | $2s^22p^4(^1D)3d\ ^2D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 875.522 | 0.005 | 53 318.5 | 10 | b | | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | $2s^22p^4(^1D_2)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 876.155 | 0.005 | 53 300.5 | 8 | | | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 879.16 | 0.010 | 53 215.3 | 4 | | | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | $2s^22p^4(^1D_2)4f\ ^2[2]^\circ_{3/2}$ | 75MIN | |
| 1 880.663 | 0.005 | 53 172.7 | 10 | | | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 884.69 | 0.010 | 53 059.1 | 3 | | | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 886.96 | 0.010 | 52 995.3 | 8* | b | | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | $2s^22p^4(^1D_2)4f\ ^2[1]^\circ_{3/2}$ | 72MIN/NIE | |
| 1 886.96 | 0.010 | 52 995.3 | 8* | b | | $2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$ | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | 72MIN/NIE | |
| 1 887.32 | 0.005 | 52 985.2 | 4 | b | | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 887.39 | 0.005 | 52 983.2 | 10 | b | | $2s^22p^4(^3P)3d\ ^4F_{9/2}$ | $2s^22p^4(^3P_2)4f\ ^2[5]^\circ_{9/2}$ | 75MIN | 95BUT/ZEI |
| 1 887.472 | 0.005 | 52 980.9 | 20 | b | 1.25E+9 | $2s^22p^4(^3P)3d\ ^4F_{9/2}$ | $2s^22p^4(^3P_2)4f\ ^2[5]^\circ_{11/2}$ | 75MIN | |
| 1 888.375 | 0.005 | 52 955.6 | 8 | | | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 890.59 | 0.010 | 52 893.5 | 3 | b | | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 890.754 | 0.005 | 52 889.0 | 15 | b | | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{9/2}$ | 75MIN | |
| 1 892.01 | 0.010 | 52 853.8 | 1* | b | 2.21E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 892.01 | 0.010 | 52 853.8 | 1* | b | | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 72MIN/NIE | |
| 1 895.864 | 0.005 | 52 746.4 | 6* | | | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 895.864 | 0.005 | 52 746.4 | 6* | | | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 897.350 | 0.005 | 52 705.1 | 7 | | | $2s^22p^4(^3P)3d\ ^4F_{9/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{9/2}$ | 75MIN | |
| 1 899.718 | 0.005 | 52 639.4 | 9 | b | | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 900.164 | 0.005 | 52 627.0 | 15 | | | $2s^22p^4(^3P)3d\ ^4F_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[5]^\circ_{9/2}$ | 75MIN | |
| 1 905.674 | 0.005 | 52 474.9 | 3 | | | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 907.01 | 0.010 | 52 438.1 | 10 | b | 1.70E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 907.12 | 0.010 | 52 435.1 | 9* | b | 1.68E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 907.12 | 0.010 | 52 435.1 | 9* | b | | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 72MIN/NIE | |
| 1 908.15 | 0.010 | 52 406.8 | 3 | | | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{3/2}$ | 75MIN | |
| 1 909.806 | 0.005 | 52 361.3 | 8 | | | $2s^22p^4(^3P)3d\ ^4F_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 910.660 | 0.005 | 52 337.9 | 6 | b | | $2s^22p^4(^1D)3d\ ^2S_{1/2}$ | $2s^22p^4(^1D_2)4f\ ^2[1]^\circ_{3/2}$ | 75MIN | |
| 1 913.19 | 0.010 | 52 268.7 | 9 | | 6.89E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$ | $2s^22p^4(^3P)3d^4F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 914.910 | 0.005 | 52 221.8 | 0 | | 2.19E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 915.436 | 0.005 | 52 207.4 | 8 | | | $2s^22p^4(^1D)3d\ ^2D_{5/2}$ | $2s^22p^4(^1D_2)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 916.000 | 0.005 | 52 192.1 | 3 | | | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 917.344 | 0.005 | 52 155.5 | 9 | | 1.65E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 918.453 | 0.005 | 52 125.3 | 10* | | 2.29E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 918.453 | 0.005 | 52 125.3 | 10* | | | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | $2s^22p^4(^1D_2)4f\ ^2[3]^\circ_{5/2}$ | 72MIN/NIE | |
| 1 919.93 | 0.010 | 52 085.2 | 4 | b | | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 922.58 | 0.010 | 52 013.4 | 3 | | | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 923.963 | 0.005 | 51 976.1 | 11 | | | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 925.189 | 0.005 | 51 943.0 | 8* | | | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{7/2}$ | 75MIN | |
| 1 925.189 | 0.005 | 51 943.0 | 8* | | | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{5/2}$ | 75MIN | |
| 1 926.2 | | 51 915.7 | 20 | b | | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{7/2}$ | 75MIN | |
| 1 926.259 | 0.005 | 51 914.1 | 14 | b | 8.94E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$ | $2s^22p^4(^3P)3d\ ^4F_{9/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 926.711 | 0.005 | 51 901.9 | 5 | | | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[5]^\circ_{9/2}$ | 75MIN | |
| 1 927.237 | 0.005 | 51 887.8 | 11 | | 5.66E+8 | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 927.59 | 0.010 | 51 878.3 | 3 | | | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |
| 1 929.624 | 0.005 | 51 823.6 | 3 | | | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | $2s^22p^4(^1D_2)4f\ ^2[2]^\circ_{3/2}$ | 75MIN | |
| 1 930.293 | 0.005 | 51 805.6 | 6 | l | | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 75MIN | |

TABLE 5. Observed spectral lines of Na III—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 1 932.737 | 0.005 | 51 740.1 | 12 | | 5.37E+8 | $2s^22p^4(^3P)3p\ ^4D^{\circ}_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 933.885 | 0.005 | 51 709.4 | 13 | | 6.33E+8 | $2s^22p^4(^3P)3p\ ^4D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d^4F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 934.335 | 0.005 | 51 697.4 | 3 | | | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^{\circ}_{5/2}$ | 75MIN | |
| 1 936.815 | 0.005 | 51 631.2 | 6 | | | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^{\circ}_{7/2}$ | 75MIN | |
| 1 937.03 | 0.010 | 51 625.4 | 3 | | | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^{\circ}_{9/2}$ | 75MIN | |
| 1 938.41 | 0.010 | 51 588.7 | 4 | | | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[1]^{\circ}_{3/2}$ | 75MIN | |
| 1 938.637 | 0.005 | 51 582.6 | 6 | | 8.39E+8 | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[1]^{\circ}_{1/2}$ | 75MIN | 95BUT/ZEI |
| 1 939.559 | 0.005 | 51 558.1 | 3 | | | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^{\circ}_{5/2}$ | 75MIN | |
| 1 943.047 | 0.005 | 51 465.6 | 4 | | | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | $2s^22p^4(^3P_1)4f\ ^2[4]^{\circ}_{7/2}$ | 75MIN | |
| 1 943.347 | 0.005 | 51 457.6 | 9 | | | $2s^22p^4(^1D)3d\ ^2F_{5/2}$ | $2s^22p^4(^1D_2)4f\ ^2[4]^{\circ}_{7/2}$ | 75MIN | |
| 1 943.516 | 0.005 | 51 453.1 | 10 | | | $2s^22p^4(^1D)3d\ ^2F_{7/2}$ | $2s^22p^4(^1D_2)4f\ ^2[4]^{\circ}_{9/2}$ | 75MIN | |
| 1 946.426 | 0.005 | 51 376.2 | 12 | | 8.28E+8 | $2s^22p^4(^1D)3p\ ^2F^{\circ}_{5/2}$ | $2s^22p^4(^1D)3d\ ^2G_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 947.324 | 0.005 | 51 352.5 | 1 | | | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^{\circ}_{3/2}$ | 75MIN | |
| 1 950.906 | 0.005 | 51 258.2 | 12 | | 8.55E+8 | $2s^22p^4(^1D)3p\ ^2F^{\circ}_{7/2}$ | $2s^22p^4(^1D)3d\ ^2G_{9/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 951.237 | 0.005 | 51 249.5 | 14 | | 2.38E+8 | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | $2s^22p^4(^3P)3p\ ^4S^{\circ}_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 955.326 | 0.005 | 51 142.4 | 8 | | | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^{\circ}_{5/2}$ | 75MIN | |
| 1 956.314 | 0.005 | 51 116.5 | 6 | | | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72MIN/NIE | |
| 1 960 | | 51 020.4 | 12 | b | | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^{\circ}_{5/2}$ | 75MIN | |
| 1 968.23 | 0.010 | 50 807.1 | 4 | | | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^{\circ}_{3/2}$ | 75MIN | |
| 1 970.221 | 0.005 | 50 755.7 | 2 | | | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^{\circ}_{5/2}$ | 75MIN | |
| 1 970.986 | 0.005 | 50 736.0 | 1 | | 2.44E+7 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 972.780 | 0.005 | 50 689.9 | 7* | | | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^{\circ}_{7/2}$ | 75MIN | |
| 1 972.780 | 0.005 | 50 689.9 | 7* | | | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^{\circ}_{5/2}$ | 75MIN | |
| 1 973.86 | 0.010 | 50 662.2 | 1 | | | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^{\circ}_{7/2}$ | 75MIN | |
| 1 974.150 | 0.005 | 50 654.7 | 8 | | 7.07E+8 | $2s^22p^4(^1S)3p\ ^2P^{\circ}_{1/2}$ | $2s^22p^4(^1S)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 975.617 | 0.005 | 50 617.1 | 3 | b | | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | $2s^22p^4(^3P_2)4f\ ^2[3]^{\circ}_{5/2}$ | 75MIN | |
| 1 976.700 | 0.005 | 50 589.4 | 8 | | | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | $2s^22p^4(^3P_0)4f\ ^2[3]^{\circ}_{5/2}$ | 75MIN | |
| 1 977.161 | 0.005 | 50 577.6 | 10 | | 8.46E+8 | $2s^22p^4(^1S)3p\ ^2P^{\circ}_{3/2}$ | $2s^22p^4(^1S)3d\ ^2D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 985.03 | 0.010 | 50 377.1 | 4 | b | | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^{\circ}_{5/2}$ | 75MIN | |
| 1 985.567 | 0.005 | 50 363.4 | 13 | | 1.78E+8 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4S^{\circ}_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 990.240 | 0.005 | 50 245.2 | 8 | | | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[3]^{\circ}_{5/2}$ | 75MIN | |
| 1 990.989 | 0.005 | 50 226.3 | 8 | | | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72MIN/NIE | |
| 1 991.633 | 0.005 | 50 210.1 | 5 | b | | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | $2s^22p^4(^3P_2)4f\ ^2[4]^{\circ}_{7/2}$ | 75MIN | |
| 1 995.675 | 0.005 | 50 108.4 | 10 | | 8.12E+7 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 1 998.584 | 0.005 | 50 035.4 | 5 | b | | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | $2s^22p^4(^3P_1)4f\ ^2[2]^{\circ}_{5/2}$ | 75MIN | |
| *Air* | | | | | | | | | |
| 1 999.748 | 0.005 | 49 990.1 | 6 | b | | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[1]^{\circ}_{3/2}$ | 75MIN | |
| 2 004.215 | 0.005 | 49 878.7 | 10 | | 2.07E+8 | $2s^22p^4(^3P)3p\ ^2S^{\circ}_{1/2}$ | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 005.217 | 0.005 | 49 853.8 | 11 | | 9.67E+7 | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | $2s^22p^4(^3P)3p\ ^4S^{\circ}_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 005.546 | 0.005 | 49 845.6 | 9 | | 1.50E+8 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 008.470 | 0.005 | 49 773.0 | 11 | | 1.45E+8 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 009.328 | 0.005 | 49 751.8 | | b | | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | $2s^22p^4(^3P_2)4f\ ^2[2]^{\circ}_{3/2}$ | 75MIN | |
| 2 011.865 | 0.005 | 49 689.1 | 15 | | 6.37E+8 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 014.169 | 0.005 | 49 632.2 | 11 | | 4.88E+8 | $2s^22p^4(^1D)3p\ ^2D^{\circ}_{3/2}$ | $2s^22p^4(^1D)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 017.024 | 0.005 | 49 562.0 | 12 | | 5.44E+8 | $2s^22p^4(^1D)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^1D)3d\ ^2F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 017.23 | 0.010 | 49 556.9 | 1 | | 4.31E+7 | $2s^22p^4(^1D)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^1D)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 022.295 | 0.005 | 49 432.8 | 9 | | 4.62E+7 | $2s^22p^4(^3P)3p\ ^4D^{\circ}_{7/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 023.225 | 0.005 | 49 410.1 | 6 | | 3.29E+7 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 028.553 | 0.005 | 49 280.4 | 12 | | 1.93E+8 | $2s^22p^4(^3P)3p\ ^4D^{\circ}_{7/2}$ | $2s^22p^4(^3P)3d\ ^4D_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 031.128 | 0.005 | 49 217.9 | 12 | | 3.08E+8 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{3/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 035.897 | 0.005 | 49 102.6 | 11 | | 6.23E+8 | $2s^22p^4(^3P)3p\ ^2S^{\circ}_{1/2}$ | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 037.776 | 0.005 | 49 057.3 | 8 | | 6.73E+7 | $2s^22p^4(^3P)3p\ ^4D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 041.661 | 0.005 | 48 964.0 | 12 | | 1.64E+8 | $2s^22p^4(^3P)3p\ ^2D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^4F_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 043.290 | 0.005 | 48 925.0 | 12 | | 4.02E+8 | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | $2s^22p^4(^1D)3p\ ^2P^{\circ}_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 044.823 | 0.005 | 48 888.3 | 10 | | 4.00E+8 | $2s^22p^4(^1D)3p\ ^2D^{\circ}_{3/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 045.443 | 0.005 | 48 873.5 | 10 | | 1.05E+8 | $2s^22p^4(^3P)3p\ ^4D^{\circ}_{5/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72MIN/NIE | 08KEL/POD |

TABLE 5. Observed spectral lines of Na III—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line Code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2 047.97 | 0.010 | 48 813.2 | 1 | | 4.69E+7 | $2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 048.313 | 0.005 | 48 805.0 | 6 | | 6.54E+7 | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 048.719 | 0.005 | 48 795.3 | 7 | | 8.11E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 051.484 | 0.005 | 48 729.6 | 11 | | 4.36E+8 | $2s^22p^4(^1D)3s\ ^2D^\circ_{5/2}$ | $2s^22p^4(^1D)3p\ ^2D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 051.845 | 0.005 | 48 721.0 | 5 | | 1.37E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | $2s^22p^4(^3P)3d^4D_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 055.183 | 0.005 | 48 641.9 | 9 | | 6.39E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 058.73 | 0.010 | 48 558.1 | 4 | | 6.95E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4D_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 060.360 | 0.005 | 48 519.7 | 10 | | 8.12E+7 | $2s^22p^4(^3P)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 062.990 | 0.005 | 48 457.8 | 5 | | 2.21E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 065.282 | 0.005 | 48 404.1 | 4 | | 2.58E+7 | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 066.601 | 0.005 | 48 373.2 | 15 | | 3.72E+8 | $2s^22p^4(^1D)3s\ ^2D_{5/2}$ | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 066.905 | 0.005 | 48 366.1 | 8 | | 1.57E+7 | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 072.673 | 0.005 | 48 231.5 | 11 | | 3.52E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 077.974 | 0.005 | 48 108.5 | 9 | | | $2s^22p^4(^3P)3p\ ^2S^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72MIN/NIE | |
| 2 082.907 | 0.005 | 47 994.5 | 13 | | | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72MIN/NIE | |
| 2 094.808 | 0.005 | 47 721.9 | 4 | | 3.09E+7 | $2s^22p^4(^3P)3p\ ^2S^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 099.563 | 0.005 | 47 613.8 | 6 | | 8.62E+7 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 100.443 | 0.005 | 47 593.9 | 3 | | 7.41E+7 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 102.762 | 0.005 | 47 541.4 | 12 | | 2.31E+8 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 104.76 | 0.010 | 47 496.3 | 0 | | 1.34E+8 | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 109.27 | 0.010 | 47 394.7 | 1 | | 3.97E+7 | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 112.650 | 0.005 | 47 318.9 | 7 | | 1.54E+8 | $2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 116.750 | 0.005 | 47 227.3 | 12 | | 3.03E+8 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 120.73 | 0.010 | 47 138.7 | 4 | b | 6.44E+7 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 124.510 | 0.005 | 47 054.8 | 10 | | 1.86E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2D_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 126.63 | 0.010 | 47 007.9 | 11 | | 3.71E+8 | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 127.842 | 0.005 | 46 981.1 | 11 | | | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 72MIN/NIE | |
| 2 140.723 | 0.005 | 46 698.5 | 15 | | 3.80E+8 | $2s^22p^4(^1D)3s\ ^2D_{5/2}$ | $2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 141.068 | 0.005 | 46 690.9 | 9 | | 3.11E+7 | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | $2s^22p^4(^1D)3p\ ^2D^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 141.86 | 0.010 | 46 673.7 | 1 | | | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72MIN/NIE | |
| 2 144.202 | 0.005 | 46 622.7 | 7 | | 1.98E+7 | $2s^22p^4(^1D)3s\ ^2D_{5/2}$ | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 144.542 | 0.005 | 46 615.3 | 14 | | 3.88E+8 | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | $2s^22p^4(^1D)3p\ ^2D^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 145.231 | 0.005 | 46 600.4 | 9 | | 8.27E+7 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 146.234 | 0.005 | 46 578.6 | 9 | | 1.68E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 148.574 | 0.005 | 46 527.9 | 12 | | 1.54E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 151.653 | 0.005 | 46 461.3 | 10 | | 1.34E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 159.082 | 0.005 | 46 301.4 | 9 | | 3.11E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2S_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 159.71 | 0.010 | 46 288.0 | 1 | | | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72MIN/NIE | |
| 2 163.178 | 0.005 | 46 213.8 | 5 | | 2.37E+7 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 169.702 | 0.005 | 46 074.8 | 4 | | 1.81E+7 | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 174.53 | 0.010 | 45 972.5 | 10 | b | 1.00E+8 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 182.846 | 0.005 | 45 797.4 | 9 | | 1.14E+7 | $2s^22p^4(^3P)3s\ ^4P_{5/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 185.300 | 0.005 | 45 746.0 | 8 | | 2.06E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 185.498 | 0.005 | 45 741.8 | 8 | | 2.02E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2S_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 189.42 | 0.010 | 45 659.9 | 1 | | 9.47E+6 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 190.185 | 0.005 | 45 644.0 | 11 | | 3.28E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 196.11 | 0.010 | 45 520.8 | 3 | | 1.67E+7 | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^3P)3d\ ^4F_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 202.831 | 0.005 | 45 382.0 | 15 | | 8.53E+7 | $2s^22p^4(^3P)3s\ ^4P_{5/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 208.069 | 0.005 | 45 274.3 | 8 | | 2.63E+7 | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4F_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 212.352 | 0.005 | 45 186.7 | 9 | | 2.42E+8 | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2P_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 214.208 | 0.005 | 45 148.8 | 10 | | 5.14E+7 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 217.34 | 0.010 | 45 085.0 | 6 | | 6.86E+7 | $2s^22p^4(^1D)3p\ ^2P^\circ_{1/2}$ | $2s^22p^4(^1D)3d\ ^2P_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 225.280 | 0.005 | 44 924.2 | 5 | | 1.09E+7 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 225.927 | 0.005 | 44 911.1 | 15 | | 1.82E+8 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 230.328 | 0.005 | 44 822.5 | 30 | | 3.64E+8 | $2s^22p^4(^3P)3s\ ^4P_{5/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 232.187 | 0.005 | 44 785.2 | 16 | | 2.34E+8 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 239.484 | 0.005 | 44 639.3 | 13 | | 3.09E+8 | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |

TABLE 5. Observed spectral lines of Na III—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 2 246.706 | 0.005 | 44 495.8 | 20 | w | 2.72E+8 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 251.474 | 0.005 | 44 401.6 | 14 | | 1.66E+8 | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 278.413 | 0.005 | 43 876.6 | 15 | | 2.98E+8 | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 279.482 | 0.005 | 43 856.1 | 12 | | 3.40E+8 | $2s^22p^4(^1S)3s\ ^2S_{1/2}$ | $2s^22p^4(^1S)3p\ ^2P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 281.620 | 0.005 | 43 815.0 | 10 | | 3.39E+8 | $2s^22p^4(^1S)3s\ ^2S_{1/2}$ | $2s^22p^4(^1S)3p\ ^2P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 285.660 | 0.005 | 43 737.5 | 13 | | 7.73E+7 | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 309.988 | 0.005 | 43 277.0 | 15 | | 3.08E+8 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^3P)3p\ ^2S^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 314.65 | 0.010 | 43 189.8 | 0 | | | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{3/2}$ | 72MIN/NIE | |
| 2 324.56 | 0.010 | 43 005.7 | 0 | | | $2s^22p^4(^3P)3p\ ^4S^\circ_{3/2}$ | $2s^22p^4(^3P)3d\ ^4D_{5/2}$ | 72MIN/NIE | |
| 2 367.295 | 0.005 | 42 229.4 | 9 | | 1.65E+7 | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | $2s^22p^4(^3P)3p\ ^2S^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 386.992 | 0.005 | 41 881.0 | 18 | | 3.05E+8 | $2s^22p^4(^1D)3s\ ^2D_{5/2}$ | $2s^22p^4(^1D)3p\ ^2F^\circ_{7/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 393.589 | 0.005 | 41 765.5 | 9 | | 2.26E+7 | $2s^22p^4(^1D)3s\ ^2D_{5/2}$ | $2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 394.032 | 0.005 | 41 757.8 | 17 | | 2.80E+8 | $2s^22p^4(^1D)3s\ ^2D_{3/2}$ | $2s^22p^4(^1D)3p\ ^2F^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 406.588 | 0.005 | 41 540.0 | 15 | | 7.36E+7 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^3P)3p\ ^2D^\circ_{3/2}$ | 72MIN/NIE | 04FRO/TAC |
| 2 459.306 | 0.005 | 40 649.6 | 25 | | 2.79E+8 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^3P)3p\ ^2D^\circ_{5/2}$ | 72MIN/NIE | 04FRO/TAC |
| 2 468.854 | 0.005 | 40 492.4 | 18 | | 2.09E+8 | $2s^22p^4(^3P)3s\ ^2P_{1/2}$ | $2s^22p^4(^3P)3p\ ^2D^\circ_{3/2}$ | 72MIN/NIE | 04FRO/TAC |
| 2 474.732 | 0.005 | 40 396.2 | 20 | | 1.38E+8 | $2s^22p^4(^3P)3s\ ^4P_{5/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 497.022 | 0.005 | 40 035.6 | 25 | | 1.99E+8 | $2s^22p^4(^3P)3s\ ^4P_{5/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 510.264 | 0.005 | 39 824.5 | 17 | | 2.19E+8 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 530.249 | 0.005 | 39 509.9 | 15 | | 3.65E+7 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 542.791 | 0.005 | 39 315.1 | 14 | | 3.39E+7 | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{1/2}$ | 72MIN/NIE | 08KEL/POD |
| 2 553.54 | 0.010 | 39 149.5 | 4 | h | 5.52E+7 | $2s^22p^4(^3P)3s\ ^4P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{5/2}$ | 34SOD | 08KEL/POD |
| 2 563.32 | 0.010 | 39 000.2 | 4 | h | 7.92E+7 | $2s^22p^4(^3P)3s\ ^4P_{1/2}$ | $2s^22p^4(^3P)3p\ ^4P^\circ_{3/2}$ | 34SOD | 08KEL/POD |
| 2 637.45 | 0.010 | 37 904.1 | 0 | | 2.15E+6 | $2s^22p^4(^3P)3s\ ^2P_{3/2}$ | $2s^22p^4(^3P)3p\ ^4D^\circ_{5/2}$ | 34SOD | 08KEL/POD |
| *Vacuum* | | | | | | | | | |
| 73 177 | 12 | 1 366.55 | | | 4.59E−2 | $2s^22p^5\ ^2P^\circ_{3/2}$ | $2s^22p^5\ ^2P^\circ_{1/2}$ | 97FEU/LUT | 08KEL/POD |

TABLE 6. Energy levels of Na III

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^5$ | $^2P^\circ$ | 3/2 | 0.00 | | | |
| | | 1/2 | 1 366.55 | 0.22 | | 97FEU/LUT |
| $2s2p^6$ | $^2S$ | 1/2 | 264 455.0 | 1.5 | | 81MAR/ZAL |
| $2s^22p^4(^3P)3s$ | $^4P$ | 5/2 | 366 154.41 | 0.2 | | 81MAR/ZAL |
| | | 3/2 | 367 040.66 | 0.2 | | 81MAR/ZAL |
| | | 1/2 | 367 550.17 | 0.2 | | 81MAR/ZAL |
| $2s^22p^4(^3P)3s$ | $^2P$ | 3/2 | 373 632.32 | 0.2 | | 81MAR/ZAL |
| | | 1/2 | 374 679.91 | 0.2 | | 81MAR/ZAL |
| $2s^22p^4(^1D)3s$ | $^2D$ | 5/2 | 399 174.71 | 0.2 | | 81MAR/ZAL |
| | | 3/2 | 399 182.31 | 0.2 | | 81MAR/ZAL |
| $2s^22p^4(^3P)3p$ | $^4P^\circ$ | 5/2 | 406 190.15 | 0.2 | 99% | 81MAR/ZAL |
| | | 3/2 | 406 550.63 | 0.2 | 99% | 81MAR/ZAL |
| | | 1/2 | 406 865.11 | 0.2 | 100% | 81MAR/ZAL |
| $2s^22p^4(^3P)3p$ | $^4D^\circ$ | 7/2 | 410 976.94 | 0.2 | 100% | 81MAR/ZAL |
| | | 5/2 | 411 536.38 | 0.2 | 97% | 81MAR/ZAL |
| | | 3/2 | 411 951.78 | 0.2 | 98% | 81MAR/ZAL |
| | | 1/2 | 412 189.46 | 0.2 | 100% | 81MAR/ZAL |
| $2s^22p^4(^3P)3p$ | $^2D^\circ$ | 5/2 | 414 281.85 | 0.2 | 98% | 81MAR/ZAL |
| | | 3/2 | 415 172.28 | 0.2 | 98% | 81MAR/ZAL |

TABLE 6. Energy levels of Na III—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^4(^3P)3p$ | $^2S^\circ$ | 1/2 | 416 909.31 | 0.2 | 80% + 16% $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P)3p$ | $^4S^\circ$ | 3/2 | 417 403.98 | 0.2 | 99% | 81MAR/ZAL |
| $2s^22p^4(^3P)3p$ | $^2P^\circ$ | 3/2 | 418 417.50 | 0.2 | 85% + 13% $2s^22p^4(^1D)3p\ ^2P^\circ_{3/2}$ | 81MAR/ZAL |
| | | 1/2 | 418 556.54 | 0.2 | 69% + 20% $2s^22p^4(^3P)3p\ ^2S^\circ_{1/2}$ | 81MAR/ZAL |
| $2s^22p^4(^1S)3s$ | $^2S$ | 1/2 | 435 028.00 | 0.15 | | 81MAR/ZAL |
| $2s^22p^4(^1D)3p$ | $^2F^\circ$ | 5/2 | 440 940.20 | 0.2 | 100% | 81MAR/ZAL |
| | | 7/2 | 441 055.67 | 0.2 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D)3p$ | $^2D^\circ$ | 3/2 | 445 797.52 | 0.2 | 99% | 81MAR/ZAL |
| | | 5/2 | 445 873.20 | 0.2 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D)3p$ | $^2P^\circ$ | 3/2 | 447 547.96 | 0.2 | 86% + 13% $2s^22p^4(^3P)3p\ ^2P^\circ_{3/2}$ | 81MAR/ZAL |
| | | 1/2 | 448 107.31 | 0.2 | 86% + 14% $2s^22p^4(^3P)3p\ ^2P^\circ_{1/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P)3d$ | $^4D$ | 7/2 | 460 257.21 | 0.2 | 98% | 81MAR/ZAL |
| | | 5/2 | 460 409.70 | 0.2 | 97% | 81MAR/ZAL |
| | | 3/2 | 460 593.62 | 0.2 | 97% | 81MAR/ZAL |
| | | 1/2 | 460 746.98 | 0.2 | 99% | 81MAR/ZAL |
| $2s^22p^4(^3P)3d$ | $^4F$ | 9/2 | 462 891.04 | 0.2 | 100% | 81MAR/ZAL |
| | | 7/2 | 463 245.76 | 0.2 | 82% + 17% $2s^22p^4(^3P)3d\ ^2F_{7/2}$ | 81MAR/ZAL |
| | | 5/2 | 463 691.90 | 0.2 | 82% + 9% $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 81MAR/ZAL |
| | | 3/2 | 464 077.16 | 0.2 | 90% + 7% $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P)3d$ | $^2F$ | 7/2 | 463 970.92 | 0.2 | 82% + 16% $2s^22p^4(^3P)3d\ ^4F_{7/2}$ | 81MAR/ZAL |
| | | 5/2 | 464 390.17 | 0.2 | 32% + 44% $2s^22p^4(^3P)3d\ ^2D_{5/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P)3d$ | $^4P$ | 1/2 | 464 411.94 | 0.2 | 99% | 81MAR/ZAL |
| | | 3/2 | 464 631.29 | 0.2 | 82% + 10% $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 81MAR/ZAL |
| | | 5/2 | 464 945.37 | 0.2 | 56% + 37% $2s^22p^4(^3P)3d\ ^2F_{5/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P)3d$ | $^2D$ | 5/2 | 465 398.59 | 0.2 | 42% + 35% $2s^22p^4(^3P)3d\ ^4P_{5/2}$ | 81MAR/ZAL |
| | | 3/2 | 465 017.83 | 0.2 | 76% + 14% $2s^22p^4(^3P)3d\ ^4P_{7/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P)3d$ | $^2P$ | 1/2 | 466 011.91 | 0.2 | 98% | 81MAR/ZAL |
| | | 3/2 | 466 788.03 | 0.2 | 93% + 6% $2s^22p^4(^3P)3d\ ^2D_{3/2}$ | 81MAR/ZAL |
| $2s^22p^4(^1S)3p$ | $^2P^\circ$ | 1/2 | 478 842.99 | 0.2 | 99% | 81MAR/ZAL |
| | | 3/2 | 478 884.07 | 0.2 | 99% | 81MAR/ZAL |
| $2s^22p^4(^3P)4s$ | $^4P$ | 5/2 | 479 975.34 | 0.2 | | 81MAR/ZAL |
| | | 3/2 | 480 779.21 | 0.2 | | 81MAR/ZAL |
| | | 1/2 | 481 358.65 | 0.2 | | 81MAR/ZAL |
| $2s^22p^4(^3P)4s$ | $^2P$ | 3/2 | 482 402.20 | 0.2 | | 81MAR/ZAL |
| | | 1/2 | 483 388.55 | 0.2 | | 81MAR/ZAL |
| $2s^22p^4(^1D)3d$ | $^2G$ | 9/2 | 492 313.91 | 0.2 | 100% | 81MAR/ZAL |
| | | 7/2 | 492 316.41 | 0.2 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D)3d$ | $^2P$ | 3/2 | 493 192.06 | 0.2 | 99% | 81MAR/ZAL |
| | | 1/2 | 493 293.98 | 0.2 | 99% | 81MAR/ZAL |
| $2s^22p^4(^1D)3d$ | $^2S$ | 1/2 | 493 849.24 | 0.2 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D)3d$ | $^2D$ | 5/2 | 494 602.73 | 0.2 | 99% | 81MAR/ZAL |
| | | 3/2 | 494 685.86 | 0.2 | 99% | 81MAR/ZAL |
| $2s^22p^4(^1D)3d$ | $^2F$ | 5/2 | 495 429.75 | 0.2 | 100% | 81MAR/ZAL |
| | | 7/2 | 495 435.20 | 0.2 | 100% | 81MAR/ZAL |

TABLE 6. Energy levels of Na III—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^4(^1D)4s$ | $^2D$ | 3/2 | 511 433.8 | 0.2 | | 81MAR/ZAL |
| | | 5/2 | 511 434.3 | 0.2 | | 81MAR/ZAL |
| $2s^22p^4(^3P)4d$ | $^4F$ | 5/2 | 514 007 | 6 | | 81MAR/ZAL |
| | | 3/2 | 514 241 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^3P)4d$ | $^4P$ | 3/2 | 514 069 | 6 | | 81MAR/ZAL |
| | | 5/2 | 514 608? | 6 | | 81MAR/ZAL |
| $2s^22p^4(^3P)4d$ | $^2F$ | 5/2 | 514 688 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^3P)4d$ | $^2D$ | 3/2 | 515 017 | 6 | | 81MAR/ZAL |
| | | 5/2 | 515 365 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^3P)4d$ | $^2P$ | 1/2 | 515 140 | 6 | | 81MAR/ZAL |
| | | 3/2 | 515 984 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^3P_2)4f$ | $^2[4]^\circ$ | 9/2 | 515 595.6 | 0.3 | 98% | 81MAR/ZAL |
| | | 7/2 | 515 607.27 | 0.3 | 93% + 5% $2s^22p^4(^3P_2)4f\ ^2[3]^\circ_{7/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P_2)4f$ | $^2[3]^\circ$ | 5/2 | 515 635.09 | 0.3 | 98% | 81MAR/ZAL |
| | | 7/2 | 515 635.4 | 0.3 | 93% + 5% $2s^22p^4(^3P_2)4f\ ^2[4]^\circ_{7/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P_2)4f$ | $^2[2]^\circ$ | 3/2 | 515 764.23 | 0.3 | 94% + 6% $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{3/2}$ | 81MAR/ZAL |
| | | 5/2 | 515 773.67 | 0.3 | 93% + 5% $2s^22p^4(^3P_1)4f\ ^2[2]^\circ_{5/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P_2)4f$ | $^2[5]^\circ$ | 11/2 | 515 871.96 | 0.3 | 100% | 81MAR/ZAL |
| | | 9/2 | 515 872.81 | 0.3 | 100% | 81MAR/ZAL |
| $2s^22p^4(^3P_2)4f$ | $^2[1]^\circ$ | 1/2 | 515 994.5 | 0.3 | 100% | 81MAR/ZAL |
| | | 3/2 | 516 000.6 | 0.3 | 100% | 81MAR/ZAL |
| $2s^22p^4(^3P_1)4f$ | $^2[2]^\circ$ | 3/2 | 516 817.76 | 0.3 | 94% + 6% $2s^22p^4(^3P_2)4f\ ^2[2]^\circ_{3/2}$ | 81MAR/ZAL |
| | | 5/2 | 516 823.62 | 0.3 | 93% + 5% $2s^22p^4(^3P_2)4f\ ^2[2]^\circ_{5/2}$ | 81MAR/ZAL |
| $2s^22p^4(^3P_1)4f$ | $^2[4]^\circ$ | 9/2 | 516 859.91 | 0.3 | 98% | 81MAR/ZAL |
| | | 7/2 | 516 864.62 | 0.3 | 98% | 81MAR/ZAL |
| $2s^22p^4(^3P_1)4f$ | $^2[3]^\circ$ | 7/2 | 517 029.6 | 0.3 | 99% | 81MAR/ZAL |
| | | 5/2 | 517 033.0 | 0.3 | 99% | 81MAR/ZAL |
| $2s^22p^4(^3P_0)4f$ | $^2[3]^\circ$ | 7/2 | 517 374.54 | 0.3 | 98% | 81MAR/ZAL |
| | | 5/2 | 517 377.58 | 0.3 | 98% | 81MAR/ZAL |
| $2s^22p^4(^3P)5s$ | $^2P$ | 3/2 | 522 720 | 6 | | 81MAR/ZAL |
| | | 1/2 | 523 527 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^1S)3d$ | $^2D$ | 5/2 | 529 461.64 | 0.2 | 100% | 81MAR/ZAL |
| | | 3/2 | 529 497.70 | 0.2 | 99% | 81MAR/ZAL |
| $2s^22p^4(^1D)4d$ | $^2S$ | 1/2 | 543 640 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^1D)4d$ | $^2P$ | 3/2 | 544 226 | 6 | | 81MAR/ZAL |
| | | 1/2 | 544 278 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^1D)4d$ | $^2D$ | 5/2 | 544 749 | 6 | | 81MAR/ZAL |
| | | 3/2 | 544 788 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^1D)4d$ | $^2F$ | 5/2 | 544 915 | 6 | | 81MAR/ZAL |
| $2s^22p^4(^1D_2)4f$ | $^2[1]^\circ$ | 3/2 | 546 187.1? | 0.3 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D_2)4f$ | $^2[5]^\circ$ | 11/2 | 546 440.3 | 0.3 | 100% | 81MAR/ZAL |
| | | 9/2 | 546 441.0 | 0.3 | 100% | 81MAR/ZAL |

TABLE 6. Energy levels of Na III—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^4(^1D_2)4f$ | $^2[2]^°$ | 3/2 | 546 509.3 | 0.3 | 100% | 81MAR/ZAL |
| | | 5/2 | 546 510.55? | 0.3 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D_2)4f$ | $^2[3]^°$ | 7/2 | 546 810.1 | 0.3 | 100% | 81MAR/ZAL |
| | | 5/2 | 546 811 | 0.3 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1D_2)4f$ | $^2[4]^°$ | 7/2 | 546 887.36 | 0.3 | 100% | 81MAR/ZAL |
| | | 9/2 | 546 888.34 | 0.3 | 100% | 81MAR/ZAL |
| $2s^22p^4(^1S)4s$ | $^2S$ | 1/2 | 547 910.7 | 0.5 | | 81MAR/ZAL |
| $2s^22p^4(^1D)5s$ | $^2D$ | 3/2 | 552 404 | 6 | | 81MAR/ZAL |
| | | 5/2 | 552 416.? | 6 | | 81MAR/ZAL |
| **Na IV ($^3P_2$)** | *Limit* | — | [577 654] | 10 | | 81MAR/ZAL |
| **Na IV ($^3P_1$)** | *Limit* | — | [578 760] | 10 | | 81MAR/ZAL |
| **Na IV ($^3P_0$)** | *Limit* | — | [579 230] | 10 | | 81MAR/ZAL |
| **Na IV ($^1D_2$)** | *Limit* | — | [608 494] | 10 | | 81MAR/ZAL |
| **Na IV ($^1S_0$)** | *Limit* | — | [644 150] | 10 | | 81MAR/ZAL |

### 6.4. Na IV

**O isoelectronic sequence**
**Ground state** $1s^22s^22p^4\ ^3P_2$
**Ionization energy** [797 800] $cm^{-1}$; [98.92 eV]

The Na IV spectrum was first studied extensively by Söderqvist [32SOD, 34SOD, 46SOD] in the ultraviolet region between 129 Å and 412 Å, though Vance [32VAN] also reported observing seven of those transitions. Söderqvist established the ground configuration and levels in the $2s2p^5$ and $2s^22p^3ns$ and $nd$ configurations. A few of the $2s^22p^33s$-$3p$ and $3p$-$3d$ transitions were observed in a beam-foil spectrum and classified by Gaillard *et al.* [69GAI/CEY]. Minnhagen [76MIN] used observations between 136 Å and 412 Å and 1456 Å and 2156 Å to make a major extension of the analysis and improve the values of most of the previously identified levels. The forbidden lines in the visible region were reported by Bowen [60BOW] in nebular spectra. While not reporting measurements of the wavelengths, Gehrz *et al.* [94GEH/WOO] observed the forbidden transitions $2s^22p^4\ ^3P_2$-$^3P_1$ at 9.039(12) $\mu$m and $2s^22p^4\ ^3P_1$-$^3P_0$ at 21.29(6) $\mu$m in the spectrum of the nova V1974 Cygni. (These wavelengths and uncertainties are obtained from Ritz calculations by Kaufman and Sugar [86KAU/SUG].) In addition, Kelly and Lacy [95KEL/LAC] observed three hyperfine components of the $2s^22p^4\ ^3P_2$-$^3P_1$ transition (see Table 7).

The energy levels and leading percentages retained here are taken from the compilation of Martin and Zalubas [81MAR/ZAL]. The uncertainties of the levels are given with respect to the ground state; however, it should be noted that the relative positions of the $2s^22p^3nl$ levels given to the nearest 0.1 $cm^{-1}$ are known to about $\pm(0.2$–$0.4)$ $cm^{-1}$. The level values for the quintet states are given with the notation "+$x$" to indicate that no intercombination lines to singlet or triplet levels have been observed. Thus the quintet level uncertainties are relative to other quintet levels. Martin and Zalubas [81MAR/ZAL] estimate that $x$ is within $\pm300$ $cm^{-1}$ of zero (see Table 8).

The transition probabilities of allowed transitions of Na IV have been calculated by Tachiev and Froese Fischer [02TAC/FROa, 02TAC/FROb] using the multiconfiguration Hartree-Fock technique and compiled by Kelleher and Podobedova [08KEL/POD] along with many-body perturbation theory calculations of Vilkas *et al.* [94VIL/MER]. For transitions involving 4*d* levels, where values were not available from these sources, [08KEL/POD] listed the Opacity Project values of Butler and Zeippen [95BUT/ZEI]. The ionization energy cited above was obtained by Edlén [64EDL] from data available for other members of the O I isoelectronic sequence.

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TABLE 7. Observed spectral lines of Na IV

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | | |
| 136.4295 | 0.002 | 732 979. | 3 | | 1.74E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)4d\ ^3S^\circ_1$ | 76MIN | 95BUT/ZEI |
| 136.5513 | 0.002 | 732 326. | 4 | | 2.08E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)4d\ ^3P^\circ_2$ | 76MIN | 95BUT/ZEI |
| 136.6359 | 0.002 | 731 872. | 3 | | 1.04E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)4d\ ^3S^\circ_1$ | 76MIN | 95BUT/ZEI |
| 136.7540 | 0.002 | 731 240. | 3 | | 6.88E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)4d\ ^3P^\circ_1$ | 76MIN | 95BUT/ZEI |
| 136.8547 | 0.002 | 730 702. | 4* | | 3.88E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)4d\ ^3D^\circ_2$ | 76MIN | 95BUT/ZEI |
| 136.8547 | 0.002 | 730 702. | 4* | | 1.56E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)4d\ ^3D^\circ_3$ | 76MIN | 95BUT/ZEI |
| 137.0573 | 0.002 | 729 622. | 4* | | 6.46E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)4d\ ^3D^\circ_1$ | 76MIN | 95BUT/ZEI |
| 137.0573 | 0.002 | 729 622. | 4* | | 1.16E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)4d\ ^3D^\circ_2$ | 76MIN | 95BUT/ZEI |
| 137.1429 | 0.002 | 729 166. | 3 | | 8.59E+9 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2D^\circ)4d\ ^3D^\circ_1$ | 76MIN | 95BUT/ZEI |
| 137.7117 | 0.002 | 726 155. | 5 | | 1.68E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)4d\ ^1F^\circ_3$ | 76MIN | 95BUT/ZEI |
| 137.9415 | 0.002 | 724 945. | 5 | | | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)4d\ ^1D^\circ_2$ | 76MIN | |
| 139.9613 | 0.002 | 714 483. | 4 | | | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)4s\ ^3P^\circ_2$ | 76MIN | |
| 140.1811 | 0.002 | 713 363. | 3* | | | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)4s\ ^3P^\circ_0$ | 76MIN | |
| 140.1811 | 0.002 | 713 363. | 3* | | | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)4s\ ^3P^\circ_1$ | 76MIN | |
| 140.274 | 0.002 | 712 890. | 1 | | | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2P^\circ)4s\ ^3P^\circ_1$ | 76MIN | |
| 142.2315 | 0.002 | 703 079. | 7 | | 3.06E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)4d\ ^1F^\circ_3$ | 76MIN | 95BUT/ZEI |
| 142.3593 | 0.002 | 702 448. | 6 | | 2.77E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)4d\ ^1D^\circ_2$ | 76MIN | 95BUT/ZEI |
| 142.6851 | 0.002 | 700 844. | 5 | | 1.70E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)4d\ ^1P^\circ_1$ | 76MIN | 95BUT/ZEI |
| 144.9794 | 0.002 | 689 753. | 4 | | | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)4s\ ^3D^\circ_3$ | 76MIN | |
| 145.2046 | 0.002 | 688 683. | 3 | | | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)4s\ ^3D^\circ_2$ | 76MIN | |
| 145.300 | 0.002 | 688 231. | 1 | | | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2D^\circ)4s\ ^3D^\circ_1$ | 76MIN | |
| 145.8426 | 0.002 | 685 671. | 3 | | | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)4s\ ^1P^\circ_1$ | 76MIN | |
| 146.0644 | 0.002 | 684 630. | 8* | | 7.40E+8 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)4d\ ^3D^\circ_1$ | 76MIN | 95BUT/ZEI |
| 146.0644 | 0.002 | 684 630. | 8* | | 2.68E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)4d\ ^3D^\circ_3$ | 76MIN | 95BUT/ZEI |
| 146.0644 | 0.002 | 684 630. | 8* | | 6.69E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)4d\ ^3D^\circ_2$ | 76MIN | 95BUT/ZEI |
| 146.3015 | 0.002 | 683 520. | 7 | | 2.00E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^4S^\circ)4d\ ^3D^\circ_2$ | 76MIN | 95BUT/ZEI |
| 146.3991 | 0.002 | 683 064. | 6 | b | 1.47E+10 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^4S^\circ)4d\ ^3D^\circ_1$ | 76MIN | 95BUT/ZEI |
| 150.2981 | 0.002 | 665 344. | 9 | | 2.38E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_3$ | 76MIN | 08KEL/POD |
| 150.459 | 0.002 | 664 633. | 1 | | 3.32E+8 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)3d\ ^1D^\circ_2$ | 76MIN | 08KEL/POD |
| 150.5427 | 0.002 | 664 263. | 7 | | 1.71E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 150.642 | 0.002 | 663 825. | 7 | a | 1.56E+10 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 150.6867 | 0.002 | 663 629. | 8 | | 9.87E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)3d\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 150.7097 | 0.002 | 663 527. | 5* | | 3.10E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3d\ ^1D^\circ_2$ | 76MIN | 08KEL/POD |
| 150.7097 | 0.002 | 663 527. | 5* | | 5.51E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)3d\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 150.9424 | 0.002 | 662 504. | 5 | | 2.73E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3d\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 150.9667 | 0.002 | 662 398. | 6 | | 4.70E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3d\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 151.0503 | 0.002 | 662 031. | 6 | | 1.71E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3d\ ^3P^\circ_0$ | 76MIN | 08KEL/POD |
| 151.2994 | 0.002 | 660 941. | 7 | | 6.70E+9 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)4s\ ^1D^\circ_2$ | 76MIN | 95BUT/ZEI |
| 153.8432 | 0.002 | 650 012. | 3 | | | $2s^22p^4\ ^1S_0$ | $2s^22p^3(^2P^\circ)4s\ ^1P^\circ_1$ | 76MIN | |
| 155.0826 | 0.002 | 644 818. | 7 | | 1.33E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)4s\ ^3S^\circ_1$ | 76MIN | 08KEL/POD |

TABLE 7. Observed spectral lines of Na IV—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 155.2398 | 0.002 | 644 165. | 7 | | 1.88E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3d\ ^3S^\circ_1$ | 76MIN | 08KEL/POD |
| 155.3486 | 0.002 | 643 714. | 5 | b | 1.48E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^4S^\circ)4s\ ^3S^\circ_1$ | 76MIN | 08KEL/POD |
| 155.368 | 0.002 | 643 633. | 1 | b | | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3d\ ^1D^\circ_2$ | 76MIN | |
| 155.4477 | 0.002 | 643 303. | 7 | | 3.45E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 155.4600 | 0.002 | 643 252. | 3 | b | 6.30E+9 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^4S^\circ)4s\ ^3S^\circ_1$ | 76MIN | 08KEL/POD |
| 155.5104 | 0.002 | 643 044. | 8* | | 1.40E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3d\ ^3S^\circ_1$ | 76MIN | 08KEL/POD |
| 155.5104 | 0.002 | 643 044. | 8* | | 4.81E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 155.6197 | 0.002 | 642 592. | 6 | | 5.13E+9 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2D^\circ)3d\ ^3S^\circ_1$ | 76MIN | 08KEL/POD |
| 155.6872 | 0.002 | 642 314. | 6* | | 5.93E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_0$ | 76MIN | 08KEL/POD |
| 155.6872 | 0.002 | 642 314. | 6* | | 1.79E+9 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)3d\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 155.7129 | 0.002 | 642 208. | 5 | | 1.00E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 155.7762 | 0.002 | 641 947. | 7 | | 1.50E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 155.8276 | 0.002 | 641 735. | 5 | | 1.57E+10 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 156.5084 | 0.002 | 638 943. | 6 | | 6.45E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 156.5374 | 0.002 | 638 825. | 8 | | 2.92E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_3$ | 76MIN | 08KEL/POD |
| 156.7635 | 0.002 | 637 904. | 5 | b | 1.07E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 156.7798 | 0.002 | 637 837. | 6 | b | 2.12E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 156.8800 | 0.002 | 637 430. | 7 | | 1.52E+10 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 157.0841 | 0.002 | 636 602. | 8 | | 3.66E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)3d\ ^1F^\circ_3$ | 76MIN | 08KEL/POD |
| 157.5948 | 0.002 | 634 539. | 5 | | 3.50E+9 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 157.7792 | 0.002 | 633 797. | 8 | | 1.99E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)3d\ ^1D^\circ_2$ | 76MIN | 08KEL/POD |
| 162.4479 | 0.002 | 615 582. | 12 | | 6.04E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)3d\ ^1F^\circ_3$ | 76MIN | 08KEL/POD |
| 163.1895 | 0.002 | 612 785. | 10 | | 4.32E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)3d\ ^1D^\circ_2$ | 76MIN | 08KEL/POD |
| 163.274 | 0.002 | 612 467. | 1 | | | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_1$ | 76MIN | |
| 163.343 | 0.002 | 612 209. | 1 | | | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)3d\ ^3P^\circ_2$ | 76MIN | |
| 163.8396 | 0.002 | 610 353. | 9 | a | 3.56E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)3d\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 163.8412 | 0.002 | 610 347. | 9 | | 7.02E+10 | $2s^22p^4\ ^1S_0$ | $2s^22p^3(^2P^\circ)3d\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 168.093 | 0.002 | 594 909. | 13* | b | 3.33E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_3$ | 76MIN | 08KEL/POD |
| 168.093 | 0.002 | 594 909. | 13* | b | 8.38E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 168.093 | 0.002 | 594 909. | 13* | b | 9.35E+8 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 168.4110 | 0.002 | 593 785. | 12* | | 2.45E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 168.4110 | 0.002 | 593 785. | 12* | | 1.37E+10 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 168.5456 | 0.002 | 593 311. | 10 | | 1.81E+10 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 174.0047 | 0.002 | 574 697. | 6 | | 4.33E+9 | $2s^22p^4\ ^1S_0$ | $2s^22p^3(^2D^\circ)3d\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 175.4964 | 0.002 | 569 812. | 6 | | | $2s2p^5\ ^3P^\circ_2$ | $2s2p^4(^4P)3d\ ^3D^\circ_3$ | 76MIN | |
| 175.7965 | 0.002 | 568 840. | 3 | | | $2s2p^5\ ^3P^\circ_1$ | $2s2p^4(^4P)3d\ ^3D^\circ_2$ | 76MIN | |
| 175.930 | 0.002 | 568 408. | 1 | | | $2s2p^5\ ^3P^\circ_0$ | $2s2p^4(^4P)3d\ ^3D^\circ_1$ | 76MIN | |
| 181.7565 | 0.002 | 550 187. | 8 | | 6.07E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 181.7640 | 0.002 | 550 164. | 6 | | 3.33E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 182.1230 | 0.002 | 549 079. | 6 | | 2.42E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 182.1322 | 0.002 | 549 052. | 7* | | 8.44E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_0$ | 76MIN | 08KEL/POD |
| 182.1322 | 0.002 | 549 052. | 7* | | 2.04E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 182.2885 | 0.002 | 548 581. | 6 | | 3.10E+9 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 188.178 | 0.002 | 531 412. | 1 | | 4.43E+7 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3s\ ^1D^\circ_2$ | 76MIN | 08KEL/POD |
| 190.1300 | 0.002 | 525 956. | 8 | | 9.39E+9 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)3s\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 190.423 | 0.002 | 525 147. | 2 | b | 2.72E+8 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 190.4337 | 0.002 | 525 117. | 9 | b | 2.31E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 190.4453 | 0.002 | 525 085. | 10 | | 8.21E+9 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_3$ | 76MIN | 08KEL/POD |
| 190.8273 | 0.002 | 524 034. | 9 | | 3.56E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 190.8359 | 0.002 | 524 010. | 9 | | 5.87E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_2$ | 76MIN | 08KEL/POD |
| 190.9992 | 0.002 | 523 562. | 8 | | 4.33E+9 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_1$ | 76MIN | 08KEL/POD |
| 192.551 | 0.002 | 519 343. | 1 | | 6.42E+7 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 199.7722 | 0.002 | 500 570. | 10 | | 2.05E+10 | $2s^22p^4\ ^1D_2$ | $2s^22p^3(^2D^\circ)3s\ ^1D^\circ_2$ | 76MIN | 08KEL/POD |
| 203.9577 | 0.002 | 490 298. | 8 | | 9.54E+9 | $2s^22p^4\ ^1S_0$ | $2s^22p^3(^2P^\circ)3s\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 205.4869 | 0.002 | 486 649. | 10 | a | 1.39E+10 | $2s^22p^4\ ^3P_2$ | $2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$ | 76MIN | 02TAC/FROa |
| 205.9546 | 0.002 | 485 544. | 9 | | 8.19E+9 | $2s^22p^4\ ^3P_1$ | $2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$ | 76MIN | 02TAC/FROa |
| 206.1533 | 0.002 | 485 076. | 8 | | 2.72E+9 | $2s^22p^4\ ^3P_0$ | $2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$ | 76MIN | 02TAC/FROa |

TABLE 7. Observed spectral lines of Na IV—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | Line code | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 319.6436 | 0.002 | 312 848.4 | 10 | | 2.52E+10 | $2s^22p^4\ ^1D_2$ | $2s2p^5\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 360.760 | 0.002 | 277 192.6 | 10 | | 1.38E+9 | $2s^22p^4\ ^1S_0$ | $2s2p^5\ ^1P^\circ_1$ | 76MIN | 08KEL/POD |
| 408.6836 | 0.002 | 244 688.1 | 12 | | 2.66E+9 | $2s^22p^4\ ^3P_2$ | $2s2p^5\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 409.6142 | 0.002 | 244 132.2 | 10 | | 6.34E+9 | $2s^22p^4\ ^3P_1$ | $2s2p^5\ ^3P^\circ_0$ | 76MIN | 08KEL/POD |
| 410.3715 | 0.002 | 243 681.6 | 15 | | 4.73E+9 | $2s^22p^4\ ^3P_2$ | $2s2p^5\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 410.5411 | 0.002 | 243 581.0 | 8 | | 1.57E+9 | $2s^22p^4\ ^3P_1$ | $2s2p^5\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 411.3343 | 0.002 | 243 111.3 | 10 | | 2.09E+9 | $2s^22p^4\ ^3P_0$ | $2s2p^5\ ^3P^\circ_1$ | 76MIN | 08KEL/POD |
| 412.2418 | 0.002 | 242 576.1 | 13 | | 1.55E+9 | $2s^22p^4\ ^3P_1$ | $2s2p^5\ ^3P^\circ_2$ | 76MIN | 08KEL/POD |
| 1456.943 | 0.010 | 68 636.9 | 7 | | 4.35E+8 | $2s^22p^3(^2D^\circ)3p\ ^1F_3$ | $2s^22p^3(^2D^\circ)3d\ ^1F^\circ_3$ | 76MIN | 02TAC/FROa |
| 1502.85 | 0.010 | 66 540.2 | | b | 4.36E+8 | $2s^22p^3(^2D^\circ)3p\ ^3D_2$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_3$ | 76MIN | |
| 1508.754 | 0.010 | 66 279.9 | 8 | | 5.50E+8 | $2s^22p^3(^2D^\circ)3p\ ^3D_3$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_3$ | 76MIN | 02TAC/FROa |
| 1534.475 | 0.010 | 65 168.9 | 12 | b | 7.14E+8 | $2s^22p^3(^2D^\circ)3s\ ^1D^\circ_2$ | $2s^22p^3(^2D^\circ)3p\ ^1D_2$ | 76MIN | 02TAC/FROa |
| 1542.46 | 0.010 | 64 831.5 | * | b | 1.93E+8 | $2s^22p^3(^2P^\circ)3p\ ^3D_1$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_1$ | 76MIN | 02TAC/FROa |
| 1542.46 | 0.010 | 64 831.5 | * | b | 1.73E+8 | $2s^22p^3(^2P^\circ)3p\ ^3D_2$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_2$ | 76MIN | 02TAC/FROa |
| 1542.46 | 0.010 | 64 831.5 | * | b | 2.53E+8 | $2s^22p^3(^2P^\circ)3p\ ^3D_3$ | $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_3$ | 76MIN | 02TAC/FROa |
| 1580.233 | 0.010 | 63 281.8 | 9 | | 5.64E+8 | $2s^22p^3(^2D^\circ)3p\ ^3D_2$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_3$ | 76MIN | 02TAC/FROa |
| 1580.500 | 0.010 | 63 271.1 | 10 | | 6.27E+8 | $2s^22p^3(^2D^\circ)3p\ ^3D_3$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_4$ | 76MIN | 02TAC/FROa |
| 1582.121 | 0.010 | 63 206.3 | 4 | b | 9.54E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_1$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_0$ | 76MIN | 02TAC/FROa |
| 1582.182 | 0.010 | 63 203.9 | 11 | b | 7.16E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_1$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_1$ | 76MIN | 02TAC/FROa |
| 1582.326 | 0.010 | 63 198.1 | 10 | | 3.34E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_1$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_2$ | 76MIN | 02TAC/FROa |
| 1582.613 | 0.010 | 63 186.6 | 8 | | 5.11E+8 | $2s^22p^3(^2D^\circ)3p\ ^3D_1$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_2$ | 76MIN | 02TAC/FROa |
| 1583.91 | 0.010 | 63 134.9 | 5 | b | 2.38E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_2$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_1$ | 76MIN | 02TAC/FROa |
| 1583.977 | 0.010 | 63 134.9 | 11 | b | 5.55E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_2$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_2$ | 76MIN | 02TAC/FROa |
| 1584.141 | 0.010 | 63 125.7 | 12 | | 6.34E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_2$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_3$ | 76MIN | 02TAC/FROa |
| 1586.848 | 0.010 | 63 018.0 | 3* | b | 6.31E+7 | $2s^22p^3(^4S^\circ)3p\ ^5P_3$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_2$ | 76MIN | 02TAC/FROa |
| 1586.848 | 0.010 | 63 018.0 | 3* | b | 3.88E+6 | $2s^22p^3(^2D^\circ)3p\ ^3D_3$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_2$ | 76MIN | 02TAC/FROa |
| 1586.990 | 0.010 | 63 012.4 | 10 | b | 3.15E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_3$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_3$ | 76MIN | 02TAC/FROa |
| 1587.048 | 0.010 | 63 010.1 | 12 | b | 9.46E+8 | $2s^22p^3(^4S^\circ)3p\ ^5P_3$ | $2s^22p^3(^4S^\circ)3d\ ^5D^\circ_4$ | 76MIN | 02TAC/FROa |
| 1588.87 | 0.010 | 62 937.8 | 3 | b | 5.74E+7 | $2s^22p^3(^2D^\circ)3p\ ^3F_4$ | $2s^22p^3(^2D^\circ)3d\ ^3D^\circ_3$ | 76MIN | 02TAC/FROa |
| 1596.304 | 0.010 | 62 644.7 | 3 | b | 8.16E+8 | $2s^22p^3(^2P^\circ)3p\ ^3D_1$ | $2s^22p^3(^2P^\circ)3d\ ^3F^\circ_2$ | 76MIN | 02TAC/FROa |
| 1596.367 | 0.010 | 62 642.2 | 6 | b | 8.59E+8 | $2s^22p^3(^2P^\circ)3p\ ^3D_2$ | $2s^22p^3(^2P^\circ)3d\ ^3F^\circ_3$ | 76MIN | 02TAC/FROa |
| 1596.401 | 0.010 | 62 640.9 | 9 | b | 9.55E+8 | $2s^22p^3(^2P^\circ)3p\ ^3D_3$ | $2s^22p^3(^2P^\circ)3d\ ^3F^\circ_4$ | 76MIN | 02TAC/FROa |
| 1613.948 | 0.010 | 61 959.9 | 10 | | 8.74E+8 | $2s^22p^3(^2D^\circ)3p\ ^3F_2$ | $2s^22p^3(^2D^\circ)3d\ ^3G^\circ_3$ | 76MIN | 02TAC/FROa |
| 1615.922 | 0.010 | 61 884.2 | 11 | | 8.89E+8 | $2s^22p^3(^2D^\circ)3p\ ^3F_3$ | $2s^22p^3(^2D^\circ)3d\ ^3G^\circ_4$ | 76MIN | 02TAC/FROa |
| 1618.570 | 0.010 | 61 782.9 | 12 | | 9.23E+8 | $2s^22p^3(^2D^\circ)3p\ ^3F_4$ | $2s^22p^3(^2D^\circ)3d\ ^3G^\circ_5$ | 76MIN | 02TAC/FROa |
| 1655.468 | 0.010 | 60 405.9 | 11 | | 8.72E+8 | $2s^22p^3(^2D^\circ)3p\ ^1F_3$ | $2s^22p^3(^2D^\circ)3d\ ^1G^\circ_4$ | 76MIN | 02TAC/FROa |
| 1668.588 | 0.010 | 59 930.9 | 8 | b | 2.65E+8 | $2s^22p^3(^2D^\circ)3p\ ^3F_4$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_4$ | 76MIN | 02TAC/FROa |
| 1670.79 | 0.010 | 59 851.9 | | b | 2.20E+8 | $2s^22p^3(^2D^\circ)3p\ ^3F_3$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_3$ | 76MIN | 02TAC/FROa |
| 1672.330 | 0.010 | 59 796.8 | 5 | | 2.17E+8 | $2s^22p^3(^2D^\circ)3p\ ^3F_2$ | $2s^22p^3(^2D^\circ)3d\ ^3F^\circ_2$ | 76MIN | 02TAC/FROa |
| 1701.97 | 0.010 | 58 755.4 | 15 | b | 7.93E+8 | $2s^22p^3(^4S^\circ)3p\ ^3P_2$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_3$ | 76MIN | 02TAC/FROa |
| 1702.409 | 0.010 | 58 740.3 | 10 | | 5.95E+8 | $2s^22p^3(^4S^\circ)3p\ ^3P_1$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_2$ | 76MIN | 02TAC/FROa |
| 1702.735 | 0.010 | 58 694.6 | 6 | | 3.30E+8 | $2s^22p^3(^4S^\circ)3p\ ^3P_1$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_1$ | 76MIN | 02TAC/FROa |
| 1702.995 | 0.010 | 58 720.1 | 7 | | 1.98E+8 | $2s^22p^3(^4S^\circ)3p\ ^3P_2$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_2$ | 76MIN | 02TAC/FROa |
| 1703.53 | 0.010 | 58 701.6 | 9 | b | 4.40E+8 | $2s^22p^3(^4S^\circ)3p\ ^3P_0$ | $2s^22p^3(^4S^\circ)3d\ ^3D^\circ_1$ | 76MIN | 02TAC/FROa |
| 1791.629 | 0.010 | 55 815.1 | 8 | | 4.47E+8 | $2s^22p^3(^2P^\circ)3s\ ^1P^\circ_1$ | $2s^22p^3(^2P^\circ)3p\ ^1D_2$ | 76MIN | 02TAC/FROa |
| 1824.113 | 0.010 | 54 821.2 | 5 | | 5.85E+8 | $2s^22p^3(^2P^\circ)3p\ ^1D_2$ | $2s^22p^3(^2P^\circ)3s\ ^1F^\circ_3$ | 76MIN | 02TAC/FROa |
| 1960.760 | 0.010 | 51 000.6 | 12 | | 3.71E+8 | $2s^22p^3(^4S^\circ)3s\ ^5S^\circ_2$ | $2s^22p^3(^4S^\circ)3p\ ^5P_3$ | 76MIN | 02TAC/FROa |
| 1965.078 | 0.010 | 50 888.6 | 11 | | 3.68E+8 | $2s^22p^3(^4S^\circ)3s\ ^5S^\circ_2$ | $2s^22p^3(^4S^\circ)3p\ ^5P_2$ | 76MIN | 02TAC/FROa |
| 1967.601 | 0.010 | 50 823.3 | 10 | | 3.67E+8 | $2s^22p^3(^4S^\circ)3s\ ^5S^\circ_2$ | $2s^22p^3(^4S^\circ)3p\ ^5P_1$ | 76MIN | 02TAC/FROa |
| 1968.441 | 0.010 | 50 801.6 | 9 | | 3.82E+8 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_3$ | $2s^22p^3(^2D^\circ)3p\ ^3F_4$ | 76MIN | 02TAC/FROa |
| 1970.986 | 0.010 | 50 736.0 | 4 | b | 2.70E+7 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_3$ | $2s^22p^3(^2D^\circ)3p\ ^3F_3$ | 76MIN | 02TAC/FROa |
| 1972.223 | 0.010 | 50 704.2 | 9 | | 3.51E+8 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_2$ | $2s^22p^3(^2D^\circ)3p\ ^3F_3$ | 76MIN | 02TAC/FROa |
| 1975.148 | 0.010 | 50 629.1 | 7 | | 3.32E+8 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_1$ | $2s^22p^3(^2D^\circ)3p\ ^3F_2$ | 76MIN | 02TAC/FROa |
| 1983.746 | 0.010 | 50 409.7 | 5 | | 2.00E+8 | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_0$ | $2s^22p^3(^2P^\circ)3p\ ^3D_1$ | 76MIN | 02TAC/FROa |
| 1985.03 | 0.010 | 50 377.1 | 4 | b | 2.72E+8 | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_1$ | $2s^22p^3(^2P^\circ)3p\ ^3D_2$ | 76MIN | 02TAC/FROa |
| 1987.140 | 0.010 | 50 323.6 | 7 | | 3.56E+8 | $2s^22p^3(^2P^\circ)3s\ ^3P^\circ_2$ | $2s^22p^3(^2P^\circ)3p\ ^3D_3$ | 76MIN | 02TAC/FROa |
| 1998.584 | 0.010 | 50 035.4 | 4 | b | 3.28E+8 | $2s^22p^3(^2P^\circ)3s\ ^1P^\circ_1$ | $2s^22p^3(^2P^\circ)3p\ ^1P_1$ | 76MIN | 02TAC/FROa |

TABLE 7. Observed spectral lines of Na IV—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Air* | | | | | | | | | |
| 2018.137 | 0.010 | 49 534.7 | 5 | | 3.45E+8 | $2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$ | $2s^22p^3(^4S^\circ)3p\ ^3P_0$ | 76MIN | 02TAC/FROa |
| 2018.384 | 0.010 | 49 528.6 | 10 | | 3.44E+8 | $2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$ | $2s^22p^3(^4S^\circ)3p\ ^3P_2$ | 76MIN | 02TAC/FROa |
| 2019.188 | 0.010 | 49 508.9 | 9 | | 3.44E+8 | $2s^22p^3(^4S^\circ)3s\ ^3S^\circ_1$ | $2s^22p^3(^4S^\circ)3p\ ^3P_1$ | 76MIN | 02TAC/FROa |
| 2106.327 | 0.010 | 47 461.0 | 12 | b | 2.72E+8 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_3$ | $2s^22p^3(^2D^\circ)3p\ ^3D_3$ | 76MIN | 02TAC/FROa |
| 2113.099 | 0.010 | 47 308.9 | 4 | | 4.70E+7 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_3$ | $2s^22p^3(^2D^\circ)3p\ ^3D_2$ | 76MIN | 02TAC/FROa |
| 2114.533 | 0.010 | 47 276.8 | 10 | | 2.10E+8 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_2$ | $2s^22p^3(^2D^\circ)3p\ ^3D_2$ | 76MIN | 02TAC/FROa |
| 2115.13 | 0.010 | 47 263.5 | 3 | | 7.05E+7 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_2$ | $2s^22p^3(^2D^\circ)3p\ ^3D_1$ | 76MIN | 02TAC/FROa |
| 2116.158 | 0.010 | 47 240.5 | 7 | b | 2.04E+8 | $2s^22p^3(^2D^\circ)3s\ ^3D^\circ_1$ | $2s^22p^3(^2D^\circ)3p\ ^3D_1$ | 76MIN | 02TAC/FROa |
| 2124.875 | 0.010 | 47 046.7 | 4 | | 2.34E+8 | $2s^22p^3(^2D^\circ)3p\ ^1D_2$ | $2s^22p^3(^2D^\circ)3d\ ^1D^\circ_2$ | 76MIN | 02TAC/FROa |
| 2155.762 | 0.010 | 46 372.7 | 10 | | 2.97E+8 | $2s^22p^3(^2D^\circ)3s\ ^1D^\circ_2$ | $2s^22p^3(^2D^\circ)3p\ ^1F_3$ | 76MIN | 02TAC/FROa |
| 3241.68 | 0.10 | 30 839.3 | | | 6.13E−1 | $2s^22p^4\ ^3P_2$ | $2s^22p^4\ ^1D_2$ | 60BOW | 08KEL/POD |
| 3362.20 | 0.10 | 29 733.9 | | | 1.83E−1 | $2s^22p^4\ ^3P_1$ | $2s^22p^4\ ^1D_2$ | 60BOW | 08KEL/POD |

TABLE 8. Energy levels of Na IV

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^4$ | $^3P$ | 2 | 0.0 | | | |
| | | 1 | 1 106.3 | 1.0 | | 81MAR/ZAL |
| | | 0 | 1 576.0 | 1.0 | | 81MAR/ZAL |
| $2s^22p^4$ | $^1D$ | 2 | 30 839.8 | 1.0 | | 81MAR/ZAL |
| $2s^22p^4$ | $^1S$ | 0 | 66 496 | 2 | | 81MAR/ZAL |
| $2s2p^5$ | $^3P^\circ$ | 2 | 243 681.9 | 1.0 | 99% | 81MAR/ZAL |
| | | 1 | 244 687.6 | 1.0 | 99% | 81MAR/ZAL |
| | | 0 | 245 238.8 | 1.0 | 99% | 81MAR/ZAL |
| $2s2p^5$ | $^1P^\circ$ | 1 | 343 688 | 2 | 99% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)3s$ | $^5S^\circ$ | 2 | 473 950.0+$x$ | 0.4 | 100% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)3s$ | $^3S^\circ$ | 1 | 486 650.2 | 10 | 100% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)3p$ | $^5P$ | 1 | 524 773.3+$x$ | 0.4 | 100% | 81MAR/ZAL |
| | | 2 | 524 838.6+$x$ | 0.4 | 100% | 81MAR/ZAL |
| | | 3 | 524 950.6+$x$ | 0.4 | 100% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3s$ | $^3D^\circ$ | 3 | 525 085 | 10 | 100% | 81MAR/ZAL |
| | | 2 | 525 117 | 10 | 100% | 81MAR/ZAL |
| | | 1 | 525 139 | 10 | 100% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3s$ | $^1D^\circ$ | 2 | 531 410 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)3p$ | $^3P$ | 1 | 536 159.1 | 10 | 94% +5% $2s^22p^3(^2D^\circ)3p\ ^3P_1$ | 81MAR/ZAL |
| | | 2 | 536 178.8 | 10 | 94% +5% $2s^22p^3(^2D^\circ)3p\ ^3P_2$ | 81MAR/ZAL |
| | | 0 | 536 184.9 | 10 | 94% +5% $2s^22p^3(^2D^\circ)3p\ ^3P_0$ | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3s$ | $^3P^\circ$ | 1 | 550 157 | 10 | 99% | 81MAR/ZAL |
| | | 0 | 550 158.? | 10 | 99% | 81MAR/ZAL |
| | | 2 | 550 186 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3s$ | $^1P^\circ$ | 1 | 556 796 | 10 | 99% | 81MAR/ZAL |
| $2p^6$ | $^1S$ | 0 | 570 823 | 2 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3p$ | $^3P$ | 1 | 572 379.5 | 10 | 92% +6% $2s^22p^3(^2P^\circ)3p\ ^3D_1$ | 81MAR/ZAL |
| | | 2 | 572 393.8 | 10 | 94% +5% $2s^22p^3(^2P^\circ)3p\ ^3D_2$ | 81MAR/ZAL |
| | | 3 | 572 546.0 | 10 | 95% +5% $2s^22p^3(^2P^\circ)3p\ ^3D_3$ | 81MAR/ZAL |

TABLE 8. Energy levels of Na IV—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^3(^2D^\circ)3p$ | $^3F$ | 2 | 575 768.1 | 10 | 99% | 81MAR/ZAL |
| | | 3 | 575 821.0 | 10 | 99% | 81MAR/ZAL |
| | | 4 | 575 886.6 | 10 | 100% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3p$ | $^1F$ | 3 | 577 782.7 | 10 | 100% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)3d$ | $^5D^\circ$ | 4 | 587 960.7+$x$ | 0.4 | 100% | 81MAR/ZAL |
| | | 3 | 587 964.3+$x$ | 0.4 | 100% | 81MAR/ZAL |
| | | 2 | 587 971.2+$x$ | 0.4 | 100% | 81MAR/ZAL |
| | | 1 | 587 977.2+$x$ | 0.4 | 100% | 81MAR/ZAL |
| | | 0 | 587 979.6+$x$ | 0.4 | 100% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)3d$ | $^3D^\circ$ | 1 | 594 888.1 | 10 | 99% | 81MAR/ZAL |
| | | 2 | 594 899.2 | 10 | 99% | 81MAR/ZAL |
| | | 3 | 594 934 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3p$ | $^1D$ | 2 | 596 578.9 | 10 | 96% | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3p$ | $^3D$ | 3 | 600 509.6 | 10 | 95% +4% $2s^22p^3(^2D^\circ)3p\ ^3D_3$ | 81MAR/ZAL |
| | | 2 | 600 534.1 | 10 | 94% +5% $2s^22p^3(^2D^\circ)3p\ ^3D_2$ | 81MAR/ZAL |
| | | 1 | 600 567.7 | 10 | 94% +6% $2s^22p^3(^2D^\circ)3p\ ^3D_1$ | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3p$ | $^1P$ | 1 | 606 831? | 10 | 75% +14% $2s^22p^3(^2D^\circ)3p\ ^1P_1$ | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3p$ | $^1D$ | 2 | 612 611? | 10 | 98% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^3F^\circ$ | 2 | 635 566.0 | 10 | 97% | 81MAR/ZAL |
| | | 3 | 635 675.6 | 10 | 97% | 81MAR/ZAL |
| | | 4 | 635 817.2 | 10 | 98% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^3G^\circ$ | 5 | 637 669.6 | 10 | 100% | 81MAR/ZAL |
| | | 4 | 637 705.1 | 10 | 99% | 81MAR/ZAL |
| | | 3 | 637 728.0 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^1G^\circ$ | 4 | 638 188.6 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^3D^\circ$ | 3 | 638 825 | 10 | 98% | 81MAR/ZAL |
| | | 2 | 638 943 | 10 | 99% | 81MAR/ZAL |
| | | 1 | 639 007 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^1P^\circ$ | 1 | 641 193 | 10 | 95% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^3P^\circ$ | 2 | 643 052 | 10 | 97% | 81MAR/ZAL |
| | | 1 | 643 311 | 10 | 95% | 81MAR/ZAL |
| | | 0 | 643 420? | 10 | 98% | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^1D^\circ$ | 2 | 643 625.6 | 10 | 94% +6% $2s^22p^3(^2P^\circ)3d\ ^1D^\circ_2$ | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^3S^\circ$ | 1 | 644 166 | 10 | 97% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)4s$ | $^3S^\circ$ | 1 | 644 819 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)3d$ | $^1F^\circ$ | 3 | 646 419.6 | 10 | 100% | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3d$ | $^3P^\circ$ | 0 | 663 137? | 10 | 99% | 81MAR/ZAL |
| | | 1 | 663 509 | 10 | 99% | 81MAR/ZAL |
| | | 2 | 663 623 | 10 | 98% | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3d$ | $^3F^\circ$ | 4 | 663 150.5 | 10 | 98% | 81MAR/ZAL |
| | | 3 | 663 176.3 | 10 | 98% | 81MAR/ZAL |
| | | 2 | 663 212.4 | 10 | 96% | 81MAR/ZAL |

TABLE 8. Energy levels of Na IV—Continued

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Leading percentages | Reference |
|---|---|---|---|---|---|---|
| $2s^22p^3(^2P^\circ)3d$ | $^1D^\circ$ | 2 | 664 637 | 10 | 86% +8% $2s^22p^3(^2P^\circ)3d\ ^3D^\circ_2$ | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3d$ | $^3D^\circ$ | 3 | 665 344 | 10 | 98% | 81MAR/ZAL |
| | | 2 | 665 370 | 10 | 91% +6% $2s^22p^3(^2P^\circ)3d\ ^1D^\circ_2$ | 81MAR/ZAL |
| | | 1 | 665 400 | 10 | 99% | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3d$ | $^1F^\circ$ | 3 | 667 442 | 10 | 100% | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)3d$ | $^1P^\circ$ | 1 | 673 140 | 10 | 98% | 81MAR/ZAL |
| $2s^22p^3(^4S^\circ)4d$ | $^3D^\circ$ | 2 | 684 626 | 10 | | 81MAR/ZAL |
| | | 3 | 684 630 | 10 | | 81MAR/ZAL |
| | | 1 | 684 640 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4s$ | $^3D^\circ$ | 3 | 689 753 | 10 | | 81MAR/ZAL |
| | | 2 | 689 789 | 10 | | 81MAR/ZAL |
| | | 1 | 689 808 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4s$ | $^1D^\circ$ | 2 | 691 781 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)4s$ | $^3P^\circ$ | 0 | 714 468? | 10 | | 81MAR/ZAL |
| | | 1 | 714 468 | 10 | | 81MAR/ZAL |
| | | 2 | 714 483 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)4s$ | $^1P^\circ$ | 1 | 716 509 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4d$ | $^3D^\circ$ | 3 | 730 702 | 10 | | 81MAR/ZAL |
| | | 2 | 730 728 | 10 | | 81MAR/ZAL |
| | | 1 | 730 742 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4d$ | $^1P^\circ$ | 1 | 731 684 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4d$ | $^3P^\circ$ | 2 | 732 325 | 10 | | 81MAR/ZAL |
| | | 1 | 732 346 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4d$ | $^3S^\circ$ | 1 | 732 979 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4d$ | $^1D^\circ$ | 2 | 733 288 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2D^\circ)4d$ | $^1F^\circ$ | 3 | 733 919 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)4d$ | $^1D^\circ$ | 2 | 755 785 | 10 | | 81MAR/ZAL |
| $2s^22p^3(^2P^\circ)4d$ | $^1F^\circ$ | 3 | 756 995 | 10 | | 81MAR/ZAL |
| **Na v ($^4S^\circ_{3/2}$)** | *Limit* | — | [797 800] | 10 | | 81MAR/ZAL |
| $2s2p^4(^4P)3d$ | $^3D$ | 3 | 813 494 | 10 | | 81MAR/ZAL |
| | | 2 | 813 527 | 10 | | 81MAR/ZAL |
| | | 1 | 813 648? | 10 | | 81MAR/ZAL |

## 6.5. Na v

**N isoelectronic sequence**
**Ground state** $1s^22s^22p^3\ ^4S^\circ_{3/2}$
**Ionization energy** 1 116 300(100) cm$^{-1}$; 138.40(0.01) eV

The Na v spectrum between 100 Å and 514 Å was first measured and analyzed by Söderqvist [34SOD, 46SOD], who reported 103 lines. Subsequently Goto *et al.* [73GOT/GAUa] measured nine additional lines between 150 Å and 1806 Å in a vacuum spark discharge and classified them as transitions between Söderqvist's levels. The doublet levels were re-evaluated by Martin and Zalubas [81MAR/ZAL] using a quartet-doublet intersystem connection reported by Edlén [64EDL]. Since then the connection between the systems has been directly observed in the solar spectrum by Curdt *et al.* [01CUR/BRE]. The values of the doublet levels retained here are from compilation of the Martin and Zalubas [81MAR/ZAL], adjusted to reflect the improved values of the $2s^22p^3\ ^4S^\circ_{3/2}$-$2s^22p^3\ ^2P^\circ_{3/2,5/2}$ intervals. Some of the upper levels are only derived from a single weak line or blended lines. These are indicated in the table below by question marks after the level value. The ionization energy cited above was calculated by Söderqvist [46SOD] from series data. Edlén [64EDL] fitted a semiempirical formula to the N I isoelectronic sequence, which agrees with the Söderqvist value within 100 $cm^{-1}$ (see Tables 9 and 10).

For levels up to $2s^22p^2(^1S)3d$ (867 530 $cm^{-1}$), the transition probabilities for Na V have been compiled by Kelleher and Podobedova [08KEL/POD] using the multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer 02TAC/FROa, 02TAC/FROb] and the many-body perturbation results of Merkelis *et al.* [97MER/VIL]. For transitions involving levels above 867 530 $cm^{-1}$, the [08KEL/POD] values are taken from the nonrelativistic Opacity Project calculations of Burke and Lennon [95BUR/LEN]. Froese Fischer and Tachiev [04FRO/TAC] subsequently published slightly revised values for some of the transitions below.

### References for Na V


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TABLE 9. Observed spectral lines of Na V

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | |
| 100.88 | 0.010 | 991 280 | 10* | 1.86E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)5d\ ^2D_{5/2}$ | 46SOD | 08KEL/POD |
| 100.88 | 0.010 | 991 280 | 10* | 1.80E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)5d\ ^2D_{3/2}$ | 46SOD | 08KEL/POD |
| 100.945 | 0.010 | 990 640 | 10* | | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)5d\ ^2F_{7/2}$ | 46SOD | |
| 100.945 | 0.010 | 990 640 | 10* | | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)5d\ ^2F_{5/2}$ | 46SOD | |
| 103.482 | 0.010 | 966 350 | 10* | | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^1D)5d\ ^2D_{3/2}$ | 46SOD | |
| 103.482 | 0.010 | 966 350 | 10* | | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1D)5d\ ^2D_{5/2}$ | 46SOD | |
| 106.278 | 0.010 | 940 930 | 100 | 6.44E+10 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^4P_{3/2}$ | 46SOD | 08KEL/POD |
| 106.302 | 0.010 | 940 720 | 100 | 6.41E+10 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^4P_{5/2}$ | 46SOD | 08KEL/POD |
| 106.399 | 0.010 | 939 860 | 100 | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^4D_{1/2}$ | 46SOD | |
| 106.490 | 0.010 | 939 060 | 100 | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^4D_{5/2}$ | 46SOD | |
| 107.934 | 0.010 | 926 490 | 200 | 2.58E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)4d\ ^2D_{5/2}$? | 46SOD | 08KEL/POD |
| 108.017 | 0.010 | 925 780 | 200* | 3.85E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)4d\ ^2F_{7/2}$ | 46SOD | 08KEL/POD |
| 108.017 | 0.010 | 925 780 | 200* | 3.59E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)4d\ ^2F_{5/2}$ | 46SOD | 08KEL/POD |
| 110.817 | 0.010 | 902 390 | 200 | 6.95E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s2p^3(^3D^\circ)3p\ ^2F_{5/2}$ | 46SOD | 08KEL/POD |
| 110.878 | 0.010 | 901 890 | 200 | 7.45E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s2p^3(^3D^\circ)3p\ ^2F_{7/2}$ | 46SOD | 08KEL/POD |
| 110.921 | 0.010 | 901 540 | 10 | 1.89E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1D)4d\ ^2D_{5/2}$? | 46SOD | 08KEL/POD |
| 111.512 | 0.010 | 896 760 | 100 | 1.74E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)4d\ ^2D_{5/2}$ | 46SOD | 08KEL/POD |
| 111.552 | 0.010 | 896 440 | 10 | 1.68E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^2D_{3/2}$ | 46SOD | 08KEL/POD |
| 111.879 | 0.010 | 893 820 | 10* | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4s\ ^4P_{5/2}$ | 46SOD | |
| 111.879 | 0.010 | 893 820 | 10* | | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)4d\ ^2F_{7/2}$ | 46SOD | |
| 112.009 | 0.010 | 892 780 | 300 | | | | 46SOD | |
| 112.077 | 0.010 | 892 240 | 10 | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4s\ ^4P_{1/2}$ | 46SOD | |
| 112.186 | 0.010 | 891 380 | 10 | | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^4D_{1/2}$ | 46SOD | |
| 112.347 | 0.010 | 890 100 | 10 | | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)4d\ ^2P_{3/2}$ | 46SOD | |
| 113.574 | 0.010 | 880 480 | 10* | | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)4s\ ^2D_{5/2}$ | 46SOD | |
| 113.574 | 0.010 | 880 480 | 10* | | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)4s\ ^2D_{3/2}$ | 46SOD | |
| 113.952 | 0.010 | 877 560 | 10 | | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s2p^3(^3D^\circ)3p\ ^2F_{5/2}$ | 46SOD | |
| 114.700 | 0.010 | 871 840 | 100 | 3.95E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^2D_{5/2}$ | 46SOD | 08KEL/POD |
| 114.738 | 0.010 | 871 550 | 100 | 3.29E+10 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^3P)4d\ ^2D_{3/2}$ | 46SOD | 08KEL/POD |
| 117.703 | 0.010 | 849 600 | 10 | | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)4s\ ^2P_{3/2}$ | 92SOD | |
| 117.876 | 0.010 | 848 350 | 10 | | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)4s\ ^2P_{1/2}$ | 34SOD | |

TABLE 9. Observed spectral lines of Na V—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 117.990 | 0.010 | 847 530 | 400 | 2.28E+10 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s2p^3(^5P^*)3p\ ^4P_{5/2}$ | 46SOD | 04FRO/TAC |
| 120.040 | 0.010 | 833 060 | 100 | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2D_{5/2}$ | 46SOD | |
| 121.263 | 0.010 | 824 660 | 10 | | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^3P)4s\ ^2P_{3/2}$ | 46SOD | |
| 125.178 | 0.010 | 798 860 | 400 | 1.60E+11 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^4P_{1/2}$ | 46SOD | 04FRO/TAC |
| 125.216 | 0.010 | 798 620 | 400 | 1.58E+11 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^4P_{3/2}$ | 46SOD | 04FRO/TAC |
| 125.286 | 0.010 | 798 170 | 500 | 1.18E+11 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^4P_{5/2}$ | 46SOD | 04FRO/TAC |
| 125.428 | 0.010 | 797 270 | 300 | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^4D_{1/2}$ | 46SOD | |
| 125.461 | 0.010 | 797 060 | 300 | | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^4D_{5/2}$ | 46SOD | |
| 125.899 | 0.010 | 794 290 | 200 | 5.58E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1S)3d\ ^4D_{5/2}$ | 46SOD | 04FRO/TAC |
| 126.090 | 0.010 | 793 080 | 10 | 5.42E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^4S^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 126.210 | 0.010 | 792 330 | 100 | 5.75E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^4D^\circ_{7/2}$ | 46SOD | 08KEL/POD |
| 126.368 | 0.010 | 791 340 | 10 | 4.01E+10 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^3D^\circ)3d\ ^4D^\circ_{5/2}$ | 46SOD | 08KEL/POD |
| 126.458 | 0.010 | 790 780 | 10 | 2.38E+10 | $2s2p^4\ ^4P_{1/2}$ | $2s2p^3(^3D^\circ)3d\ ^4D^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 126.557 | 0.010 | 790 160 | 200 | 2.70E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)3d\ ^2P_{3/2}$ | 46SOD | 04FRO/TAC |
| 126.608 | 0.010 | 789 840 | 100 | 3.42E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2P_{1/2}$ | 46SOD | 04FRO/TAC |
| 126.779 | 0.010 | 788 770 | 10 | 5.69E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^4P^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 126.814 | 0.010 | 788 560 | 100 | 8.83E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^4P^\circ_{5/2}$ | 46SOD | 08KEL/POD |
| 126.920 | 0.010 | 787 900 | 10 | 1.05E+11 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^3D^\circ)3d\ ^4P^\circ_{1/2}$ | 46SOD | 08KEL/POD |
| 126.985 | 0.010 | 787 500 | 10 | 3.78E+10 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^3D^\circ)3d\ ^4P^\circ_{5/2}$ | 46SOD | 08KEL/POD |
| 127.036 | 0.010 | 787 180 | 10 | 5.23E+10 | $2s2p^4\ ^4P_{1/2}$ | $2s2p^3(^3D^\circ)3d\ ^4P^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 127.444 | 0.010 | 784 660 | 400 | 7.01E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)3d\ ^2D_{5/2}$ | 46SOD | 04FRO/TAC |
| 127.473 | 0.010 | 784 480 | 400 | 7.52E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2D_{3/2}$ | 46SOD | 04FRO/TAC |
| 128.025 | 0.010 | 781 100 | 400 | 1.25E+11 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2F_{5/2}$ | 46SOD | 04FRO/TAC |
| 128.051 | 0.010 | 780 940 | 400 | 9.65E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)3d\ ^2F_{7/2}$ | 46SOD | 04FRO/TAC |
| 129.942 | 0.010 | 769 570 | 100 | 5.14E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2S_{1/2}$ | 46SOD | 04FRO/TAC |
| 130.680 | 0.010 | 765 230 | 200 | 5.48E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2P_{3/2}$ | 46SOD | 04FRO/TAC |
| 130.723 | 0.010 | 764 980 | 100 | 4.18E+10 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^1D)3d\ ^2P_{1/2}$ | 46SOD | 04FRO/TAC |
| 131.345 | 0.010 | 761 350 | 300 | 3.57E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)3d\ ^2D_{5/2}$ | 46SOD | 04FRO/TAC |
| 131.413 | 0.010 | 760 960 | 200 | 2.94E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^2D_{3/2}$ | 46SOD | 04FRO/TAC |
| 131.635 | 0.010 | 759 680 | 300* | 4.93E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1D)3d\ ^2D_{5/2}$ | 46SOD | 04FRO/TAC |
| 131.635 | 0.010 | 759 680 | 300* | 3.67E+10 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^1D)5d\ ^2D_{3/2}$ | 46SOD | 04FRO/TAC |
| 133.162 | 0.010 | 750 970 | 500 | 5.20E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)3d\ ^2F_{7/2}$ | 46SOD | 04FRO/TAC |
| 133.388 | 0.010 | 749 690 | 400 | 3.63E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^2F_{5/2}$ | 46SOD | 04FRO/TAC |
| 134.183 | 0.010 | 745 250 | 10 | 5.36E+9 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^2P_{1/2}$ | 46SOD | 04FRO/TAC |
| 134.272 | 0.010 | 744 760 | 200 | 9.66E+9 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)3d\ ^2P_{3/2}$ | 46SOD | 04FRO/TAC |
| 135.791 | 0.010 | 736 430 | 300 | 5.92E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^2D_{5/2}$ | 46SOD | 04FRO/TAC |
| 135.854 | 0.010 | 736 080 | 300 | 5.06E+10 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^3P)3d\ ^2D_{3/2}$ | 46SOD | 04FRO/TAC |
| 138.812 | 0.010 | 720 400 | 200 | 1.69E+10 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^3P)3d\ ^2P_{1/2}$ | 46SOD | 04FRO/TAC |
| 138.917 | 0.010 | 719 850 | 300 | 3.20E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^3P)3d\ ^2P_{3/2}$ | 46SOD | 04FRO/TAC |
| 140.171 | 0.010 | 713 410 | 10 | 7.17E+10 | $2s2p^4\ ^2D_{3/2}$ | $2s2p^3(^3D^\circ)3d\ ^2F^\circ_{5/2}$ | 46SOD | 08KEL/POD |
| 140.258 | 0.010 | 712 970 | 10 | 7.65E+10 | $2s2p^4\ ^2D_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^2F^\circ_{7/2}$ | 46SOD | 08KEL/POD |
| 142.232 | 0.010 | 703 080 | 200 | | | | 46SOD | |
| 142.415 | 0.010 | 702 170 | 10 | 1.01E+10 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^3P*)3s\ ^4P^\circ_{1/2}$ | 46SOD | 08KEL/POD |
| 144.330 | 0.010 | 692 860 | 200 | 5.79E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^5S^\circ)3d\ ^4D^\circ_{7/2}$ | 46SOD | 08KEL/POD |
| 144.546 | 0.010 | 691 820 | 200 | 4.04E+10 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^5S^\circ)3d\ ^4D^\circ_{5/2}$ | 46SOD | 08KEL/POD |
| 144.661 | 0.010 | 691 270 | 100 | 2.41E+10 | $2s2p^4\ ^4P_{1/2}$ | $2s2p^3(^5S^\circ)3d\ ^4D^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 147.897 | 0.010 | 676 150 | 200 | 1.48E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1S)3s\ ^2S_{1/2}$ | 46SOD | 04FRO/TAC |
| 148.642 | 0.010 | 672 760 | 400 | 1.30E+10 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3s\ ^4P_{5/2}$ | 46SOD | 04FRO/TAC |
| 148.856 | 0.010 | 671 790 | 300 | 1.29E+10 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3s\ ^4P_{3/2}$ | 46SOD | 04FRO/TAC |
| 149.001 | 0.010 | 671 140 | 200 | 1.28E+10 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)3s\ ^4P_{1/2}$ | 46SOD | 04FRO/TAC |
| 150.968 | 0.010 | 662 390 | 200 | 1.67E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^3D^\circ)3s\ ^4D^\circ_{7/2}$ | 46SOD | 08KEL/POD |
| 151.127 | 0.010 | 661 700 | 400* | 1.61E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^1D)3s\ ^2D_{5/2}$ | 46SOD | 04FRO/TAC |
| 151.127 | 0.010 | 661 700 | 400* | 1.53E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^1D)3s\ ^2D_{3/2}$ | 46SOD | 04FRO/TAC |
| 151.188 | 0.010 | 661 430 | 100 | 1.16E+10 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^3D^\circ)3s\ ^4D^\circ_{5/2}$ | 46SOD | 08KEL/POD |
| 151.303 | 0.010 | 660 920 | 100 | 6.90E+9 | $2s2p^4\ ^4P_{1/2}$ | $2s2p^3(^3D^\circ)3s\ ^4D^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 157.036 | 0.010 | 636 800 | 200* | 4.81E+9 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^1D)3s\ ^2D_{3/2}$ | 46SOD | 04FRO/TAC |
| 157.036 | 0.010 | 636 800 | 200* | 5.79E+9 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^1D)3s\ ^2D_{5/2}$ | 46SOD | 04FRO/TAC |
| 157.209 | 0.010 | 636 100 | 300 | 1.89E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s^22p^2(^3P)3s\ ^2P_{3/2}$ | 46SOD | 04FRO/TAC |
| 157.511 | 0.010 | 634 880 | 200 | 2.17E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s^22p^2(^3P)3s\ ^2P_{1/2}$ | 46SOD | 04FRO/TAC |
| 163.616 | 0.010 | 611 190 | 300 | 1.38E+10 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s^22p^2(^3P)3s\ ^2P_{3/2}$ | 46SOD | 04FRO/TAC |
| 163.662 | 0.010 | 611 020 | 5 | | $2s2p^4\ ^2D_{5/2}$ | $2s2p^3(^5S^\circ)3d\ ^4D^\circ$ | 73GOT/GAUa | |
| 163.930 | 0.010 | 610 020 | 200 | 1.06E+10 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s^22p^2(^3P)3s\ ^2P_{1/2}$ | 46SOD | 04FRO/TAC |
| 167.510 | 0.010 | 596 980 | 100 | 2.00E+10 | $2s2p^4\ ^2D_{5/2}$ | $2s2p^3(^3D^\circ)3s\ ^2D^\circ_{5/2}$ | 46SOD | 08KEL/POD |

TABLE 9. Observed spectral lines of Na V—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 170.631 | 0.010 | 586 060 | 100 | 1.41E+10 | $2s2p^4\ ^4P_{5/2}$ | $2s2p^3(^5S^\circ)3s\ ^4S^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 170.923 | 0.010 | 585 060 | 100 | 9.28E+9 | $2s2p^4\ ^4P_{3/2}$ | $2s2p^3(^5S^\circ)3s\ ^4S^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 171.076 | 0.010 | 584 540 | 100 | 4.62E+9 | $2s2p^4\ ^4P_{1/2}$ | $2s2p^3(^5S^\circ)3s\ ^4S^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 183.806 | 0.010 | 544 050 | 30 | | $2s2p^4\ ^2S_{1/2}$ | $2s2p^3(^3D^\circ)3s\ ^2D^\circ_{3/2}$ | 73GOT/GAUa | |
| 297.482 | 0.010 | 336 155 | 30 | 9.48E+8 | $2s^22p^2(^3P)3s\ ^4P_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^4S^\circ_{3/2}$ | 73GOT/GAUa | 08KEL/POD |
| 307.152 | 0.010 | 325 572 | 800 | 2.10E+10 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s2p^4\ ^2P_{1/2}$ | 46SOD | 08KEL/POD |
| 308.264 | 0.010 | 324 397 | 1000 | 1.96E+10 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s2p^4\ ^2P_{3/2}$ | 46SOD | 08KEL/POD |
| 330.718 | 0.010 | 302 372 | 10 | | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s2p^4\ ^2S_{1/2}$ | 46SOD | |
| 332.550 | 0.010 | 300 707 | 800 | 3.60E+9 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s2p^4\ ^2P_{1/2}$ | 46SOD | 08KEL/POD |
| 333.910 | 0.010 | 299 482 | 900 | 4.53E+9 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s2p^4\ ^2P_{3/2}$ | 46SOD | 08KEL/POD |
| 360.319 | 0.010 | 277 532 | 800 | 4.19E+9 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s2p^4\ ^2S_{1/2}$ | 46SOD | 08KEL/POD |
| 360.367 | 0.010 | 277 495 | 800 | 7.54E+9 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s2p^4\ ^2S_{1/2}$ | 46SOD | 08KEL/POD |
| 367.557 | 0.010 | 272 067 | 200 | 8.82E+9 | $2s2p^4\ ^2D_{3/2}$ | $2p^5\ ^2P^\circ_{1/2}$ | 46SOD | 08KEL/POD |
| 369.743 | 0.010 | 270 458 | 300 | 7.91E+9 | $2s2p^4\ ^2D_{5/2}$ | $2p^5\ ^2P^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 400.722 | 0.010 | 249 550 | 1000* | 4.82E+9 | $2s^22p^3\ ^2D^\circ_{3/2}$ | $2s2p^4\ ^2D_{3/2}$ | 46SOD | 08KEL/POD |
| 400.722 | 0.010 | 249 550 | 1000* | 4.87E+9 | $2s^22p^3\ ^2D^\circ_{5/2}$ | $2s2p^4\ ^2D_{5/2}$ | 46SOD | 08KEL/POD |
| 403.283 | 0.010 | 247 965 | 5* | 2.55E+8 | $2s^22p^2(^3P)3s\ ^4P_{1/2}$ | $2s2p^3(^3P^\circ)3s\ ^4P^\circ_{1/2}$ | 73GOT/GAUa | 08KEL/POD |
| 403.283 | 0.010 | 247 965 | 5* | 6.40E+8 | $2s^22p^2(^3P)3s\ ^4P_{1/2}$ | $2s2p^3(^3P^\circ)3s\ ^4P^\circ_{3/2}$ | 73GOT/GAUa | 08KEL/POD |
| 445.046 | 0.010 | 224 696 | 500 | 5.83E+8 | $2s^22p^3\ ^2P^\circ_{1/2}$ | $2s2p^4\ ^2D_{3/2}$ | 46SOD | 08KEL/POD |
| 445.190 | 0.010 | 224 623 | 600 | 7.50E+8 | $2s^22p^3\ ^2P^\circ_{3/2}$ | $2s2p^4\ ^2D_{5/2}$ | 46SOD | 08KEL/POD |
| 459.897 | 0.010 | 217 440 | 600 | 2.20E+9 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s2p^4\ ^4P_{1/2}$ | 46SOD | 08KEL/POD |
| 461.051 | 0.010 | 216 896 | 850 | 2.19E+9 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s2p^4\ ^4P_{3/2}$ | 46SOD | 08KEL/POD |
| 463.263 | 0.010 | 215 860 | 1000 | 2.15E+9 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s2p^4\ ^4P_{5/2}$ | 46SOD | 08KEL/POD |
| 510.102 | 0.010 | 196 039 | 10 | 3.70E+9 | $2s2p^4\ ^2P_{1/2}$ | $2p^5\ ^2P^\circ_{1/2}$ | 46SOD | 08KEL/POD |
| 511.193 | 0.010 | 195 621 | 100 | 4.48E+9 | $2s2p^4\ ^2P_{3/2}$ | $2p^5\ ^2P^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 514.350 | 0.010 | 194 420 | 10 | 8.46E+8 | $2s2p^4\ ^2P_{1/2}$ | $2p^5\ ^2P^\circ_{3/2}$ | 46SOD | 08KEL/POD |
| 636.579 | 0.010 | 157 090 | 10 | | $2s2p^3(^5S^\circ)3p\ ^4P$ | $2s2p^3(^3D^\circ)3d\ ^4P^\circ_{3/2}$ | 73GOT/GAUa | |
| 719.491 | 0.010 | 138 987 | 15 | 2.81E+8 | $2s2p^3(^5S^\circ)3s\ ^4S^\circ_{3/2}$ | $2s^22p^2(^3P)4d\ ^4P_{3/2}$ | 73GOT/GAUa | 08KEL/POD |
| 831.868 | 0.010 | 120 211 | 5* | 1.97E+7 | $2s^22p^2(^3P)3d\ ^4P_{1/2}$ | $2s2p^3(^3P^\circ)3s\ ^4P^\circ_{1/2}$ | 73GOT/GAUa | 08KEL/POD |
| 831.868 | 0.010 | 120 211 | 5* | 4.92E+7 | $2s^22p^2(^3P)3d\ ^4P_{1/2}$ | $2s2p^3(^3P^\circ)3s\ ^4P^\circ_{3/2}$ | 73GOT/GAUa | 08KEL/POD |
| 1364.87 | 0.01 | 73 267.1 | 22 | 4.16E+0 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^3\ ^2P^\circ_{3/2}$ | 01CUR/BRE | 08KEL/POD |
| 1365.51 | 0.01 | 73 232.7 | 22 | 1.68E+0 | $2s^22p^3\ ^4S^\circ_{3/2}$ | $2s^22p^3\ ^2P^\circ_{1/2}$ | 01CUR/BRE | 08KEL/POD |
| 1650.654 | 0.010 | 60 582.0 | 20* | 1.69E+8 | $2s2p^3(^3D^\circ)3p\ ^2F_{5/2}$ | $2s2p^3(^3D^\circ)3d\ ^2F^\circ_{5/2}$ | 73GOT/GAUa | 08KEL/POD |
| 1650.654 | 0.010 | 60 582.0 | 20* | 1.40E+8 | $2s2p^3(^3D^\circ)3p\ ^2F_{7/2}$ | $2s2p^3(^3D^\circ)3d\ ^2F^\circ_{7/2}$ | 73GOT/GAUa | 08KEL/POD |
| 1806.170 | 0.010 | 55 365.8 | 25 | 1.75E+8 | $2s2p^3(^3D^\circ)3s\ ^2D^\circ_{5/2}$ | $2s2p^3(^3D^\circ)3p\ ^2F_{7/2}$ | 73GOT/GAUa | 08KEL/POD |

TABLE 10. Energy levels of Na V

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^22p^3$ | $^4S^\circ$ | 3/2 | 0 | | |
| $2s^22p^3$ | $^2D^\circ$ | 5/2 | 48 343 | 5 | 81MAR/ZAL,01CUR/BRE |
| | | 3/2 | 48 379 | 5 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^3$ | $^2P^\circ$ | 1/2 | 73 232.7 | 0.5 | 01CUR/BRE |
| | | 3/2 | 73 267.1 | 0.5 | 01CUR/BRE |
| $2s2p^4$ | $^4P$ | 5/2 | 215 860 | 5 | 81MAR/ZAL |
| | | 3/2 | 216 896 | 5 | 81MAR/ZAL |
| | | 1/2 | 217 440 | 5 | 81MAR/ZAL |
| $2s2p^4$ | $^2D$ | 5/2 | 297 893 | 10 | 81MAR/ZAL,01CUR/BRE |
| | | 3/2 | 297 929 | 10 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^4$ | $^2S$ | 1/2 | 350 760 | 10 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^4$ | $^2P$ | 3/2 | 372 744 | 10 | 81MAR/ZAL,01CUR/BRE |
| | | 1/2 | 373 945 | 10 | 81MAR/ZAL,01CUR/BRE |
| $2p^5$ | $^2P^\circ$ | 3/2 | 568 361 | 15 | 81MAR/ZAL,01CUR/BRE |
| | | 1/2 | 569 990 | 15 | 81MAR/ZAL,01CUR/BRE |

TABLE 10. Energy levels of Na V—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^22p^2(^3P)3s$ | $^4P$ | 1/2 | 671 136 | 50 | 81MAR/ZAL |
| | | 3/2 | 671 790 | 50 | 81MAR/ZAL |
| | | 5/2 | 672 757 | 50 | 81MAR/ZAL |
| $2s^22p^2(^3P)3s$ | $^2P$ | 1/2 | 683 250 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 3/2 | 684 450 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)3s$ | $^2D$ | 5/2,3/2 | 710 050 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1S)3s$ | $^2S$ | 1/2 | 749 420 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)3d$ | $^2P$ | 3/2 | 793 120 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 1/2 | 793 630 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)3d$ | $^4D$ | 5/2,3/2 | 797 060 | 100 | 81MAR/ZAL |
| | | 1/2 | 797 270 | 100 | 81MAR/ZAL |
| $2s^22p^2(^3P)3d$ | $^2F$ | 5/2 | 798 070 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 7/2 | 799 310 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)3d$ | $^4P$ | 5/2 | 798 170 | 100 | 81MAR/ZAL |
| | | 3/2 | 798 620 | 100 | 81MAR/ZAL |
| | | 1/2 | 798 860 | 100 | 81MAR/ZAL |
| $2s2p^3(^5S^\circ)3s$ | $^4S^\circ$ | 3/2 | 801 950 | 100 | 81MAR/ZAL |
| $2s^22p^2(^3P)3d$ | $^2D$ | 3/2 | 809 330 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 5/2 | 809 700 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)3d$ | $^2F$ | 7/2 | 829 280 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 5/2 | 829 480 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)3d$ | $^2D$ | 3/2 | 832 860 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 5/2 | 833 000 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)3d$ | $^2P$ | 1/2 | 838 210 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 3/2 | 838 500 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)3d$ | $^2S$ | 1/2 | 842 840 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^3(^5S^\circ)3p$ | $^4P$ | 1/2–5/2 | 847 540 | 100 | 81MAR/ZAL |
| $2s^22p^2(^1S)3d$ | $^2D$ | 3/2,5/2 | 867 540? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^3(^3P^\circ)3s$ | $^4S^\circ$ | 1/2–7/2 | 878 320 | 100 | 81MAR/ZAL |
| $2s^22p^2(^3P)4s$ | $^4P$ | 1/2 | 892 240 | 100 | 81MAR/ZAL |
| | | 5/2 | 893 820 | 100 | 81MAR/ZAL |
| $2s2p^3(^3P^\circ)3s$ | $^2D^\circ$ | 3/2,5/2 | 894 870 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)4s$ | $^2P$ | 1/2 | 896 730? | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 3/2 | 897 920? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^3(^5S^\circ)3d$ | $^4S^\circ$ | 1/2–7/2 | 908 710 | 100 | 81MAR/ZAL |
| $2s2p^3(^3P^\circ)3s$ | $^4P^\circ$ | 1/2–5/2 | 919 070 | 100 | 81MAR/ZAL |
| $2s^22p^2(^1D)4s$ | $^2D$ | 5/2,3/2 | 928 840? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)4d$ | $^2P$ | 3/2 | 938 440? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)4d$ | $^4D$ | 5/2,3/2 | 939 060 | 100 | 81MAR/ZAL |
| | | 1/2 | 939 860 | 100 | 81MAR/ZAL |
| $2s^22p^2(^3P)4d$ | $^4P$ | 5/2 | 940 720 | 100 | 81MAR/ZAL |
| | | 3/2 | 940 930 | 100 | 81MAR/ZAL |

TABLE 10. Energy levels of Na V—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^22p^2(^3P)4d$ | $^2F$ | 7/2 | 942 160? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^3P)4d$ | $^2D$ | 3/2 | 944 803 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 5/2 | 945 113 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^3(^3P^\circ)3p$ | $^2F$ | 7/2 | 950 233 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 5/2 | 950 773? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)4d$ | $^2F$ | 7/2,5/2 | 974 123? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)4d$? | $^2D$? | 3/2,5/2 | 974 813 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s2p^3(^3P^\circ)3d$ | $^4P^\circ$ | 5/2 | 1 004 400 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 004 620 | 100 | 81MAR/ZAL |
| | | 1/2 | 1 004 790 | 100 | 81MAR/ZAL |
| $2s2p^3(^3P^\circ)3d$ | $^4S^\circ$ | 1/2–7/2 | 1 008 210 | 100 | 81MAR/ZAL |
| $2s2p^3(^3P^\circ)3d$ | $^4S^\circ$ | 3/2 | 1 008 940 | 100 | 81MAR/ZAL |
| $2s2p^3(^3P^\circ)3d$ | $^2F^\circ$ | 7/2 | 1 010 860 | 100 | 81MAR/ZAL,01CUR/BRE |
| | | 5/2 | 1 011 340 | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)5d$ | $^2F$ | 7/2,5/2 | 1 038 980? | 100 | 81MAR/ZAL,01CUR/BRE |
| $2s^22p^2(^1D)5d$ | $^2D$ | 3/2,5/2 | 1 039 620? | 100 | 81MAR/ZAL,01CUR/BRE |
| **Na VI ($^3P_0$)** | *Limit* | — | 1 116 300 | 100 | 81MAR/ZAL |

### 6.6. Na VI

**C isoelectronic sequence**
**Ground state** $1s^22s^22p^2\ ^3P_0$
**Ionization energy** 1 388 750(400) $cm^{-1}$; 172.18(5) eV

The first reported observations of the Na VI spectrum were made by Söderqvist [34SOD, 46SOD], who measured 134 lines in the range 80 Å–638 Å. Fawcett [71FAW] measured and classified the three $2s2p^3$-$2p^4$ lines arising from the $2p^4\ ^1D_2$ and $^1S_0$ levels, giving a new value for the former level. Goto *et al.* [73GOT/GAUa] gave a number of new lines in the 119 Å–2205 Å range as belonging to Na VI. The level values were re-evaluated by Martin and Zalubas [81MAR/ZAL], confirming most of the prior levels and line classifications. Although Goto *et al.* [73GOT/GAUa] reported two intercombination lines involving the $2s2p^3\ ^5S^\circ_2$ level, the assignments are somewhat in doubt because, although the difference in wave numbers is correct, the intensity ratio of the two lines is anomalous and the wavelengths (974.034 Å and 985.190 Å) are somewhat shorter than expected. Feldman *et al.* [97FEL/BEH] report measuring a line in the solar corona at 988.71 Å, which they assign to the $2s^22p^2\ ^3P_2$-$2s2p^3\ ^5S^\circ_2$ transition. Their value agrees well with the level values predicted by Edlén [85EDL] using isoelectronic fitting. However, the transition to the $2s^22p^2\ ^3P_1$ level is not observed even though calculations of the intensity ratio indicate that it should appear. We have retained the $2s2p^3\ ^5S^\circ_2$ level predicted by Edlén [85EDL] and indicate the uncertainty in the relative positions of the quintet and triplet levels by adding the $+x$ in the energy level table. In a second paper Goto *et al.* [73GOT/GAUb] report four additional Na VI transitions with $2s^22p3p\ ^1D_2$ as the lower level. Recent measurements by Feuchtgruber *et al.* [97FEU/LUT] of light from planetary nebulae have yielded values for the forbidden transitions in the ground configuration; thus the ground state splitting has been established with improved accuracy. Levels based on single weak lines are included here but denoted as tentative with a question mark. The ionization energy cited above was determined by Martin and Zalubas [81MAR/ZAL] using the $2s^22pnd\ ^1F^\circ_3$ positions (see Tables 11 and 12).

Transition probabilities for Na VI have been calculated by Tachiev and Froese Fischer [01TAC/FRO] using the multiconfiguration Dirac-Fock (MCDF) technique and by Aggarwal *et al.* [01AGG/KEE] using the CIV3 code. These are compiled by Kelleher and Podobedova [08KEL/POD] along with nonrelativistic close-coupling calculations by Luo and Pradhan [89LUO/PRA] for the Opacity Project, which gave values for levels above $3d$. For transitions involving the $2s2p^23s$, $3p$, and $3d$ levels the CIV3 calculations of Mendoza *et al.* [99MEN/ZEI] were retained by Kelleher and Podobedova. Further MCDF calculations by Froese Fischer and Tachiev [04FRO/TAC] include a few transitions not in the [08KEL/POD] compilation.

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TABLE 11. Observed spectral lines of Na VI

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | |
| 80.345 | 0.010 | 1 244 630 | 10 | | $2s^22p^2\ ^1D_2$ | $2s^22p6d\ ^1F^\circ_3$ | 46SOD | |
| 80.645 | 0.010 | 1 240 000 | 10 | 4.81E+10 | $2s2p^3\ ^5S^\circ_2$ | $2s2p^2(^4P)5d\ ^5P_3$ | 46SOD | 08KEL/POD |
| 81.498 | 0.010 | 1 227 020 | | | | | 46SOD | |
| 81.543 | 0.010 | 1 226 350 | 100 | 3.91E+10 | $2s^22p^2\ ^3P_2$ | $2s^22p5d\ ^3D^\circ_3$ | 46SOD | 08KEL/POD |
| 81.584 | 0.010 | 1 225 730 | | | | | 46SOD | |
| 83.639 | 0.010 | 1 195 610 | 100 | 5.11E+10 | $2s^22p^2\ ^1D_2$ | $2s^22p5d\ ^1F^\circ_3$ | 46SOD | 89LUO/PRA |
| 87.141 | 0.010 | 1 147 560 | 100 | 8.20E+10 | $2s2p^3\ ^5S^\circ_2$ | $2s2p^2(^4P)4d\ ^5P_2$ | 46SOD | 08KEL/POD |
| 87.211 | 0.010 | 1 146 640 | 700 | 8.21E+10 | $2s2p^3\ ^5S^\circ_2$ | $2s2p^2(^4P)4d\ ^5P_3$ | 46SOD | 08KEL/POD |
| 88.038 | 0.010 | 1 135 870 | 100 | | $2s^22p^2\ ^3P_1$ | $2s^22p4d\ ^3P^\circ_2$ | 46SOD | |
| 88.143 | 0.010 | 1 134 520 | 200 | | $2s^22p^2\ ^3P_2$ | $2s^22p4d\ ^3P^\circ_2$ | 46SOD | |
| 88.223 | 0.010 | 1 133 490 | 100 | 5.66E+10 | $2s^22p^2\ ^3P_0$ | $2s^22p4d\ ^3D^\circ_1$ | 46SOD | 08KEL/POD |
| 88.246 | 0.010 | 1 133 200 | 200 | 7.61E+10 | $2s^22p^2\ ^3P_1$ | $2s^22p4d\ ^3D^\circ_2$ | 46SOD | 08KEL/POD |
| 88.270 | 0.010 | 1 132 890 | 300 | 1.02E+11 | $2s^22p^2\ ^3P_2$ | $2s^22p4d\ ^3D^\circ_3$ | 46SOD | 08KEL/POD |
| 88.340 | 0.010 | 1 131 990 | 100 | 2.54E+10 | $2s^22p^2\ ^3P_2$ | $2s^22p4d\ ^3D^\circ_2$ | 46SOD | 08KEL/POD |
| 88.387 | 0.010 | 1 131 390 | 10 | | $2s2p^3\ ^3D^\circ_3$ | $2s2p^2(^2D)4d\ ^3P_2$ | 46SOD | |
| 88.460 | 0.010 | 1 130 450 | 100 | 2.61E+10 | $2s2p^3\ ^3D^\circ_3$ | $2s2p^2(^2D)4d\ ^3F_4$ | 46SOD | 08KEL/POD |
| 88.583 | 0.010 | 1 128 880 | 100 | | $2s^22p^2\ ^3P_2$ | $2s^22p(^2P)4d\ ^1D_2$ | 46SOD | |
| 90.468 | 0.010 | 1 105 360 | 300 | 1.04E+11 | $2s^22p^2\ ^1D_2$ | $2s^22p4d\ ^1F^\circ_3$ | 46SOD | 89LUO/PRA |
| 90.746 | 0.010 | 1 101 980 | 10 | | $2s2p^3\ ^5S^\circ_2$ | $2s2p^2(^4P)4s\ ^5P_3$ | 46SOD | |
| 91.268 | 0.010 | 1 095 670 | 100 | | $2s^22p^2\ ^1D_2$ | $2s^22p4d\ ^1D^\circ_2$ | 46SOD | |
| 91.414 | 0.010 | 1 093 920 | 10 | | $2s2p^3\ ^3P^\circ_2$ | $2s2p^2(^2D)4d\ ^3P_2$ | 46SOD | |
| 91.475 | 0.010 | 1 093 200 | 10 | | $2s2p^3\ ^3P^\circ_2$ | $2s2p^2(^2D)4d\ ^3F_3$ | 46SOD | |
| 91.737 | 0.010 | 1 090 070 | 10 | | $2s^22p^2\ ^3P_1$ | $2s^22p4s\ ^3P^\circ_2$ | 46SOD | |
| 91.836 | 0.010 | 1 088 900 | 10 | | $2s^22p^2\ ^3P_2$ | $2s^22p4s\ ^3P^\circ_2$ | 46SOD | |
| 94.208 | 0.010 | 1 061 480 | 100 | | $2s2p^3\ ^3D^\circ_3$ | $2p^3(^4S^\circ)3p\ ^3P_2$ | 46SOD | |
| 94.827 | 0.010 | 1 054 550 | 10 | | $2s2p^3\ ^3D^\circ_3$ | $2s2p^2(^4P)4d\ ^3D_3$ | 46SOD | |
| 95.182 | 0.010 | 1 050 620 | 100 | 7.33E+10 | $2s2p^3\ ^3D^\circ_3$ | $2s2p^2(^4P)4d\ ^3F_4$ | 46SOD | 08KEL/POD |
| 95.263 | 0.010 | 1 049 720 | 100 | 6.51E+10 | $2s2p^3\ ^3D^\circ_2$ | $2s2p^2(^4P)4d\ ^3F_3$ | 46SOD | 08KEL/POD |
| 95.319 | 0.010 | 1 049 110 | 10 | 6.17E+10 | $2s2p^3\ ^3D^\circ_1$ | $2s2p^2(^4P)4d\ ^3F_2$ | 46SOD | 08KEL/POD |
| 95.933 | 0.010 | 1 042 390 | 300 | 6.64E+10 | $2s^22p^2\ ^1D_2$ | $2s2p^2(^2D)3p\ ^1D^\circ_2$ | 46SOD | 99MEN/ZEI |
| 96.124 | 0.010 | 1 040 320 | 10 | | $2s^22p^2\ ^3P_0$ | $2s2p^2(^2D)3p\ ^3D^\circ_1$ | 46SOD | |
| 96.196 | 0.010 | 1 039 540 | 100 | | $2s^22p^2\ ^3P_1$ | $2s2p^2(^2D)3p\ ^3D^\circ_1$ | 46SOD | |
| 96.307 | 0.010 | 1 038 350 | 100 | | $2s^22p^2\ ^3P_2$ | $2s2p^2(^2D)3p\ ^3D^\circ_3$ | 46SOD | |
| 96.475 | 0.010 | 1 036 540 | 300 | 7.30E+10 | $2s^22p^2\ ^1D_2$ | $2s2p^2(^2D)3p\ ^1F^\circ_3$ | 46SOD | 99MEN/ZEI |
| 97.636 | 0.010 | 1 024 210 | 10 | | $2s2p^3\ ^3P^\circ_2$ | $2p^3(^4S^\circ)3p\ ^3P_2$ | 46SOD | |
| 98.309 | 0.010 | 1 017 200 | 20 | 6.11E+10 | $2s2p^3\ ^3P^\circ_2$ | $2s2p^2(^4P)4d\ ^3D_3$ | 46SOD | 08KEL/POD |

TABLE 11. Observed spectral lines of Na VI—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 99.004 | 0.010 | 1 010 060 | 10 | | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^4P)4s\,^3P_2$ | 46SOD | |
| 99.500 | 0.010 | 1 005 020 | 10* | 1.68E+10 | $2s^22p^2\,^3P_0$ | $2s2p^2(^4P)3p\,^3P^\circ_1$ | 46SOD | 99MEN/ZEI |
| 99.500 | 0.010 | 1 005 020 | 10* | 1.25E+10 | $2s^22p^2\,^3P_1$ | $2s2p^2(^4P)3p\,^3P^\circ_2$ | 46SOD | 99MEN/ZEI |
| 99.617 | 0.010 | 1 003 840 | 100 | 4.45E+10 | $2s^22p^2\,^3P_2$ | $2s2p^2(^4P)3p\,^3P^\circ_2$ | 46SOD | 99MEN/ZEI |
| 99.680 | 0.010 | 1 003 210 | 100 | 2.53E+10 | $2s^22p^2\,^3P_2$ | $2s2p^2(^4P)3p\,^3P^\circ_1$ | 46SOD | 99MEN/ZEI |
| 100.469 | 0.010 | 9 953 30 | 200 | 4.32E+10 | $2s^22p^2\,^3P_1$ | $2s2p^2(^4P)3p\,^3D^\circ_2$ | 46SOD | 99MEN/ZEI |
| 100.519 | 0.010 | 994 840 | 300 | 5.51E+10 | $2s^22p^2\,^3P_2$ | $2s2p^2(^4P)3p\,^3D^\circ_3$ | 46SOD | 99MEN/ZEI |
| 100.590 | 0.010 | 994 140 | 100 | 1.17E+10 | $2s^22p^2\,^3P_2$ | $2s2p^2(^4P)3p\,^3D^\circ_2$ | 46SOD | 99MEN/ZEI |
| 103.002 | 0.010 | 970 860 | 10 | 9.64E+9 | $2s^22p^2\,^3P_0$ | $2s2p^2(^4P)3p\,^3S^\circ_1$ | 46SOD | 99MEN/ZEI |
| 103.078 | 0.010 | 970 140 | 100 | 2.80E+10 | $2s^22p^2\,^3P_1$ | $2s2p^2(^4P)3p\,^3S^\circ_1$ | 46SOD | 99MEN/ZEI |
| 103.210 | 0.010 | 968 900 | 200 | 4.40E+10 | $2s^22p^2\,^3P_2$ | $2s2p^2(^4P)3p\,^3S^\circ_1$ | 46SOD | 99MEN/ZEI |
| 106.040 | 0.010 | 943 040 | 300 | 2.87E+11 | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3d\,^5P_1$ | 46SOD | 99MEN/ZEI |
| 106.077 | 0.010 | 942 710 | 300 | 2.85E+11 | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3d\,^5P_2$ | 46SOD | 99MEN/ZEI |
| 106.125 | 0.010 | 942 280 | 400 | 2.84E+11 | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3d\,^5P_3$ | 46SOD | 99MEN/ZEI |
| 106.580 | 0.010 | 938 260 | 10 | | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3d\,^5D_{2,3}$ | 46SOD | |
| 107.014 | 0.010 | 934 460 | 200 | 2.78E+10 | $2s^22p^2\,^3P_0$ | $2s^22p3d\,^3P^\circ_1$ | 46SOD | 08KEL/POD |
| 107.061 | 0.010 | 934 050 | 300 | 1.48E+11 | $2s^22p^2\,^3P_1$ | $2s^22p3d\,^3P^\circ_0$ | 46SOD | 08KEL/POD |
| 107.093 | 0.010 | 933 770 | 300 | 5.58E+10 | $2s^22p^2\,^3P_1$ | $2s^22p3d\,^3P^\circ_1$ | 46SOD | 08KEL/POD |
| 107.158 | 0.010 | 933 200 | 100 | 8.64E+9 | $2s^22p^2\,^3P_1$ | $2s^22p3d\,^3P^\circ_2$ | 46SOD | 08KEL/POD |
| 107.227 | 0.010 | 932 600 | 300 | 6.60E+10 | $2s^22p^2\,^3P_2$ | $2s^22p3d\,^3P^\circ_1$ | 46SOD | 08KEL/POD |
| 107.288 | 0.010 | 932 070 | 400 | 1.43E+11 | $2s^22p^2\,^3P_2$ | $2s^22p3d\,^3P^\circ_2$ | 46SOD | 08KEL/POD |
| 107.535 | 0.010 | 929 930 | 300 | 1.17E+11 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^2D)3d\,^3D_3$ | 46SOD | 99MEN/ZEI |
| 107.553 | 0.010 | 929 770 | 300 | 1.65E+11 | $2s^22p^2\,^3P_0$ | $2s^22p3d\,^3D^\circ_1$ | 46SOD | 08KEL/POD |
| 107.608 | 0.010 | 929 300 | 400 | 2.21E+11 | $2s^22p^2\,^3P_1$ | $2s^22p3d\,^3D^\circ_2$ | 46SOD | 08KEL/POD |
| 107.683 | 0.010 | 928 650 | 500 | 2.57E+11 | $2s^22p^2\,^3P_2$ | $2s^22p3d\,^3D^\circ_3$ | 46SOD | 08KEL/POD |
| 107.742 | 0.010 | 928 140 | 200 | 3.18E+10 | $2s^22p^2\,^3P_2$ | $2s^22p3d\,^3D^\circ_2$ | 46SOD | 08KEL/POD |
| 107.934 | 0.010 | 926 490 | 200 | 6.28E+10 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^2D)3d\,^3P_2$ | 46SOD | 99MEN/ZEI |
| 108.555 | 0.010 | 921 190 | 400 | 2.45E+11 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^2D)3d\,^3F_4$ | 46SOD | 99MEN/ZEI |
| 108.678 | 0.010 | 920 150 | 10 | | $2s^22p^2\,^3P_1$ | $2s^22p3d\,^1D^\circ_2$ | 46SOD | |
| 109.763 | 0.010 | 911 050 | 10 | 6.76E+9 | $2s^22p^2\,^1D_2$ | $2s^22p3d\,^1P^\circ_1$ | 46SOD | 04FRO/TAC |
| 109.896 | 0.010 | 909 950 | 500 | 2.95E+11 | $2s^22p^2\,^1D_2$ | $2s^22p3d\,^1F^\circ_3$ | 46SOD | 08KEL/POD |
| 110.085 | 0.010 | 908 390 | 200 | | $2s2p^3\,^1P^\circ_1$ | $2s2p^2(^4P)4d\,^3D_2$ | 46SOD | |
| 110.750 | 0.010 | 902 940 | 200 | 7.05E+10 | $2s2p^3\,^3P^\circ_2$ | $2s2p^2(^2D)3d\,^3S_1$ | 46SOD | 99MEN/ZEI |
| 111.725 | 0.010 | 895 060 | 100 | | $2s^22p^2\,^1D_2$ | $2s^22p3d\,^3D^\circ_3$ | 46SOD | |
| 111.793 | 0.010 | 894 510 | 100 | | $2s^22p^2\,^1D_2$ | $2s^22p3d\,^3D^\circ_2$ | 46SOD | |
| 112.009 | 0.010 | 892 780 | 300 | 8.47E+10 | $2s2p^3\,^3P^\circ_2$ | $2s2p^2(^2D)3d\,^3D_3$ | 46SOD | 99MEN/ZEI |
| 112.448 | 0.010 | 889 300 | 300 | 9.95E+10 | $2s2p^3\,^3P^\circ_2$ | $2s2p^2(^2D)3d\,^3P_2$ | 46SOD | 99MEN/ZEI |
| 112.950 | 0.010 | 885 350 | 400 | 5.76E+10 | $2s^22p^2\,^1D_2$ | $2s^22p3d\,^1D^\circ_2$ | 46SOD | 08KEL/POD |
| 113.125 | 0.010 | 883 980 | 400 | 4.03E+10 | $2s^22p^2\,^1D_2$ | $2s^22p3d\,^3F^\circ_2$ | 46SOD | 04FRO/TAC |
| 114.666 | 0.010 | 872 100 | 400 | 1.69E+11 | $2s^22p^2\,^1S_0$ | $2s^22p3d\,^1P^\circ_1$ | 46SOD | 04FRO/TAC |
| 115.729 | 0.010 | 864 090 | 200 | 4.71E+10 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^4P)3d\,^3D_3$ | 46SOD | 99MEN/ZEI |
| 115.780 | 0.010 | 863 710 | 10 | 3.34E+10 | $2s2p^3\,^3D^\circ_2$ | $2s2p^2(^4P)3d\,^3D_2$ | 46SOD | 99MEN/ZEI |
| 117.491 | 0.010 | 851 130 | 400 | 1.32E+11 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^4P)3d\,^3F_4$ | 46SOD | 99MEN/ZEI |
| 117.609 | 0.010 | 850 280 | 300 | 1.18E+11 | $2s2p^3\,^3D^\circ_2$ | $2s2p^2(^4P)3d\,^3F_3$ | 46SOD | 99MEN/ZEI |
| 117.699 | 0.010 | 849 620 | 300 | 1.11E+11 | $2s2p^3\,^3D^\circ_1$ | $2s2p^2(^4P)3d\,^3F_2$ | 46SOD | 99MEN/ZEI |
| 118.500 | 0.010 | 843 880 | 10 | 8.55E+9 | $2s2p^3\,^3D^\circ_2$ | $2s2p^2(^4P)3d\,^3P_1$ | 46SOD | 99MEN/ZEI |
| 118.585 | 0.010 | 843 280 | 10 | 1.11E+10 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^4P)3d\,^3P_2$ | 46SOD | 99MEN/ZEI |
| 119.204 | 0.010 | 838 900 | 10 | 3.43E+10 | $2s2p^3\,^1D^\circ_2$ | $2s2p^2(^2D)3d\,^1P_1$ | 46SOD | 99MEN/ZEI |
| 119.415 | 0.010 | 837 420 | 5 | | $2s2p^3\,^3D^\circ_2$ | $2s2p^2(^4P)3d\,^5D_{2,3}$ | 73GOT/GAUa | |
| 119.684 | 0.010 | 835 530 | 300 | 1.73E+11 | $2s2p^3\,^1D^\circ_2$ | $2s2p^2(^2D)3d\,^1D_2$ | 46SOD | 99MEN/ZEI |
| 120.355 | 0.010 | 830 880 | 10 | | $2s2p^3\,^3S^\circ_1$ | $2s2p^2(^2D)3d\,^1P_1$ | 46SOD | |
| 120.931 | 0.010 | 826 920 | 300 | 1.11E+11 | $2s2p^3\,^3P^\circ_2$ | $2s2p^2(^4P)3d\,^3D_3$ | 46SOD | 99MEN/ZEI |
| 120.973 | 0.010 | 826 630 | 200 | 8.08E+10 | $2s2p^3\,^3P^\circ_1$ | $2s2p^2(^4P)3d\,^3D_2$ | 46SOD | 99MEN/ZEI |
| 121.004 | 0.010 | 826 420 | 100 | 6.04E+10 | $2s2p^3\,^3P^\circ_0$ | $2s2p^2(^4P)3d\,^3D_1$ | 46SOD | 99MEN/ZEI |
| 121.773 | 0.010 | 821 200 | 400 | 2.23E+10 | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3s\,^5P_3$ | 46SOD | 99MEN/ZEI |
| 121.913 | 0.010 | 820 260 | 320 | 2.21E+10 | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3s\,^5P_2$ | 46SOD | 99MEN/ZEI |
| 122.018 | 0.010 | 819 550 | 300 | 2.20E+10 | $2s2p^3\,^5S^\circ_2$ | $2s2p^2(^4P)3s\,^5P_1$ | 46SOD | 99MEN/ZEI |
| 122.199 | 0.010 | 818 340 | 5 | | $2s2p^3\,^1D^\circ_2$ | $2s2p^2(^2D)3d\,^3P_2$ | 73GOT/GAUa | |
| 123.134 | 0.010 | 812 120 | 400 | 3.02E+10 | $2s2p^3\,^3D^\circ_3$ | $2s2p^2(^2D)3s\,^3D_3$ | 46SOD | 99MEN/ZEI |

TABLE 11. Observed spectral lines of Na VI—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 123.744 | 0.010 | 808 120 | 400 | 7.94E+9 | $2s^22p^2\ ^3P_1$ | $2s^22p3s\ ^3P^{\circ}_2$ | 46SOD | 08KEL/POD |
| 123.868 | 0.010 | 807 310 | 300 | 1.05E+10 | $2s^22p^2\ ^3P_0$ | $2s^22p3s\ ^3P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 123.929 | 0.010 | 806 910 | 500 | 2.38E+10 | $2s^22p^2\ ^3P_2$ | $2s^22p3s\ ^3P^{\circ}_2$ | 46SOD | 08KEL/POD |
| 123.970 | 0.010 | 806 650 | 200 | 7.83E+9 | $2s^22p^2\ ^3P_1$ | $2s^22p3s\ ^3P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 124.059 | 0.010 | 806 070 | 400 | 5.63E+10 | $2s2p^3\ ^3P^{\circ}_2$ | $2s2p^2(^4P)3d\ ^3P_2$ | 46SOD | 99MEN/ZEI |
| 124.153 | 0.010 | 805 460 | 400 | 1.32E+10 | $2s^22p^2\ ^3P_2$ | $2s^22p3s\ ^3P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 124.850 | 0.010 | 800 960 | 10 | 3.00E+10 | $2s2p^3\ ^1P^{\circ}_1$ | $2s2p^2(^2D)3d\ ^1P_1$ | 46SOD | 89LUO/PRA |
| 125.383 | 0.010 | 797 560 | 10 | 7.26E+10 | $2s2p^3\ ^1P^{\circ}_1$ | $2s2p^2(^2D)3d\ ^1D_2$ | 46SOD | 99MEN/ZEI |
| 127.837 | 0.010 | 782 250 | 400 | 3.68E+10 | $2s^22p^2\ ^1D_2$ | $2s^22p3s\ ^1P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 129.040 | 0.010 | 774 950 | 200 | 1.21E+10 | $2s2p^3\ ^3P^{\circ}_2$ | $2s2p^2(^2D)3s\ ^3D_3$ | 46SOD | 99MEN/ZEI |
| 133.825 | 0.010 | 747 240 | 200 | 1.78E+10 | $2s2p^3\ ^3D^{\circ}_3$ | $2s2p^2(^4P)3s\ ^3P_2$ | 46SOD | 99MEN/ZEI |
| 134.021 | 0.010 | 746 150 | 100 | 1.65E+10 | $2s2p^3\ ^3D^{\circ}_2$ | $2s2p^2(^4P)3s\ ^3P_1$ | 46SOD | 99MEN/ZEI |
| 134.135 | 0.010 | 745 520 | 10 | 2.15E+10 | $2s2p^3\ ^3D^{\circ}_1$ | $2s2p^2(^4P)3s\ ^3P_0$ | 46SOD | 99MEN/ZEI |
| 134.532 | 0.010 | 743 320 | 300 | 1.12E+10 | $2s^22p^2\ ^1S_0$ | $2s^22p3s\ ^1P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 137.589 | 0.010 | 726 800 | 10 | 1.95E+10 | $2s2p^3\ ^3S^{\circ}_1$ | $2s2p^2(^4P)3d\ ^3P_2$ | 46SOD | 99MEN/ZEI |
| 138.693 | 0.010 | 721 020 | 200 | 2.25E+10 | $2s2p^3\ ^1D^{\circ}_2$ | $2s2p^2(^2D)3s\ ^1D_2$ | 46SOD | 99MEN/ZEI |
| 140.833 | 0.010 | 710 060 | 200 | 1.32E+10 | $2s2p^3\ ^3P^{\circ}_2$ | $2s2p^2(^4P)3s\ ^3P_2$ | 46SOD | 99MEN/ZEI |
| 141.040 | 0.010 | 709 020 | 10 | 6.76E+9 | $2s2p^3\ ^3P^{\circ}_2$ | $2s2p^2(^4P)3s\ ^3P_1$ | 46SOD | 08KEL/POD |
| 146.398 | 0.010 | 683 070 | 10 | 7.97E+9 | $2s2p^3\ ^1P^{\circ}_1$ | $2s2p^2(^2D)3s\ ^1D_2$ | 46SOD | 99MEN/ZEI |
| 149.442 | 0.010 | 669 160 | 10 | 2.98E+9 | $2s2p^3\ ^3D^{\circ}_3$ | $2s^22p3p\ ^3P_2$ | 46SOD | 08KEL/POD |
| 149.621 | 0.010 | 668 360 | 10 | 2.65E+9 | $2s2p^3\ ^3D^{\circ}_2$ | $2s^22p3p\ ^3P_1$ | 46SOD | 08KEL/POD |
| 158.225 | 0.010 | 632 010 | 5 | 2.15E+8 | $2s2p^3\ ^3P^{\circ}_2$ | $2s^22p3p\ ^3P_2$ | 73GOT/GAUa | 08KEL/POD |
| 158.517 | 0.010 | 630 850 | 5 | 5.31E+8 | $2s2p^3\ ^3S^{\circ}_1$ | $2s2p^2(^4P)3s\ ^3P_2$ | 73GOT/GAUa | 99MEN/ZEI |
| 166.367 | 0.010 | 601 080 | 40 | | $2s2p^3\ ^1P^{\circ}_1$ | $2s2p^2(^4P)3s\ ^3P_2$ | 73GOT/GAUa | |
| 177.637 | 0.010 | 562 950 | 30 | | $2p^4\ ^3P_2$ | $2s2p^2(^2D)3p\ ^3D^{\circ}_3$ | 73GOT/GAUa | |
| 178.061 | 0.010 | 561 600 | 20 | | $2p^4\ ^3P_1$ | $2s2p^2(^2D)3p\ ^3D^{\circ}_2$ | 73GOT/GAUa | |
| 178.244 | 0.010 | 561 030 | 15 | | $2p^4\ ^3P_0$ | $2s2p^2(^2D)3p\ ^3D^{\circ}_1$ | 73GOT/GAUa | |
| 189.473 | 0.010 | 527 780 | 10 | | $2p^4\ ^3P_2$ | $2s2p^2(^4P)3p\ ^3D^{\circ}_1$ | 73GOT/GAUa | |
| 191.205 | 0.010 | 523 000 | 10 | | $2s2p^3\ ^1P^{\circ}_1$ | $2s^22p3p\ ^3P_2$ | 34SOD | |
| 293.887 | 0.010 | 340 267 | 30 | | | | 73GOT/GAUa | |
| 308.500 | 0.010 | 324 149 | 25 | | $2s^22p3d\ ^3P^{\circ}_1$ | $2s2p^2(^4P)4d\ ^3D_2$ | 73GOT/GAUa | |
| 311.921 | 0.010 | 320 594 | 400 | 2.79E+9 | $2s^22p^2\ ^3P_0$ | $2s2p^3\ ^3S^{\circ}_1$ | 46SOD | 08KEL/POD |
| 312.608 | 0.010 | 319 889 | 300 | 8.37E+9 | $2s^22p^2\ ^3P_1$ | $2s2p^3\ ^3S^{\circ}_1$ | 46SOD | 08KEL/POD |
| 313.748 | 0.010 | 318 727 | 500 | 1.40E+10 | $2s^22p^2\ ^3P_2$ | $2s2p^3\ ^3S^{\circ}_1$ | 46SOD | 08KEL/POD |
| 317.641 | 0.010 | 314 821 | 600 | 1.57E+10 | $2s^22p^2\ ^1D_2$ | $2s2p^3\ ^1P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 361.250 | 0.010 | 276 817 | 800 | 1.15E+10 | $2s^22p^2\ ^1D_2$ | $2s2p^3\ ^1D^{\circ}_2$ | 46SOD | 08KEL/POD |
| 362.444 | 0.010 | 275 905 | 400 | 3.69E+9 | $2s^22p^2\ ^1S_0$ | $2s2p^3\ ^1P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 363.774 | 0.010 | 274 896 | 200 | 9.49E+9 | $2s2p^3\ ^3D^{\circ}_1$ | $2p^4\ ^3P_0$ | 46SOD | 08KEL/POD |
| 364.477 | 0.010 | 274 366 | 300 | 7.07E+9 | $2s2p^3\ ^3D^{\circ}_2$ | $2p^4\ ^3P_1$ | 46SOD | 08KEL/POD |
| 366.110 | 0.010 | 273 142 | 400 | 8.02E+9 | $2s2p^3\ ^3D^{\circ}_3$ | $2p^4\ ^3P_2$ | 46SOD | 08KEL/POD |
| 366.240 | 0.010 | 273 045 | 10 | 1.54E+9 | $2s2p^3\ ^3D^{\circ}_2$ | $2p^4\ ^3P_2$ | 46SOD | 08KEL/POD |
| 383.783 | 0.010 | 260 564 | 25 | 1.67E+9 | $2s^22p3p\ ^3P_2$ | $2s^22p4d\ ^3D^{\circ}_2$ | 73GOT/GAUa | 08KEL/POD |
| 414.370 | 0.010 | 241 330 | 200 | 1.25E+9 | $2s^22p^2\ ^3P_0$ | $2s2p^3\ ^3P^{\circ}_1$ | 46SOD | 08KEL/POD |
| 415.505 | 0.010 | 240 671 | 400 | 8.79E+8 | $2s^22p^2\ ^3P_1$ | $2s2p^3\ ^3P^{\circ}_2$ | 46SOD | 08KEL/POD |
| 417.595 | 0.010 | 239 466 | 600 | 2.89E+9 | $2s^22p^2\ ^3P_2$ | $2s2p^3\ ^3P^{\circ}_2$ | 46SOD | 08KEL/POD |
| 418.828 | 0.010 | 238 761 | 30 | | $2s^22p3s\ ^3P^{\circ}_1$ | $2s2p^2(^4P)3d\ ^5P^{\circ}_2$ | 73GOT/GAUa | |
| 421.465 | 0.010 | 237 268 | 100 | 1.05E+9 | $2s2p^3\ ^3P^{\circ}_2$ | $2p^4\ ^3P_1$ | 46SOD | 08KEL/POD |
| 423.821 | 0.010 | 235 949 | 200 | 1.57E+9 | $2s2p^3\ ^3P^{\circ}_2$ | $2p^4\ ^3P_2$ | 46SOD | 08KEL/POD |
| 436.96 | 0.05 | 228 854 | | 1.47E+10 | $2s2p^3\ ^1P^{\circ}_1$ | $2p^4\ ^1S_0$ | 71FAW | 08KEL/POD |
| 440.266 | 0.010 | 227 135 | 300 | | | | 46SOD | |
| 444.686 | 0.010 | 224 878 | 20 | | $2s2p^2(^4P)3d\ ^3F_4$ | $2s^22p6d\ ^1F^{\circ}_3$ | 73GOT/GAUa | |
| 465.460 | 0.010 | 214 841 | 5 | | $2s2p^2(^2D)3s\ ^3D_2$ | $2s^22p5d\ ^1F^{\circ}_3$ | 73GOT/GAUa | |
| 466.640 | 0.010 | 214 298 | 20 | | $2s^22p3d\ ^3D^{\circ}_2$ | $2s2p^2(^2D)3d\ ^3S_1$ | 73GOT/GAUa | |
| 489.580 | 0.010 | 204 257 | 500 | 8.27E+8 | $2s^22p^2\ ^3P_0$ | $2s2p^3\ ^3D^{\circ}_1$ | 46SOD | 08KEL/POD |
| 491.240 | 0.010 | 203 566 | 300 | 5.63E+8 | $2s^22p^2\ ^3P_1$ | $2s2p^3\ ^3D^{\circ}_1$ | 46SOD | 08KEL/POD |
| 491.340 | 0.010 | 203 525 | 600 | 1.10E+9 | $2s^22p^2\ ^3P_1$ | $2s2p^3\ ^3D^{\circ}_2$ | 46SOD | 08KEL/POD |
| 494.160 | 0.010 | 202 364 | 300 | 3.03E+8 | $2s^22p^2\ ^3P_2$ | $2s2p^3\ ^3D^{\circ}_2$ | 46SOD | 08KEL/POD |
| 494.382 | 0.010 | 202 273 | 700 | 1.38E+9 | $2s^22p^2\ ^3P_2$ | $2s2p^3\ ^3D^{\circ}_3$ | 46SOD | 08KEL/POD |
| 497.273 | 0.010 | 201 097 | 5 | 6.20E+8 | $2s^22p4d\ ^3D^{\circ}_1$ | $2s2p^2(^2D)4d\ ^3F_2$ | 73GOT/GAUa | 08KEL/POD |

TABLE 11. Observed spectral lines of Na VI—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 499.115 | 0.010 | 200 354 | 20 | | $2s^22p3p\ ^1D_2$ | $2s2p^2(^2D)3p\ ^1D^\circ_2$ | 73GOT/GAUb | |
| 504.541 | 0.010 | 198 200 | 30 | | $2s^22p4d\ ^3P^\circ_2$ | $2s2p^2(^2D)4d\ ^3F_3$ | 73GOT/GAUa | |
| 516.00 | 0.05 | 193 798 | | 5.60E+9 | $2s2p^3\ ^1D^\circ_2$ | $2p^4\ ^1D_2$ | 71FAW | 08KEL/POD |
| 528.730 | 0.010 | 189 132 | 10 | | | | 46SOD | |
| 632.90 | 0.05 | 158 003 | 10 | 1.32E+9 | $2s2p^3\ ^3S^\circ_1$ | $2p^4\ ^3P_1$ | 46SOD | 08KEL/POD |
| 638.21 | 0.05 | 156 688 | 10 | 1.27E+9 | $2s2p^3\ ^3S^\circ_1$ | $2p^4\ ^3P_2$ | 46SOD | 08KEL/POD |
| 641.87 | 0.05 | 155 795 | | 5.86E+8 | $2s2p^3\ ^1P^\circ_1$ | $2p^4\ ^1D_2$ | 71FAW | 08KEL/POD |
| 699.093 | 0.010 | 143 042 | 20 | 8.30E+7 | $2s^22p3s\ ^3P^\circ_1$ | $2s2p^2(^4P)3s\ ^3P_1$ | 73GOT/GAUa | 08KEL/POD |
| 733.743 | 0.010 | 136 288 | 15 | | $2s2p^2(^2D)3p\ ^1D^\circ_2$ | $2s2p^2(^4P)4s\ ^3P_2$ | 73GOT/GAUa | |
| 798.320 | 0.010 | 125 263 | 10 | | $2s^22p4d\ ^3F^\circ_2$ | $2s2p^2(^4P)4d\ ^3F_3$ | 73GOT/GAUa | |
| 810.183 | 0.010 | 123 429 | 25 | 2.99E+8 | $2s^22p3p\ ^3P_1$ | $2s2p^2(^4P)3p\ ^3D^\circ_2$ | 73GOT/GAUa | 08KEL/POD |
| 814.515 | 0.010 | 122 772 | 15 | | | | 73GOT/GAUa | |
| 818.096 | 0.010 | 122235 | 10 | | $2s^22p4d\ ^3P^\circ_2$ | $2s2p^2(^4P)4d\ ^3D_3$ | 73GOT/GAUa | |
| 827.909 | 0.010 | 120 786 | 5 | | | | 73GOT/GAUa | |
| 844.14 | 0.010 | 118 464 | 15 | | $2s^22p3p\ ^1D_2$ | $2s2p^2(^4P)3p\ ^3D^\circ_2$ | 73GOT/GAUb | |
| 851.740 | 0.010 | 117 407 | 5 | | $2s^22p3d\ ^3D^\circ_2$ | $2s2p^2(^4P)3d\ ^3P_2$ | 73GOT/GAUa | |
| 854.790 | 0.010 | 116 988 | 20 | | $2s^22p4d\ ^3P^{c}irc_2$ | $2s2p^2(^4P)4d\ ^3F_2$ | 73GOT/GAUa | |
| 864.625 | 0.010 | 115 657 | 10 | | | | 73GOT/GAUa | |
| 867.537 | 0.010 | 115 269 | 5 | | | | 73GOT/GAUa | |
| 888.784 | 0.010 | 112 513 | 5 | | $2s^22p4d\ ^1F^\circ_3$ | $2s2p^2(^4P)4d\ ^3F_2$ | 73GOT/GAUa | |
| 945.223 | 0.010 | 105 795 | 5 | | $2s2p^2(^2D)3d\ ^3F_3$ | $2s^22p5d\ ^1F^\circ_3$ | 73GOT/GAUa | |
| 946.064 | 0.010 | 105 701 | 20 | | | | 73GOT/GAUa | |
| 967.480 | 0.010 | 103 361 | 20 | | $2s^22p3d\ ^3D^\circ_2$ | $2s2p^2(^2D)3s\ ^1D_2$ | 73GOT/GAUa | |
| 974.034 | 0.010 | 102 666 | 10 | | | | 73GOT/GAUa | |
| 985.190 | 0.010 | 101 503 | 5 | | | | 73GOT/GAUa | |
| 988.71 | 0.01 | 101 142 | 2500 | | | | 97FEL/BEH | |
| 1 088.636 | 0.010 | 91 858 | 20 | | | | 73GOT/GAUa | |
| 1 116.780 | 0.010 | 89 543.2 | 15 | | | | 73GOT/GAUa | |
| 1 356.35 | 0.010 | 73 727.3 | 200 | 1.30E+1 | $2s^22p^2\ ^3P_1$ | $2s^22p^2\ ^1S_0$ | 97FEL/BEH | 08KEL/POD |
| 1 365.248 | 0.010 | 73 246.7 | 10 | 2.53E+2 | $2s^22p3p\ ^3P_2$ | $2s^22p3d\ ^1P^\circ_1$ | 73GOT/GAUa | 04FRO/TAC |
| 1 429.430 | 0.010 | 69 958.0 | 10 | | $2s2p^2(^2D)3p\ ^1D^\circ_2$ | $2s2p^2(^2D)3d\ ^1F_3$ | 73GOT/GAUa | |
| 1 449.628 | 0.010 | 68 983.2 | 40 | 1.39E+7 | $2s^22p3p\ ^1D_2$ | $2s^22p3d\ ^1P^\circ_1$ | 73GOT/GAUb | 04FRO/TAC |
| 1 756.961 | 0.010 | 56 916.5 | 10 | 6.01E+2 | $2s^22p3p\ ^1D_2$ | $2s^22p3d\ ^3P^\circ_1$ | 73GOT/GAUb | 04FRO/TAC |
| *Air* | | | | | | | | |
| 2 204.59 | 0.01 | 45 345.7 | 25 | 1.63E+8 | $2s2p^2(^4P)3s\ ^3P_2$ | $2s2p^2(^4P)3p\ ^3D^\circ_3$ | 73GOT/GAUa | 08KEL/POD |
| *Vacuum* | | | | | | | | |
| 86 106 | 9 | 1 161.36 | | 2.07E−2 | $2s^22p^2\ ^3P_1$ | $2s^22p^2\ ^3P_2$ | 97FEU/LUT | 08KEL/POD |
| 143 964 | 21 | 694.62 | | 5.98E−3 | $2s^22p^2\ ^3P_0$ | $2s^22p^2\ ^3P_1$ | 97FEU/LUT | 08KEL/POD |

TABLE 12. Energy levels of Na VI

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^22p^2$ | $^3P$ | 0 | 0.00 | | |
| | | 1 | 694.62 | 0.10 | 97FEU/LUT |
| | | 2 | 1 855.98 | 0.19 | 97FEU/LUT |
| $2s^22p^2$ | $^1D$ | 2 | 35 498 | 15 | 81MAR/ZAL |
| $2s^22p^2$ | $^1S$ | 0 | 74 414 | 15 | 81MAR/ZAL |
| $2s2p^3$ | $^5S^\circ$ | 2 | 103 010+*x* | 15 | 85EDL |
| $2s2p^3$ | $^3D^\circ$ | 3 | 204 132 | 15 | 81MAR/ZAL |
| | | 2 | 204 223 | 15 | 81MAR/ZAL |
| | | 1 | 204 261 | 15 | 81MAR/ZAL |
| $2s2p^3$ | $^3P^\circ$ | 2,1,0 | 241 341 | 15 | 81MAR/ZAL |

TABLE 12. Energy levels of Na VI—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s2p^3$ | $^1D^\circ$ | 2 | 312 315 | 15 | 81MAR/ZAL |
| $2s2p^3$ | $^3S^\circ$ | 1 | 320 589 | 15 | 81MAR/ZAL |
| $2s2p^3$ | $^1P^\circ$ | 1 | 350 319 | 15 | 81MAR/ZAL |
| $2p^4$ | $^3P$ | 2 | 477 277 | 15 | 81MAR/ZAL |
| | | 1 | 478 597 | 15 | 81MAR/ZAL |
| | | 0 | 479 157 | 15 | 81MAR/ZAL |
| $2p^4$ | $^1D$ | 2 | 506 114 | 15 | 81MAR/ZAL |
| $2p^4$ | $^1S$ | 0 | 579 173 | 15 | 81MAR/ZAL |
| $2s^22p3s$ | $^3P^\circ$ | 0 | | | |
| | | 1 | 807 320 | 100 | 81MAR/ZAL |
| | | 2 | 808 800 | 100 | 81MAR/ZAL |
| $2s^22p3s$ | $^1P^\circ$ | 1 | 817 740 | 100 | 81MAR/ZAL |
| $2s^22p3p$ | $^3P$ | 0 | | | |
| | | 1 | 872 580 | 100 | 81MAR/ZAL |
| | | 2 | 873 290 | 100 | 81MAR/ZAL |
| $2s^22p3p$ | $^1D$ | 2 | 877 550 | 100 | 73GOT/GAUb |
| $2s^22p3d$ | $^3F^\circ$ | 2 | 919 480 | 100 | 81MAR/ZAL |
| $2s^22p3d$ | $^1D^\circ$ | 2 | 920 850 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)3s$ | $^5P$ | 1 | 922 560+$x$ | 100 | 81MAR/ZAL,85EDL |
| | | 2 | 923 270+$x$ | 100 | 81MAR/ZAL,85EDL |
| | | 3 | 924 210+$x$ | 100 | 81MAR/ZAL,85EDL |
| $2s^22p3d$ | $^3D^\circ$ | 1 | 929 774 | 100 | 81MAR/ZAL |
| | | 2 | 930 000 | 100 | 81MAR/ZAL |
| | | 3 | 930 510 | 100 | 81MAR/ZAL |
| $2s^22p3d$ | $^3P^\circ$ | 2 | 933 920 | 100 | 81MAR/ZAL |
| | | 1 | 934 460 | 100 | 81MAR/ZAL |
| | | 0 | 934 740? | 100 | 81MAR/ZAL |
| $2s^22p3d$ | $^1F^\circ$ | 3 | 945 450 | 100 | 81MAR/ZAL |
| $2s^22p3d$ | $^1P^\circ$ | 1 | 946 530 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)3s$ | $^3P$ | 0 | 949 780 | 100 | 81MAR/ZAL |
| | | 1 | 950 370 | 100 | 81MAR/ZAL |
| | | 2 | 951 390 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)3p$ | $^3S^\circ$ | 1 | 970 840 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)3p$ | $^3D^\circ$ | 1 | | | |
| | | 2 | 996 010 | 100 | 81MAR/ZAL |
| | | 3 | 996 740 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)3p$ | $^3P^\circ$ | 0 | | | |
| | | 1 | 1 005 070? | 100 | 81MAR/ZAL |
| | | 2 | 1 005 710 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3s$ | $^3P$ | 1,2,3 | 1 016 270 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3s$ | $^1D$ | 2 | 1 033 360 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3p$ | $^3D^\circ$ | 1,2,3 | 1 040 220 | 100 | 81MAR/ZAL |

TABLE 12. Energy levels of Na VI—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s2p^2(^4P)3d$ | $^5D$ | 2,3 | 1 041 280+$x$? | 100 | 81MAR/ZAL,85EDL |
| $2s2p^2(^4P)3d$ | $^5P$ | 3 | 1 045 300+$x$ | 100 | 81MAR/ZAL,85EDL |
| | | 2 | 1 045 720+$x$ | 100 | 81MAR/ZAL,85EDL |
| | | 1 | 1 046 050+$x$ | 100 | 81MAR/ZAL,85EDL |
| $2s2p^2(^4P)3d$ | $^3P$ | 2 | 1 047 410 | 100 | 81MAR/ZAL |
| | | 1 | 1 048 100 | 100 | 81MAR/ZAL |
| | | 0 | | | |
| $2s2p^2(^4P)3d$ | $^3F$ | 2 | 1 053 880 | 100 | 81MAR/ZAL |
| | | 3 | 1 054 500 | 100 | 81MAR/ZAL |
| | | 4 | 1 055 260 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)3d$ | $^3P$ | 1 | 1 067 760 | 100 | 81MAR/ZAL |
| | | 2 | 1 067 970 | 100 | 81MAR/ZAL |
| | | 3 | 1 068 260 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3p$ | $^1F^\circ$ | 3 | 1 072 040 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3p$ | $^1D^\circ$ | 2 | 1 077 890 | 100 | 81MAR/ZAL |
| $2s^22p4s$ | $^3P^\circ$ | 2 | 1 090 760 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3d$ | $^3F$ | 2,3,4 | 1 125 320 | 100 | 81MAR/ZAL |
| $2s^22p4d$ | $^3F^\circ$ | 2 | 1 128 690 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3d$ | $^3P$ | 0,1,2 | 1 130 630 | 100 | 81MAR/ZAL |
| $2s^22p4d$ | $^1D^\circ$ | 2 | 1 131 170 | 100 | 81MAR/ZAL |
| $2s^22p4d$ | $^3D^\circ$ | 1 | 1 133 490 | 100 | 81MAR/ZAL |
| | | 2 | 1 133 870 | 100 | 81MAR/ZAL |
| | | 3 | 1 134 750 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3d$ | $^3P$ | 1,2,3 | 1 134 090 | 100 | 81MAR/ZAL |
| $2s^22p4d$ | $^3P^\circ$ | 2 | 1 136 380 | 100 | 81MAR/ZAL |
| $2s^22p4d$ | $^1F^\circ$ | 3 | 1 140 860 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3d$ | $^3S$ | 1 | 1 144 280 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3d$ | $^1D$ | 2 | 1 147 860 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)3d$ | $^1P$ | 1 | 1 151 280 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)4s$ | $^5P$ | 3 | 1 204 990+$x$ | 100 | 81MAR/ZAL,85EDL |
| $2s2p^2(^4P)4s$ | $^3P$ | 2 | 1 214 190? | 100 | 81MAR/ZAL |
| $2s^22p5d$ | $^3D^\circ$ | 3 | 1 228 210? | 100 | 81MAR/ZAL |
| $2s^22p5d$ | $^1F^\circ$ | 3 | 1 231 110 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)4d$ | $^5P$ | 3 | 1 249 660+$x$? | 100 | 81MAR/ZAL,85EDL |
| | | 2 | 1 250 580+$x$? | 100 | 81MAR/ZAL,85EDL |
| | | 1 | | | |
| $2s2p^2(^4P)4d$ | $^3F$ | 2 | 1 253 370 | 100 | 81MAR/ZAL |
| | | 3 | 1 253 950 | 100 | 81MAR/ZAL |
| | | 4 | 1 254 750 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)4d$ | $^3P$ | 1,2,3 | 1 258 610 | 100 | 81MAR/ZAL |
| $2p^3(^4S^\circ)3p$ | $^3P$ | 0,1,2 | 1 265 580 | 100 | 81MAR/ZAL |

TABLE 12. Energy levels of Na VI—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^22p6d$ | $^1F^\circ$ | 3 | 1 280 130 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)4d$ | $^3F$ | 2,3,4 | 1 334 580 | 100 | 81MAR/ZAL |
| $2s2p^2(^2D)4d$ | $^3P$ | 0,1,2 | 1 335 520 | 100 | 81MAR/ZAL |
| $2s2p^2(^4P)5d$ | $^5P$ | 3 | 1 343 010+$x$? | 100 | 81MAR/ZAL,85EDL |
| **Na VII ($^2P^\circ_{1/2}$)** | *Limit* | — | 1 388 750 | 400 | 81MAR/ZAL |

## 6.7. Na VII

**Be isoelectronic sequence**
**Ground state** $1s^22s^22p\ ^2P^\circ_{1/2}$
**Ionization energy** 1 681 750(250) $cm^{-1}$; 208.51(0.03) eV

The Na VII spectrum was first measured by Söderqvist [34SOD, 44SOD, 46SOD], who measured 158 lines in the range 60 Å–500 Å. Fawcett [70FAW] measured and classified the $2s2p^2\ ^2P$-$2p^3\ ^2D^\circ$ doublet near 780 Å, with results agreeing with the values calculated from Söderqvist's levels. The level values were re-evaluated by Martin and Zalubas [81MAR/ZAL], confirming most of the earlier analysis except for adjusting the values of the $2s^24d\ ^2D_{5/2}$ and $2p^2(^1D)3p\ ^2D^\circ$ levels. Edlén [81EDL , 83EDL] studied the available data for boronlike ions and produced a critical compilation of the $n=2$ energy levels using isoelectronic fitting. Recent measurements by Feuchtgruber *et al.* [97FEU/LUT] of light from planetary nebulae have yielded a value for the forbidden transition in the ground configuration; thus the ground state splitting has been established with improved accuracy. By observing the solar corona, Feldman *et al.* [97FEL/BEH] have established the connection between the doublet and quartet levels. This connection has been used here to adjust the values of higher quartet levels. In keeping with the compilation of Martin and Zalubas [81MAR/ZAL], levels based on single weak lines are included here but denoted as tentative with a question mark (see Tables 13 and 14).

The transition probabilities of Na VII transitions have been calculated for the Opacity Project by Fernley *et al.* [99FER/HIB] and compiled by Kelleher and Podobedova [08KEL/POD] along with multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer 02TAC/FROa, 02TAC/FROb]. Many-body perturbation theory calculations by Merkelis *et al.* [95MER/VIL], the SUPERSTRUCTURE calculations of Galvís *et al.* [98GAL/MEN], and relativistic multibody perturbation results of Safronova *et al.* [99SAF/JOHa] were also incorporated in the [08KEL/POD] compilation for transitions only involving low-lying energy levels. It should also be noted that Doerfert and Träbert [93DOE/TRA] have measured intensity ratios of the $1s^22s^22p\ ^2P^\circ_{1/2,3/2}$-$1s^22s2p^2\ ^2P^\circ_{1/2}$ transitions to within a few percent. In addition, Tordoir *et al.* [99TOR/BIE] measured lifetimes of several $n=2$ levels and also reported oscillator strengths for the $n=2-2$ transitions. Except for the intercombination lines, the transition probabilities agreed with [08KEL/POD] within ±15%, but for the intercombination lines, the consistency between the relativistic Hartree-Fock and the MCDF values was in the ±40% to 50% range. The ionization energy cited above was determined by Martin and Zalubas [81MAR/ZAL] using the $2s^2nd\ ^2D_{5/2}$ series.

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TABLE 13. Observed spectral lines of Na VII

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | |
| 62.725 | 0.010 | 1 594 300 | 10 | | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^28d\ ^2D_{5/2}$ | 44SOD | |
| 63.185 | 0.010 | 1 582 700 | 10 | 1.65E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)5p\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 63.227 | 0.010 | 1 581 600 | 10 | 1.97E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)5p\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 63.361 | 0.010 | 1 578 300 | 10 | 1.93E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)5p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 63.442 | 0.010 | 1 576 200 | 10 | 2.40E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)5p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 63.778 | 0.010 | 1 567 900 | 10 | | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^27d\ ^2D_{5/2}$ | 44SOD | |
| 64.113 | 0.010 | 1 559 700 | 10 | 1.25E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^1P^\circ)4p\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 64.904 | 0.010 | 1 540 700 | 10 | 3.36E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)6d\ ^4D^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 65.388 | 0.010 | 1 529 300 | 100* | | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^26d\ ^2D_{5/2}$ | 44SOD | |
| 65.388 | 0.010 | 1 529 300 | 100* | 2.28E+10 | $2s2p^2\ ^4P_{5/2}$ | $2p^2(^3P)4p\ ^4D^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 65.474 | 0.010 | 1 527 300 | 100 | 2.35E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^26d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 67.826 | 0.010 | 1 474 400 | 100* | 4.97E+9 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)5d\ ^4P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 67.826 | 0.010 | 1 474 400 | 100* | 2.89E+10 | $2s2p^2\ ^4P_{1/2}$ | $2s2p(^3P^\circ)5d\ ^4D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 67.877 | 0.010 | 1 473 300 | 100 | 2.61E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)5d\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 67.912 | 0.010 | 1 472 500 | 200 | 6.89E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)5d\ ^4D^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 68.422 | 0.010 | 1 461 500 | 10 | 3.32E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s^25d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 68.519 | 0.010 | 1 459 400 | 100 | 3.97E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^25d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 68.866 | 0.010 | 1 452 100 | 10 | 3.23E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)4p\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 68.908 | 0.010 | 1 451 200 | 100 | 3.87E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)4p\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 69.314 | 0.010 | 1 442 700 | 10 | 2.97E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)4p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 69.395 | 0.010 | 1 441 000 | 10 | 3.70E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)4p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 72.020 | 0.010 | 1 388 500 | 100 | 6.94E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)5d\ ^2F^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 72.079 | 0.010 | 1 387 370 | 100 | 6.47E+10 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^3P^\circ)5d\ ^2F^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 72.865 | 0.010 | 1 372 400 | 200* | 3.09E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^1P^\circ)4d\ ^2F^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 72.865 | 0.010 | 1 372 400 | 200* | 2.88E+10 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^1P^\circ)4d\ ^2F^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 74.097 | 0.010 | 1 349 580 | 100 | 2.27E+10 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)4d\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 74.180 | 0.010 | 1 348 070 | 200 | 5.30E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)4d\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 74.217 | 0.010 | 1 347 400 | 200 | 5.81E+10 | $2s2p^2\ ^4P_{1/2}$ | $2s2p(^3P^\circ)4d\ ^4D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 74.255 | 0.010 | 1 346 710 | 300 | 9.76E+10 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)4d\ ^4D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 74.268 | 0.010 | 1 346 480 | 300 | 1.40E+11 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)4d\ ^4D^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 74.861 | 0.010 | 1 335 810 | 300 | 7.26E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s^24d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 74.980 | 0.010 | 1 333 690 | 300 | 8.70E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^24d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 76.501 | 0.010 | 1 307 170 | 10 | 3.80E+9 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)4s\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 76.565 | 0.010 | 1 306 080 | 10 | 8.84E+9 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)4s\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 76.827 | 0.010 | 1 301 630 | 10 | 1.37E+11 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)4d\ ^4P_{3/2}$ | 44SOD | 08KEL/POD |
| 76.862 | 0.010 | 1 301 030 | 10 | 1.37E+11 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)4d\ ^4P_{5/2}$ | 44SOD | 08KEL/POD |
| 77.353 | 0.010 | 1 292 780 | 100 | 2.61E+9 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^24s\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 78.459 | 0.010 | 1 274 550 | 10 | | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^1P^\circ)4s\ ^2P^\circ$ | 44SOD | |
| 78.771 | 0.010 | 1 269 500 | 10 | 3.78E+9 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^3P^\circ)4d\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 78.907 | 0.010 | 1 267 320 | 300 | 1.10E+11 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)4d\ ^2F^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 78.982 | 0.010 | 1 266 110 | 200 | 1.02E+11 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^3P^\circ)4d\ ^2F^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 79.477 | 0.010 | 1 258 230 | 200* | 1.34E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^1P^\circ)3p\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 79.477 | 0.010 | 1 258 230 | 200* | 2.81E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)4d\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 79.571 | 0.010 | 1 256 740 | 100 | 2.68E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^1P^\circ)3p\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 79.761 | 0.010 | 1 253 750 | 10 | 6.89E+9 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^1P^\circ)4s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 79.786 | 0.010 | 1 253 350 | 10 | 2.23E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^1P^\circ)3p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 79.893 | 0.010 | 1 251 670 | 300* | 9.77E+9 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^1P^\circ)3p\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 79.893 | 0.010 | 1 251 670 | 300* | 2.77E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^1P^\circ)3p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |

TABLE 13. Observed spectral lines of Na VII—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 80.008 | 0.010 | 1 249 880 | 300 | 1.17E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^1P^\circ)3p\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 80.133 | 0.010 | 1 247 920 | 10 | 9.30E+9 | $2s2p^2\ ^4P_{1/2}$ | $2p^2(^3P)3p\ ^4S^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 80.174 | 0.010 | 1 247 290 | 10 | 1.86E+10 | $2s2p^2\ ^4P_{3/2}$ | $2p^2(^3P)3p\ ^4S^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 80.245 | 0.010 | 1 246 180 | 100 | 2.77E+10 | $2s2p^2\ ^4P_{5/2}$ | $2p^2(^3P)3p\ ^4S^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 81.430 | 0.010 | 1 228 050 | 100 | 3.33E+10 | $2s2p^2\ ^4P_{5/2}$ | $2p^2(^3P)3p\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 81.498 | 0.010 | 1 227 020 | 200 | 1.91E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)4s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 81.855 | 0.010 | 1 221 670 | 400 | 3.24E+10 | $2s2p^2\ ^4P_{5/2}$ | $2p^2(^3P)3p\ ^4D^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 82.636 | 0.010 | 1 210 130 | 10 | 4.05E+10 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^3P^\circ)4d\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 82.685 | 0.010 | 1 209 410 | 10 | 4.05E+10 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^3P^\circ)4d\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 84.221 | 0.010 | 1 187 350 | 400* | 4.01E+10 | $2s2p^2\ ^2D_{5/2}$ | $2p^2(^1D)3p\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 84.221 | 0.010 | 1 187 350 | 400* | 3.86E+10 | $2s2p^2\ ^2D_{3/2}$ | $2p^2(^1D)3p\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 84.832 | 0.010 | 1 178 800 | 10 | 2.49E+10 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^3P^\circ)4d\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 85.260 | 0.010 | 1 172 880 | 300 | 2.55E+10 | $2s2p^2\ ^2D_{5/2}$ | $2p^2(^1D)3p\ ^2F^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 85.297 | 0.010 | 1 172 370 | 300* | 2.38E+10 | $2s2p^2\ ^2D_{3/2}$ | $2p^2(^1D)3p\ ^2F^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 85.297 | 0.010 | 1 172 370 | 300* | 3.22E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)3p\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 85.458 | 0.010 | 1 170 160 | 400 | 6.39E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)3p\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 86.596 | 0.010 | 1 154 790 | 400 | 8.41E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)3p\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 86.652 | 0.010 | 1 154 040 | 500 | 1.01E+11 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)3p\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 86.758 | 0.010 | 1 152 630 | 300 | 1.67E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)3p\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 87.141 | 0.010 | 1 147 560 | 100 | 5.39E+9 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^3P^\circ)4s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 87.471 | 0.010 | 1 143 240 | 10* | 8.07E+9 | $2s2p^2\ ^2D_{5/2}$ | $2p^2(^3P)3p\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 87.471 | 0.010 | 1 143 240 | 10* | 7.79E+9 | $2s2p^2\ ^2D_{3/2}$ | $2p^2(^3P)3p\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 88.698 | 0.010 | 1 127 420 | 200 | 1.60E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)3p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 88.747 | 0.010 | 1 126 800 | 300 | 6.39E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p(^3P^\circ)3p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 88.865 | 0.010 | 1 125 300 | 400 | 7.95E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)3p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 88.914 | 0.010 | 1 124 680 | 200 | 3.17E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p(^3P^\circ)3p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 90.173 | 0.010 | 1 108 980 | 100 | 2.85E+10 | $2s2p^2\ ^2P_{1/2}$ | $2p^2(^1D)3p\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 90.252 | 0.010 | 1 108 010 | 400 | 3.42E+10 | $2s2p^2\ ^2P_{3/2}$ | $2p^2(^1D)3p\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 90.830 | 0.010 | 1 100 960 | 10* | 1.18E+9 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^1P^\circ)3d\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 90.830 | 0.010 | 1 100 960 | 10* | 1.31E+9 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^1P^\circ)3d\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 91.064 | 0.010 | 1 098 130 | 200* | 3.29E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^1P^\circ)3d\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 91.064 | 0.010 | 1 098 130 | 200* | 3.17E+10 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^1P^\circ)3d\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 92.003 | 0.010 | 1 086 920 | 500* | 1.77E+11 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^1P^\circ)3d\ ^2F^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 92.003 | 0.010 | 1 086 920 | 500* | 1.65E+11 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^1P^\circ)3d\ ^2F^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 92.774 | 0.010 | 1 077 890 | 200 | 9.07E+10 | $2s2p^2\ ^4P_{1/2}$ | $2s2p(^3P^\circ)3d\ ^4P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 92.809 | 0.010 | 1 077 480 | 100 | 1.81E+11 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)3d\ ^4P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 92.843 | 0.010 | 1 077 090 | 100 | 2.89E+10 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)3d\ ^4P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 92.883 | 0.010 | 1 076 620 | 100 | 6.49E+10 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)3d\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 92.930 | 0.010 | 1 076 080 | 200 | 9.74E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)3d\ ^4P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 92.976 | 0.010 | 1 075 550 | 400 | 1.51E+11 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)3d\ ^4P^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 93.393 | 0.010 | 1 070 740 | 400 | 1.69E+11 | $2s2p^2\ ^4P_{1/2}$ | $2s2p(^3P^\circ)3d\ ^4D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 93.434 | 0.010 | 1 070 270 | 400 | 2.84E+11 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)3d\ ^4D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 93.486 | 0.010 | 1 069 680 | 500 | 4.05E+11 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)3d\ ^4D^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 93.528 | 0.010 | 1 069 200 | 100 | 1.21E+11 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)3d\ ^4D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 94.020 | 0.010 | 1 063 540 | 10 | 4.38E+10 | $2s2p^2\ ^2P_{3/2}$ | $2p^2(^3P)3p\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 94.288 | 0.010 | 1 060 580 | 600 | 2.20E+11 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s^23d\ ^2D_{3/2}$ | 44SOD | 02TAC/FROa |
| 94.468 | 0.010 | 1 058 560 | 700 | 2.63E+11 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^23d\ ^2D_{5/2}$ | 44SOD | 02TAC/FROa |
| 96.845 | 0.010 | 1 032 580 | 100 | 3.63E+11 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)3d\ ^4P_{1/2}$ | 44SOD | 08KEL/POD |
| 96.872 | 0.010 | 1 032 290 | 200 | 3.63E+11 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)3d\ ^4P_{3/2}$ | 44SOD | 08KEL/POD |
| 96.922 | 0.010 | 1 031 760 | 300 | 3.62E+11 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)3d\ ^4P_{5/2}$ | 44SOD | 08KEL/POD |
| 97.790 | 0.010 | 1 022 600 | 100 | 3.83E+10 | $2s2p^2\ ^2P_{1/2}$ | $2s2p(^1P^\circ)3d\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 97.907 | 0.010 | 1 021 380 | 200 | 4.77E+10 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^1P^\circ)3d\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 98.016 | 0.010 | 1 020 240 | 100 | 3.39E+10 | $2p^3\ ^2D^\circ_{5/2}$ | $2p^2(^1D)3d\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 98.080 | 0.010 | 1 019 580 | 300 | 2.32E+11 | $2s2p^2\ ^2P_{1/2}$ | $2s2p(^1P^\circ)3d\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 98.188 | 0.010 | 1 018 450 | 300 | 2.78E+11 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^1P^\circ)3d\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 98.378 | 0.010 | 1 016 490 | 300 | 4.11E+11 | $2p^3\ ^2D^\circ_{5/2}$ | $2p^2(^1D)3d\ ^2F_{7/2}$ | 44SOD | 08KEL/POD |
| 98.394 | 0.010 | 1 016 320 | 300 | 3.84E+11 | $2p^3\ ^2D^\circ_{3/2}$ | $2p^2(^1D)3d\ ^2F_{5/2}$ | 44SOD | 08KEL/POD |

TABLE 13. Observed spectral lines of Na VII—Continued

| λ (Å) | Unc. (Å) | σ (cm⁻¹) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 99.421 | 0.010 | 1 005 820 | 400 | 2.58E+11 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)3d\ ^2F^\circ_{7/2}$ | 44SOD | 08KEL/POD |
| 99.556 | 0.010 | 1 004 460 | 400 | 2.40E+11 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^3P^\circ)3d\ ^2F^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 99.680 | 0.010 | 1 003 210 | 100* | 1.22E+11 | $2p^3\ ^2D^\circ_{5/2}$ | $2p^2(^1D)3d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 99.680 | 0.010 | 1 003 210 | 100* | 1.17E+11 | $2p^3\ ^2D^\circ_{3/2}$ | $2p^2(^1D)3d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 100.718 | 0.010 | 992 870 | 200* | 2.54E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^1P^\circ)3s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 100.718 | 0.010 | 992 870 | 200* | 2.83E+10 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^1P^\circ)3s\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 101.785 | 0.010 | 982 460 | 300 | 1.02E+11 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)3d\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 101.816 | 0.010 | 982 160 | 300 | 9.76E+10 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^3P^\circ)3d\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 102.226 | 0.010 | 978 220 | 100 | 1.06E+11 | $2p^3\ ^2D^\circ_{5/2}$ | $2p^2(^3P)3d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 102.390 | 0.010 | 976 660 | 100 | 4.48E+10 | $2p^3\ ^2D^\circ_{5/2}$ | $2p^2(^3P)3d\ ^2F_{7/2}$ | 44SOD | 08KEL/POD |
| 102.448 | 0.010 | 976100 | 10 | 4.17E+10 | $2p^3\ ^2D^\circ_{3/2}$ | $2p^2(^3P)3d\ ^2F_{5/2}$ | 44SOD | 08KEL/POD |
| 103.354 | 0.010 | 967 550 | 100 | 1.08E+11 | $2p^3\ ^2P^\circ_{3/2}$ | $2p^2(^1D)3d\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 103.400 | 0.010 | 967 120 | 10 | 8.67E+10 | $2p^3\ ^2P^\circ_{1/2}$ | $2p^2(^1D)3d\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 103.779 | 0.010 | 963 590 | 300 | 1.80E+10 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)3s\ ^4P^\circ_{5/2}$ | 44SOD | 02TAC/FROa |
| 103.842 | 0.010 | 963 000 | 200 | 2.48E+10 | $2s2p^2\ ^4P_{1/2}$ | $2s2p(^3P^\circ)3s\ ^4P^\circ_{3/2}$ | 44SOD | 02TAC/FROa |
| 103.891 | 0.010 | 962 550 | 400 | 4.19E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)3s\ ^4P^\circ_{5/2}$ | 44SOD | 02TAC/FROa |
| 104.000 | 0.010 | 961 540 | 200 | 4.92E+10 | $2s2p^2\ ^4P_{3/2}$ | $2s2p(^3P^\circ)3s\ ^4P^\circ_{1/2}$ | 44SOD | 02TAC/FROa |
| 104.036 | 0.010 | 961 210 | 220 | 2.67E+10 | $2s2p^2\ ^4P_{5/2}$ | $2s2p(^3P^\circ)3s\ ^4P^\circ_{3/2}$ | 44SOD | 02TAC/FROa |
| 104.871 | 0.010 | 953 550 | 200 | 1.42E+11 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^3P^\circ)3d\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 104.955 | 0.010 | 952 790 | 300 | 1.42E+11 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^3P^\circ)3d\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 105.111 | 0.010 | 951 380 | 300 | 1.64E+10 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s^23s\ ^2S_{1/2}$ | 44SOD | 02TAC/FROa |
| 105.205 | 0.010 | 950 520 | 200 | 1.18E+11 | $2p^3\ ^2P^\circ_{3/2}$ | $2p^2(^1D)3d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 105.354 | 0.010 | 949 180 | 400 | 3.29E+10 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s^23s\ ^2S_{1/2}$ | 44SOD | 02TAC/FROa |
| 107.061 | 0.010 | 934 050 | 300 | 1.43E+10 | $2s2p^2\ ^2P_{1/2}$ | $2s2p(^3P^\circ)3d\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 107.093 | 0.010 | 933 770 | 300 | 2.47E+10 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^1P^\circ)3s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 108.079 | 0.010 | 925 250 | 10 | 8.53E+10 | $2p^3\ ^2P^\circ_{3/2}$ | $2p^2(^3P)3d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 108.193 | 0.010 | 924 270 | 200 | 3.15E+10 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)3s\ ^4P_{5/2}$ | 44SOD | 08KEL/POD |
| 108.373 | 0.010 | 922 740 | 100 | 3.14E+10 | $2p^3\ ^4S^\circ_{3/2}$ | $2p^2(^3P)3s\ ^4P_{3/2}$ | 44SOD | 08KEL/POD |
| 108.733 | 0.010 | 919 680 | 200 | 3.84E+10 | $2p^3\ ^2D^\circ_{5/2}$ | $2p^2(^1D)3s\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 108.829 | 0.010 | 918 870 | 100 | 3.69E+10 | $2p^3\ ^2D^\circ_{3/2}$ | $2p^2(^1D)3s\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 109.362 | 0.010 | 914 390 | 100 | 2.72E+10 | $2s2p^2\ ^2P_{1/2}$ | $2s2p(^1P^\circ)3s\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 109.519 | 0.010 | 913 080 | 200 | 3.39E+10 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^1P^\circ)3s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 110.647 | 0.010 | 903 780 | 200 | 2.77E+10 | $2s2p^2\ ^2P_{1/2}$ | $2s2p(^3P^\circ)3d\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 110.778 | 0.010 | 902 710 | 300 | 3.32E+10 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^3P^\circ)3d\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 110.817 | 0.010 | 902 390 | 200 | 5.53E+9 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^3P^\circ)3d\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 111.211 | 0.010 | 899 190 | 300 | 2.87E+10 | $2s2p^2\ ^2D_{5/2}$ | $2s2p(^3P^\circ)3s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 111.390 | 0.010 | 897 750 | 200 | 3.17E+10 | $2s2p^2\ ^2D_{3/2}$ | $2s2p(^3P^\circ)3s\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 115.361 | 0.010 | 866 840 | 10 | 1.24E+10 | $2p^3\ ^2P^\circ_{3/2}$ | $2p^2(^1D)3s\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 115.475 | 0.010 | 865 990 | 10 | 1.03E+10 | $2p^3\ ^2P^\circ_{1/2}$ | $2p^2(^1D)3s\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 118.840 | 0.010 | 841 470 | 10 | 8.78E+9 | $2p^3\ ^2D^\circ_{5/2}$ | $2s2p(^1P^\circ)3p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 118.902 | 0.010 | 841 030 | 10 | 9.72E+9 | $2p^3\ ^2D^\circ_{3/2}$ | $2s2p(^1P^\circ)3p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 119.014 | 0.010 | 840 240 | 100 | 9.84E+9 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^3P^\circ)3s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 119.100 | 0.010 | 839 630 | 10 | | $2p^3\ ^2D^\circ_{5/2}$ | $2s2p(^1P^\circ)3p\ ^2D_{5/2}$ | 44SOD | |
| 119.204 | 0.010 | 838 900 | 10 | 9.81E+9 | $2s2p^2\ ^2S_{1/2}$ | $2s2p(^3P^\circ)3s\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 122.018 | 0.010 | 819 550 | 300 | 2.38E+9 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^3P^\circ)3s\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 122.252 | 0.010 | 817 980 | 100 | 9.46E+8 | $2s2p^2\ ^2P_{3/2}$ | $2s2p(^3P^\circ)3s\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 124.532 | 0.010 | 803 010 | 10 | 3.22E+9 | $2s2p^2\ ^2D_{5/2}$ | $2s^23p\ ^2P^\circ_{3/2}$ | 44SOD | 02TAC/FROa |
| 126.779 | 0.010 | 788 770 | 10 | 2.41E+9 | $2p^3\ ^2P^\circ_{3/2}$ | $2s2p(^1P^\circ)3p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 126.814 | 0.010 | 788 560 | 100 | 1.93E+9 | $2p^3\ ^2P^\circ_{1/2}$ | $2s2p(^1P^\circ)3p\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 139.867 | 0.010 | 714 960 | 200 | 2.17E+9 | $2p^3\ ^2D^\circ_{5/2}$ | $2s2p(^3P^\circ)3p\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 350.645 | 0.010 | 285 189 | 500 | 2.03E+9 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p^2\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 352.275 | 0.010 | 283 869 | 600 | 7.41E+9 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p^2\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 353.294 | 0.010 | 283 050 | 800 | 9.88E+9 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p^2\ ^2P_{3/2}$ | 44SOD | 08KEL/POD |
| 354.950 | 0.010 | 281 730 | 400 | 4.23E+9 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p^2\ ^2P_{1/2}$ | 44SOD | 08KEL/POD |
| 378.22 | 0.04 | 264 396 | | 2.52E+9 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p^2\ ^2S_{1/2}$ | 70FAW | 08KEL/POD |
| 381.300 | 0.010 | 262 261 | 300 | 3.70E+9 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p^2\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 385.061 | 0.010 | 259 699 | 10 | 4.39E+9 | $2s2p^2\ ^2D_{5/2}$ | $2p^3\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |

TABLE 13. Observed spectral lines of Na VII—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 385.254 | 0.010 | 259 569 | 10 | 5.06E+9 | $2s2p^2\ ^2D_{3/2}$ | $2p^3\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 396.335 | 0.010 | 252 312 | 200 | 1.84E+9 | $2s2p^2\ ^4P_{1/2}$ | $2p^3\ ^4S^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 397.490 | 0.010 | 251 579 | 300 | 3.64E+9 | $2s2p^2\ ^4P_{3/2}$ | $2p^3\ ^4S^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 399.182 | 0.010 | 250 512 | 400 | 5.39E+9 | $2s2p^2\ ^4P_{5/2}$ | $2p^3\ ^4S^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 483.216 | 0.010 | 206 947 | 200 | 2.54E+9 | $2s2p^2\ ^2D_{3/2}$ | $2p^3\ ^2D^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 483.328 | 0.010 | 206 899 | 300 | 2.71E+9 | $2s2p^2\ ^2D_{5/2}$ | $2p^3\ ^2D^\circ_{5/2}$ | 44SOD | 08KEL/POD |
| 486.740 | 0.010 | 205 448 | 400 | 1.17E+9 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p^2\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 491.950 | 0.010 | 203 273 | 400 | 1.33E+9 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p^2\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 777.83 | 0.05 | 128 526 | | 5.48E+8 | $2s2p^2\ ^2P_{1/2}$ | $2p^3\ ^2D^\circ_{3/2}$ | 70FAW | 08KEL/POD |
| 786.35 | 0.05 | 127 121 | | 6.17E+8 | $2s2p^2\ ^2P_{3/2}$ | $2p^3\ ^2D^\circ_{5/2}$ | 70FAW | 08KEL/POD |
| 869.60 | 0.03 | 114 995 | 500 | 3.68E+4 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s2p^2\ ^4P_{1/2}$ | 97FEL/BEH | 08KEL/POD |
| 872.12 | 0.03 | 114 663 | 2000 | 2.84E+4 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p^2\ ^4P_{5/2}$ | 97FEL/BEH | 08KEL/POD |
| 880.33 | 0.03 | 113 594 | 1500 | 7.77E+3 | $2s^22p\ ^2P^\circ_{3/2}$ | $2s2p^2\ ^4P_{3/2}$ | 97FEL/BEH | 08KEL/POD |
| 46 847 | 3. | 2 134.61 | | 8.77E−2 | $2s^22p\ ^2P^\circ_{1/2}$ | $2s^22p\ ^2P^\circ_{3/2}$ | 97FEU/LUT | 02TAC/FROa |

TABLE 14. Energy levels of Na VII

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^22p$ | $^2P^\circ$ | 1/2 | 0.00 | | |
| | | 3/2 | 2 134.61 | 0.14 | 97FEU/LUT |
| $2s2p^2$ | $^4P$ | 1/2 | 114 995 | 4 | 97FEL/BEH |
| | | 3/2 | 115 728 | 4 | 97FEL/BEH |
| | | 5/2 | 116 798 | 4 | 97FEL/BEH |
| $2s2p^2$ | $^2D$ | 5/2 | 205 412 | 10 | 81MAR/ZAL |
| | | 3/2 | 205 448 | 10 | 81MAR/ZAL |
| $2s2p^2$ | $^2S$ | 1/2 | 264 400 | 10 | 81MAR/ZAL |
| $2s2p^2$ | $^2P$ | 1/2 | 283 869 | 10 | 81MAR/ZAL |
| | | 3/2 | 285 189 | 10 | 81MAR/ZAL |
| $2p^3$ | $^4S^\circ$ | 3/2 | 367 308 | 10 | 81MAR/ZAL,97FEL/BEH |
| $2p^3$ | $^2D^\circ$ | 5/2 | 412 311 | 10 | 81MAR/ZAL |
| | | 3/2 | 412 395 | 10 | 81MAR/ZAL |
| $2p^3$ | $^2P^\circ$ | 1/2 | 465 017 | 10 | 81MAR/ZAL |
| | | 3/2 | 465 111 | 10 | 81MAR/ZAL |
| $2s^23s$ | $^2S$ | 1/2 | 951 350 | 100 | 81MAR/ZAL |
| $2s^23p$ | $^2P^\circ$ | 3/2 | 1 008 420 | 100 | 81MAR/ZAL |
| $2s^23d$ | $^2D$ | 3/2 | 1 060 580 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 060 700 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3s$ | $^4P^\circ$ | 1/2 | 1 077 270 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 3/2 | 1 078 000 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 5/2 | 1 079 330 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)3s$ | $^2P^\circ$ | 1/2 | 1 103 220 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 104 620 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3p$ | $^2P$ | 1/2 | 1 126 810 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 127 430 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3p$ | $^2D$ | 3/2 | 1 154 780 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 156 180 | 100 | 81MAR/ZAL |

TABLE 14. Energy levels of Na VII—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s2p(^3P^\circ)3p$ | $^2S$ | 1/2 | 1 172 340 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3d$ | $^4D^\circ$ | 3/2 | 1 185 740 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 5/2 | 1 186 000 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 7/2 | 1 186 480 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)3d$ | $^2D^\circ$ | 3/2 | 1 186 630 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 187 890 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3d$ | $^4P^\circ$ | 5/2 | 1 192 350 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 3/2 | 1 192 870 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 1/2 | 1 193 210 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^1P^\circ)3s$ | $^2P^\circ$ | 1/2 | 1 198 290 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 198 290 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3d$ | $^2F^\circ$ | 5/2 | 1 209 910 | 100 | 81MAR/ZAL |
| | | 7/2 | 1 211 240 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)3d$ | $^2P^\circ$ | 3/2 | 1 217 190 | 100 | 81MAR/ZAL |
| | | 1/2 | 1 217 950 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)3p$ | $^2D$ | 3/2 | 1 251 670 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 252 010 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)3p$ | $^2P$ | 1/2 | 1 253 350 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 253 780 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)3p$ | $^2S$ | 1/2 | 1 258 880 | 100 | 81MAR/ZAL |
| $2p^2(^3P)3s$ | $^4P$ | 3/2 | 1 290 050 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 5/2 | 1 291 580 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^1P^\circ)3d$ | $^2F^\circ$ | 5/2 | 1 292 330 | 100 | 81MAR/ZAL |
| | | 7/2 | 1 292 330 | 100 | 81MAR/ZAL |
| $2s^24s$ | $^2S$ | 1/2 | 1 294 910 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)3d$ | $^2D^\circ$ | 3/2 | 1 303 450? | 100 | 81MAR/ZAL |
| | | 5/2 | 1 303 610 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)3d$ | $^2P^\circ$ | 1/2 | 1 306 470 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 306 470 | 100 | 81MAR/ZAL |
| $2p^2(^1D)3s$ | $^2D$ | 3/2 | 1 331 140 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 331 970 | 100 | 81MAR/ZAL |
| $2s^24d$ | $^2D$ | 3/2 | 1 335 810 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 335 830 | 100 | 81MAR/ZAL |
| $2p^2(^3P)3p$ | $^4D^\circ$ | 7/2 | 1 338 470 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2p^2(^3P)3p$ | $^4P^\circ$ | 5/2 | 1 344 850 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2p^2(^3P)3p$ | $^2D^\circ$ | 3/2 | 1 348 720 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 348 720 | 100 | 81MAR/ZAL |
| $2p^2(^3P)3p$ | $^4S^\circ$ | 3/2 | 1 362 970 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2p^2(^1D)3p$ | $^2F^\circ$ | 5/2 | 1 377 820 | 100 | 81MAR/ZAL |
| | | 7/2 | 1 378 300 | 100 | 81MAR/ZAL |
| $2p^2(^3P)3d$ | $^2F$ | 5/2 | 1 388 500? | 100 | 81MAR/ZAL |
| | | 7/2 | 1 388 970? | 100 | 81MAR/ZAL |

TABLE 14. Energy levels of Na VII—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2p^2(^3P)3d$ | $^2D$ | 3/2 | 1 390 450? | 100 | 81MAR/ZAL |
| | | 5/2 | 1 390 450? | 100 | 81MAR/ZAL |
| $2p^2(^1D)3p$ | $^2D^\circ$ | 3/2 | 1 392 800 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 392 800 | 100 | 81MAR/ZAL |
| $2p^2(^3P)3d$ | $^4P$ | 5/2 | 1 399 070 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 3/2 | 1 399 600 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 1/2 | 1 399 890 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2p^2(^1D)3d$ | $^2D$ | 3/2 | 1 415 630 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 415 630 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4s$ | $^4P^\circ$ | 5/2 | 1 422 890 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2p^2(^1D)3d$ | $^2F$ | 5/2 | 1 428 720 | 100 | 81MAR/ZAL |
| | | 7/2 | 1 428 800 | 100 | 81MAR/ZAL |
| $2p^2(^1D)3d$ | $^2P$ | 1/2 | 1 432 140 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 432 610 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4s$ | $^2P^\circ$ | 3/2 | 1 432 600? | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4p$ | $^2P$ | 1/2 | 1 442 710 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 443 170 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4p$ | $^2D$ | 3/2 | 1 452 100 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 453 350 | 100 | 81MAR/ZAL |
| $2s^25d$ | $^2D$ | 3/2 | 1 461 520 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 461 590 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4d$ | $^4D^\circ$ | 3/2 | 1 462 400 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 5/2 | 1 462 440 | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 7/2 | 1 463 270 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)4d$ | $^2D^\circ$ | 5/2 | 1 464 050 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4d$ | $^4P^\circ$ | 5/2 | 1 464 870 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)4d$ | $^2F^\circ$ | 5/2 | 1 471 560 | 100 | 81MAR/ZAL |
| | | 7/2 | 1 472 730 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)4d$ | $^2P^\circ$ | 3/2 | 1 473 810? | 100 | 81MAR/ZAL |
| | | 1/2 | 1 474 530? | 100 | 81MAR/ZAL |
| $2s^26d$ | $^2D$ | 3/2,5/2 | 1 529 460 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)4s$ | $^2P^\circ$ | 1/2,3/2 | 1 538 950? | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)4p$ | $^2D$ | 3/2,5/2 | 1 561 890? | 100 | 81MAR/ZAL |
| $2s^27d$ | $^2D$ | 3/2,5/2 | 1 570 080 | 100 | 81MAR/ZAL |
| $2s2p(^1P^\circ)4d$ | $^2F^\circ$ | 5/2,7/2 | 1 577 810? | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)5p$ | $^2P$ | 1/2,3/2 | 1 578 350 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)5p$ | $^2D$ | 3/2,5/2 | 1 583 740 | 100 | 81MAR/ZAL |
| $2s2p(^3P^\circ)5d$ | $^4D^\circ$ | 1/2–7/2 | 1 589 290 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)5d$ | $^4P^\circ$ | 1/2–5/2 | 1 590 070 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)5d$ | $^2F^\circ$ | 5/2 | 1 592 820 | 100 | 81MAR/ZAL |
| | | 7/2 | 1 593 920 | 100 | 81MAR/ZAL |

TABLE 14. Energy levels of Na VII—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $2s^2 8d$ | $^2D$ | 3/2,5/2 | 1 596 400 | 100 | 81MAR/ZAL |
| $2p^2(^3P)4p$ | $^4D^\circ$ | 3/2–7/2 | 1 646 130 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2s2p(^3P^\circ)6d$ | $^4D^\circ$ | 1/2–7/2 | 1 657 540 | 100 | 81MAR/ZAL,97FEL/BEH |
| $2p^2(^3P)4d$ | $^4P$ | 5/2 | 1 668 340? | 100 | 81MAR/ZAL,97FEL/BEH |
| | | 3/2 | 1 668 940? | 100 | 81MAR/ZAL,97FEL/BEH |
| **Na VIII ($^1S_0$)** | *Limit* | — | 1 681 700 | 250 | 81MAR/ZAL |

### 6.8. Na VIII

**Be isoelectronic sequence**
**Ground state** $1s^2 2s^2\ ^1S_0$
**Ionization energy** 2 131 300(250) $cm^{-1}$; 264.25(3) eV

The Na VIII spectrum was first measured by Söderqvist [34SOD, 44SOD], who used a vacuum spark source to measure 82 lines in the 50–170 Å range, the $1s^2 2s2p\ ^1P^\circ_1$ resonance line, and two of the $1s^2 2s2p$-$1s^2 2p^2$ transitions between 400 Å and 500 Å. Fawcett [70FAW] observed five additional $1s^2 2s2p$-$1s^2 2p^2$ transitions near 500 Å. The wavelength of the $1s^2 2s^2\ ^1S_0$-$1s^2 2s2p\ ^3P^\circ_1$ transition was obtained by interpolation along the beryllium isoelectronic series by Edlén [79EDL] and is used to determine the relative positions of the singlet and triplet sets of levels. Edlén [79EDL] also used interpolation to obtain a wavelength for the $1s^2 2s2p\ ^1P^\circ_1$-$1s^2 2p^2\ ^1D_2$ transition. The level values were re-evaluated by Martin and Zalubas [81MAR/ZAL], confirming most of the prior work. Since then the connection between the singlet and triplet sets of levels has been experimentally determined by observation of the $1s^2 2s^2\ ^1S_0$-$1s^2 2s2p\ ^3P^\circ_1$ transition in the solar spectrum by Feldman *et al.* [97FEL/BEH] and Curdt *et al.* [04CUR/LAN]. The [81MAR/ZAL] triplet levels given below have been adjusted in accordance with the newly available data. Levels based on single weak lines are included here but denoted as tentative with a question mark (see Tables 15 and 16).

The transition probabilities of allowed transitions of Na VIII have recently been compiled by Kelleher and Podobedova [08KEL/POD] based primarily on the relativistic multibody perturbation theory calculations of Safronova *et al.* [99SAF/JOHb, 99SAF/DER] along with multiconfiguration Hartree-Fock calculations of Tachiev and Froese Fischer 02TAC/FROa, 02TAC/FROb]. Nonrelativistic close-coupling approximation values by Tully *et al.* [90TUL/SEA] were also included in the [08KEL/POD] compilation for transitions where other values were not available. The lifetime of the Na VIII $2s2p\ ^1P^\circ_1$ level has been measured to be 0.21(1) ns in a beam-foil experiment by Tordoir *et al.* [99TOR/BIE], corresponding to a transition probability for the 411 Å transition of $4.8(2)\times10^9\ s^{-1}$, which is somewhat higher than the theoretical value listed below. The ionization energy cited above was determined by Martin and Zalubas [81MAR/ZAL] using the $2snd\ ^1D_2$ series.

#### References for Na VIII


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TABLE 15. Observed spectral lines of Na VIII

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | Int. | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | |
| 51.316 | 0.010 | 1 948 700 | 10 | | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p6p\ ^3D_3$ | 44SOD | |
| 51.789 | 0.010 | 1 930 900 | 10 | | $1s^22s^2\ ^1S_0$ | $1s^22s6p\ ^1P^\circ_1$ | 44SOD | |
| 53.750 | 0.010 | 1 860 500 | 10 | 1.78E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p5p\ ^3P_2$ | 44SOD | 08KEL/POD |
| 54.380 | 0.010 | 1 838 900 | 100 | 4.44E+10 | $1s^22s^2\ ^1S_0$ | $1s^22s5p\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 55.345 | 0.010 | 1 806 800 | 10 | 2.50E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22s6d\ ^3D_2$? | 44SOD | 08KEL/POD |
| 55.396 | 0.010 | 1 805 200 | 100 | 3.32E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22s6d\ ^3D_3$? | 44SOD | 08KEL/POD |
| 57.096 | 0.010 | 1 751 400 | 10 | | $1s^22p^2\ ^3P_2$ | $1s^22p6d\ ^3P^\circ_2$ | 44SOD | |
| 57.119 | 0.010 | 1 750 700 | 10 | 4.50E+10 | $1s^22p^2\ ^3P_2$ | $1s^22p6d\ ^3D^\circ_3$ | 44SOD | 08KEL/POD |
| 57.230 | 0.010 | 1 747 300 | 10 | 4.04E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p5p\ ^1D_2$ | 44SOD | 08KEL/POD |
| 58.070 | 0.010 | 1 722 100 | 10 | 4.04E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22s5d\ ^3D_2$? | 44SOD | 08KEL/POD |
| 59.009 | 0.010 | 1 694 700 | 100 | 3.35E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p4p\ ^3P_2$ | 44SOD | 08KEL/POD |
| 59.101 | 0.010 | 1 692 000 | 10 | 2.53E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22s6d\ ^1D_2$ | 44SOD | 08KEL/POD |
| 59.204 | 0.010 | 1 689 100 | 300 | 3.79E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p4p\ ^3D_3$ | 44SOD | 08KEL/POD |
| 59.249 | 0.010 | 1 687 800 | 10 | 9.44E+9 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p4p\ ^3D_2$ | 44SOD | 08KEL/POD |
| 59.759 | 0.010 | 1 673 400 | 200 | 8.47E+10 | $1s^22s^2\ ^1S_0$ | $1s^22s4p\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 59.992 | 0.010 | 1 666 900 | 10 | 1.03E+10 | $1s^22p^2\ ^3P_1$ | $1s^22p5d\ ^3P^\circ_1$ | 44SOD | 08KEL/POD |
| 60.053 | 0.010 | 1 665 200 | 100 | 3.09E+10 | $1s^22p^2\ ^3P_2$ | $1s^22p5d\ ^3P^\circ_2$ | 44SOD | 08KEL/POD |
| 60.073 | 0.010 | 1 664 600 | 100 | 8.15E+10 | $1s^22p^2\ ^3P_2$ | $1s^22p5d\ ^3D^\circ_3$ | 44SOD | 08KEL/POD |
| 61.088 | 0.010 | 1 637 000 | 200 | 1.01E+11 | $1s^22p^2\ ^1D_2$ | $1s^22p5d\ ^1F^\circ_3$ | 44SOD | 08KEL/POD |
| 61.347 | 0.010 | 1 630 100 | 1 | 2.66E+10 | $1s^22p^2\ ^1D_2$ | $1s^22p5d\ ^1D^\circ_2$ | 44SOD | 08KEL/POD |
| 62.276 | 0.010 | 1 605 800 | 100 | 5.28E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22s5d\ ^1D_2$ | 44SOD | 08KEL/POD |
| 63.114 | 0.010 | 1 584 400 | 100 | 5.04E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p4p\ ^1D_2$ | 44SOD | 08KEL/POD |
| 63.695 | 0.010 | 1 570 000 | 10 | 4.59E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p4p\ ^1P_1$ | 44SOD | 08KEL/POD |
| 64.205 | 0.010 | 1 557 500 | 200 | 7.17E+10 | $1s^22s2p\ ^3P^\circ_0$ | $1s^22s4d\ ^3D_1$ | 44SOD | 08KEL/POD |
| 64.236 | 0.010 | 1 556 800 | 400 | 9.64E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22s4d\ ^3D_2$ | 44SOD | 08KEL/POD |
| 64.302 | 0.010 | 1 555 200 | 500 | 1.28E+11 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22s4d\ ^3D_3$ | 44SOD | 08KEL/POD |
| 65.672 | 0.010 | 1 522 700 | 10 | | $1s^22s2p\ ^3P^\circ_1$ | $1s^22s4s\ ^3S_1$ | 44SOD | |
| 65.730 | 0.010 | 1 521 400 | 10 | | $1s^22s2p\ ^3P^\circ_2$ | $1s^22s4s\ ^3S_1$ | 44SOD | |
| 66.059 | 0.010 | 1 513 800 | 200 | 1.66E+10 | $1s^22s^2\ ^1S_0$ | $1s^22p3d\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 66.358 | 0.010 | 1 507 000 | 10 | 1.82E+10 | $1s^22p^2\ ^3P_1$ | $1s^22p4d\ ^3P^\circ_1$ | 44SOD | 08KEL/POD |
| 66.433 | 0.010 | 1 505 300 | 200 | 5.43E+10 | $1s^22p^2\ ^3P_2$ | $1s^22p4d\ ^3P^\circ_2$ | 44SOD | 08KEL/POD |
| 66.498 | 0.010 | 1 503 800 | 400 | 1.72E+11 | $1s^22p^2\ ^3P_2$ | $1s^22p4d\ ^3D^\circ_3$ | 44SOD | 08KEL/POD |
| 67.478 | 0.010 | 1 482 000 | 200 | | $1s^22p^2\ ^1D_2$ | $1s^22p4d\ ^1P^\circ_1$ | 44SOD | |
| 67.672 | 0.010 | 1 477 700 | 400 | 1.76E+11 | $1s^22p^2\ ^1D_2$ | $1s^22p4d\ ^1F^\circ_3$ | 44SOD | 08KEL/POD |
| 68.193 | 0.010 | 1 466 400 | 100 | 5.72E+10 | $1s^22p^2\ ^1D_2$ | $1s^22p4d\ ^1D^\circ_2$ | 44SOD | 08KEL/POD |
| 69.120 | 0.010 | 1 446 800 | 300 | 9.72E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22s4d\ ^1D_2$ | 44SOD | 08KEL/POD |
| 70.741 | 0.010 | 1 413 610 | 10 | | $1s^22s2p\ ^1P^\circ_1$ | $1s^22s4s\ ^1S_0$ | 44SOD | |
| 74.956 | 0.010 | 1 334 120 | 300 | 2.62E+10 | $1s^22s2p\ ^3P^\circ_0$ | $1s^22p3p\ ^3P_1$ | 44SOD | 08KEL/POD |
| 74.980 | 0.010 | 1 333 690 | 300 | 1.90E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22p3p\ ^3P_1$ | 44SOD | 08KEL/POD |
| 75.043 | 0.010 | 1 332 570 | 400 | 7.07E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p3p\ ^3P_2$ | 44SOD | 08KEL/POD |
| 75.096 | 0.010 | 1 331 630 | 300 | 4.72E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p3p\ ^3P_1$ | 44SOD | 08KEL/POD |
| 75.385 | 0.010 | 1 326 520 | 100 | 1.29E+10 | $1s^22s2p\ ^3P^\circ_0$ | $1s^22p3p\ ^3S_1$ | 44SOD | 08KEL/POD |
| 75.428 | 0.010 | 1 325 770 | 200 | 3.42E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22p3p\ ^3S_1$ | 44SOD | 08KEL/POD |
| 75.518 | 0.010 | 1 324 190 | 300 | 4.07E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p3p\ ^3S_1$ | 44SOD | 08KEL/POD |
| 76.123 | 0.010 | 1 313 660 | 500 | 4.94E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p3p\ ^3D_3$ | 44SOD | 08KEL/POD |
| 76.173 | 0.010 | 1 312 800 | 100 | 1.88E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22p3p\ ^3D_1$ | 44SOD | 08KEL/POD |
| 76.217 | 0.010 | 1 312 040 | 200 | 1.09E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p3p\ ^3D_2$ | 44SOD | 08KEL/POD |
| 77.266 | 0.010 | 1 294 230 | 600 | 1.87E+11 | $1s^22s^2\ ^1S_0$ | $1s^22s3p\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 80.756 | 0.010 | 1 238 300 | 10 | 6.26E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p3p\ ^1S_0$ | 44SOD | 08KEL/POD |
| 81.210 | 0.010 | 1 231 380 | 500 | 1.51E+11 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p3p\ ^1D_2$ | 44SOD | 08KEL/POD |
| 83.240 | 0.010 | 1 201 350 | 700 | 2.23E+11 | $1s^22s2p\ ^3P^\circ_0$ | $1s^22s3d\ ^3D_1$ | 44SOD | 08KEL/POD |
| 83.288 | 0.010 | 1 200 650 | 800 | 3.00E+11 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22s3d\ ^3D_2$ | 44SOD | 08KEL/POD |
| 83.391 | 0.010 | 1 199 170 | 900 | 3.99E+11 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22s3d\ ^3D_3$ | 44SOD | 08KEL/POD |
| 84.050 | 0.010 | 1 189 770 | 500 | 1.11E+11 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p3p\ ^1P_1$ | 44SOD | 08KEL/POD |
| 85.826 | 0.010 | 1 165 150 | 200 | 5.87E+10 | $1s^22p^2\ ^3P_0$ | $1s^22p3d\ ^3P^\circ_1$ | 44SOD | 08KEL/POD |
| 85.861 | 0.010 | 1 164 670 | 300 | 2.58E+11 | $1s^22p^2\ ^3P_1$ | $1s^22p3d\ ^3P^\circ_0$ | 44SOD | 08KEL/POD |

TABLE 15. Observed spectral lines of Na VIII—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| 85.887 | 0.010 | 1 164 320 | 300 | 8.74E+10 | $1s^22p^2\ ^3P_1$ | $1s^22p3d\ ^3P^\circ_1$ | 44SOD | 08KEL/POD |
| 85.936 | 0.010 | 1 163 660 | 100 | 2.74E+10 | $1s^22p^2\ ^3P_1$ | $1s^22p3d\ ^3P^\circ_2$ | 44SOD | 08KEL/POD |
| 85.992 | 0.010 | 1 162 900 | 300 | 1.14E+11 | $1s^22p^2\ ^3P_2$ | $1s^22p3d\ ^3P^\circ_1$ | 44SOD | 08KEL/POD |
| 86.039 | 0.010 | 1 162 260 | 500 | 2.33E+11 | $1s^22p^2\ ^3P_2$ | $1s^22p3d\ ^3P^\circ_2$ | 44SOD | 08KEL/POD |
| 86.381 | 0.010 | 1 157 660 | 400 | 2.98E+11 | $1s^22p^2\ ^3P_0$ | $1s^22p3d\ ^3D^\circ_1$ | 44SOD | 08KEL/POD |
| 86.417 | 0.010 | 1 157 180 | 500 | 4.02E+11 | $1s^22p^2\ ^3P_1$ | $1s^22p3d\ ^3D^\circ_2$ | 44SOD | 08KEL/POD |
| 86.479 | 0.010 | 1 156 350 | 600 | 4.88E+11 | $1s^22p^2\ ^3P_2$ | $1s^22p3d\ ^3D^\circ_3$ | 44SOD | 08KEL/POD |
| 86.530 | 0.010 | 1 155 670 | 100 | 8.12E+10 | $1s^22p^2\ ^3P_2$ | $1s^22p3d\ ^3D^\circ_2$ | 44SOD | 08KEL/POD |
| 86.758 | 0.010 | 1 152 630 | 300 | 1.80E+10 | $1s^22p^2\ ^1D_2$ | $1s^22p3d\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 87.211 | 0.010 | 1 146 640 | 700 | 5.65E+11 | $1s^22p^2\ ^1D_2$ | $1s^22p3d\ ^1F^\circ_3$ | 44SOD | 08KEL/POD |
| 89.759 | 0.010 | 1 114 090 | 200 | 9.93E+9 | $1s^22s2p\ ^3P^\circ_0$ | $1s^22s3s\ ^3S_1$ | 44SOD | 08KEL/POD |
| 89.818 | 0.010 | 1 113 360 | 300 | 2.98E+10 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22s3s\ ^3S_1$ | 44SOD | 08KEL/POD |
| 89.948 | 0.010 | 1 111 750 | 400 | 4.98E+10 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22s3s\ ^3S_1$ | 44SOD | 08KEL/POD |
| 90.252 | 0.010 | 1 108 010 | 400 | 1.35E+11 | $1s^22p^2\ ^1D_2$ | $1s^22p3d\ ^1D^\circ_2$ | 44SOD | 08KEL/POD |
| 90.536 | 0.010 | 1 104 530 | 500 | 2.54E+11 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22s3d\ ^1D_2$ | 44SOD | 08KEL/POD |
| 93.120 | 0.010 | 1 073 880 | 100 | 1.77E+10 | $1s^22p^2\ ^3P_1$ | $1s^22p3s\ ^3P^\circ_2$ | 44SOD | 08KEL/POD |
| 93.197 | 0.010 | 1 073 000 | 10 | 2.33E+10 | $1s^22p^2\ ^3P_0$ | $1s^22p3s\ ^3P^\circ_1$ | 44SOD | 08KEL/POD |
| 93.242 | 0.010 | 1 072 480 | 200 | 5.24E+10 | $1s^22p^2\ ^3P_2$ | $1s^22p3s\ ^3P^\circ_2$ | 44SOD | 08KEL/POD |
| 93.339 | 0.010 | 1 071 360 | 10 | 6.92E+10 | $1s^22p^2\ ^3P_1$ | $1s^22p3s\ ^3P^\circ_0$ | 44SOD | 08KEL/POD |
| 93.670 | 0.010 | 1 067 580 | 400 | 3.14E+11 | $1s^22p^2\ ^1S_0$ | $1s^22p3d\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 93.898 | 0.010 | 1 064 980 | 200 | 5.15E+10 | $1s^22p^2\ ^1D_2$ | $1s^22p3s\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 98.080 | 0.010 | 1 019 580 | 300 | 2.98E+10 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22s3s\ ^1S_0$ | 44SOD | 08KEL/POD |
| 102.043 | 0.010 | 979 980 | 10 | 1.99E+10 | $1s^22p^2\ ^1S_0$ | $1s^22p3s\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 107.158 | 0.010 | 933 200 | 100 | 1.17E+10 | $1s^22p^2\ ^1D_2$ | $1s^22s3p\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 117.909 | 0.010 | 848 110 | 10 | 3.66E+8 | $1s^22p^2\ ^1S_0$ | $1s^22s3p\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 168.964 | 0.010 | 591 840 | 35 | | $1s^22p3d\ ^3D^\circ_1$ | $1s^22p6p\ ^3D_1$ | 44SOD | |
| 411.145 | 0.010 | 243 223 | 100 | 4.40E+9 | $1s^22s^2\ ^1S_0$ | $1s^22s2p\ ^1P^\circ_1$ | 44SOD | 08KEL/POD |
| 492.329 | 0.010 | 203 116 | 10 | 9.09E+8 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22p^2\ ^3P_2$ | 44SOD | 08KEL/POD |
| 492.79 | 0.04 | 202 926 | | 6.59E+9 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p^2\ ^1S_0$ | 70FAW | 08KEL/POD |
| 494.00 | 0.04 | 202 430 | | 1.20E+9 | $1s^22s2p\ ^3P^\circ_0$ | $1s^22p^2\ ^3P_1$ | 70FAW | 08KEL/POD |
| 495.81 | 0.04 | 201 690 | | 8.89E+8 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22p^2\ ^3P_1$ | 70FAW | 08KEL/POD |
| 496.249 | 0.010 | 201 512 | 100 | 2.66E+9 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p^2\ ^3P_2$ | 44SOD | 08KEL/POD |
| 497.84 | 0.04 | 200 868 | | 3.51E+9 | $1s^22s2p\ ^3P^\circ_1$ | $1s^22p^2\ ^3P_0$ | 70FAW | 08KEL/POD |
| 499.78 | 0.04 | 200 088 | | 1.45E+9 | $1s^22s2p\ ^3P^\circ_2$ | $1s^22p^2\ ^3P_1$ | 70FAW | 08KEL/POD |
| 789.780 | 0.015 | 126 613 | | 3.63E+4 | $1s^22s^2\ ^1S_0$ | $1s^22s2p\ ^3P^\circ_1$ | 97FEL/BEH | 08KEL/POD |
| 847.91 | 0.03 | 117 937 | | 6.66E+8 | $1s^22s2p\ ^1P^\circ_1$ | $1s^22p^2\ ^1D_2$ | 04CUR/LAN | 08KEL/POD |

TABLE 16. Energy levels of Na VIII

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| $1s^22s^2$ | $^1S$ | 0 | 0 | | |
| $1s^22s2p$ | $^3P^\circ$ | 0 | 125 881 | 10 | 81MAR/ZAL |
| | | 1 | 126 613 | 10 | 81MAR/ZAL |
| | | 2 | 128 219 | 10 | 81MAR/ZAL |
| $1s^22s2p$ | $^1P^\circ$ | 1 | 243 208 | 10 | 81MAR/ZAL |
| $1s^22p^2$ | $^3P$ | 0 | 327 477 | 10 | 81MAR/ZAL |
| | | 1 | 328 311 | 10 | 81MAR/ZAL |
| | | 2 | 329 730 | 10 | 81MAR/ZAL |
| $1s^22p^2$ | $^1D$ | 2 | 361 145 | 10 | 81MAR/ZAL |
| $1s^22p^2$ | $^1S$ | 0 | 446 136 | 10 | 81MAR/ZAL |
| $1s^22s3s$ | $^3S$ | 1 | 1 239 975 | 100 | 81MAR/ZAL |

TABLE 16. Energy levels of Na VIII—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $1s^22s3s$ | $^1S$ | 0 | 1 262 780 | 100 | 81MAR/ZAL |
| $1s^22s3p$ | $^1P^°$ | 1 | 1 294 230 | 100 | 81MAR/ZAL |
| $1s^22s3d$ | $^3D$ | 1 | 1 327 230 | 100 | 81MAR/ZAL |
| | | 2 | 1 327 270 | 100 | 81MAR/ZAL |
| | | 3 | 1 327 390 | 100 | 81MAR/ZAL |
| $1s^22s3d$ | $^1D$ | 2 | 1 347 740 | 100 | 81MAR/ZAL |
| $1s^22p3s$ | $^3P^°$ | 0 | 1 399 670 | 100 | 81MAR/ZAL |
| | | 1 | 1 400 470 | 100 | 81MAR/ZAL |
| | | 2 | 1 402 200 | 100 | 81MAR/ZAL |
| $1s^22p3s$ | $^1P^°$ | 1 | 1 426 120 | 100 | 81MAR/ZAL |
| $1s^22p3p$ | $^1P$ | 1 | 1 432 980 | 100 | 81MAR/ZAL |
| $1s^22p3p$ | $^3D$ | 1 | 1 439 410? | 100 | 81MAR/ZAL |
| | | 2 | 1 440 260? | 100 | 81MAR/ZAL |
| | | 3 | 1 441 880 | 100 | 81MAR/ZAL |
| $1s^22p3p$ | $^3S$ | 1 | 1 452 400 | 100 | 81MAR/ZAL |
| $1s^22p3p$ | $^3P$ | 0 | | | |
| | | 1 | 1 459 850 | 100 | 81MAR/ZAL |
| | | 2 | 1 460 770 | 100 | 81MAR/ZAL |
| $1s^22p3d$ | $^1D^°$ | 2 | 1 469 150 | 100 | 81MAR/ZAL |
| $1s^22p3p$ | $^1D$ | 2 | 1 474 580 | 100 | 81MAR/ZAL |
| $1s^22p3p$ | $^1S$ | 0 | 1 481 510 | 100 | 81MAR/ZAL |
| $1s^22p3d$ | $^3D^°$ | 1 | 1 485 140 | 100 | 81MAR/ZAL |
| | | 2 | 1 485 340 | 100 | 81MAR/ZAL |
| | | 3 | 1 486 080 | 100 | 81MAR/ZAL |
| $1s^22p3d$ | $^3P^°$ | 2 | 1 491 980 | 100 | 81MAR/ZAL |
| | | 1 | 1 492 630 | 100 | 81MAR/ZAL |
| | | 0 | 1 492 980 | 100 | 81MAR/ZAL |
| $1s^22p3d$ | $^1F^°$ | 3 | 1 507 790 | 100 | 81MAR/ZAL |
| $1s^22p3d$ | $^1P^°$ | 1 | 1 513 730 | 100 | 81MAR/ZAL |
| $1s^22s4s$ | $^3S$ | 1 | 1 649 480 | 100 | 81MAR/ZAL |
| $1s^22s4s$ | $^1S$ | 0 | 1 656 820 | 100 | 81MAR/ZAL |
| $1s^22s4p$ | $^1P^°$ | 1 | 1 673 390 | 100 | 81MAR/ZAL |
| $1s^22s4d$ | $^3D$ | 1 | 1 683 370 | 100 | 81MAR/ZAL |
| | | 2 | 1 683 370 | 100 | 81MAR/ZAL |
| | | 3 | 1 683 370 | 100 | 81MAR/ZAL |
| $1s^22s4d$ | $^1D$ | 2 | 1 689 970 | 100 | 81MAR/ZAL |
| $1s^22p4p$ | $^1P$ | 1 | 1 813 190 | 100 | 81MAR/ZAL |
| $1s^22p4p$ | $^3D$ | 1 | | | |
| | | 2 | 1 816 010? | 100 | 81MAR/ZAL |
| | | 3 | 1 817 290 | 100 | 81MAR/ZAL |
| $1s^22p4p$ | $^3P$ | 2 | 1 822 880 | 100 | 81MAR/ZAL |
| $1s^22p4d$ | $^1D^°$ | 2 | 1 827 570 | 100 | 81MAR/ZAL |
| $1s^22p4p$ | $^1D$ | 2 | 1 827 640 | 100 | 81MAR/ZAL |

TABLE 16. Energy levels of Na VIII—Continued

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| $1s^22p4d$ | $^3D^\circ$ | 3 | 1 833 530 | 100 | 81MAR/ZAL |
| $1s^22p4d$ | $^3P^\circ$ | 2 | 1 835 010 | 100 | 81MAR/ZAL |
| | | 1 | 1 835 290? | 100 | 81MAR/ZAL |
| | | 0 | | | |
| $1s^22p4d$ | $^1F^\circ$ | 3 | 1 838 860 | 100 | 81MAR/ZAL |
| $1s^22s5p$ | $^1P^\circ$ | 1 | 1 838 910 | 100 | 81MAR/ZAL |
| $1s^22p4d$ | $^1P^\circ$ | 1 | 1 843 110 | 100 | 81MAR/ZAL |
| $1s^22s5d$? | $^3D$? | 1 | 1 848 670? | 100 | 81MAR/ZAL |
| | | 2 | 1 848 670? | 100 | 81MAR/ZAL |
| | | 3 | 1 848 670? | 100 | 81MAR/ZAL |
| $1s^22s5d$ | $^1D$ | 2 | 1 848 960 | 100 | 81MAR/ZAL |
| $1s^22s6p$ | $^1P^\circ$ | 1 | 1 930 910 | 100 | 81MAR/ZAL |
| $1s^22s6d$? | $^3D$? | 1 | 1 933 430 | 100 | 81MAR/ZAL |
| | | 2 | 1 933 430 | 100 | 81MAR/ZAL |
| | | 3 | 1 933 430 | 100 | 81MAR/ZAL |
| $1s^22s6d$ | $^1D$ | 2 | 1 935 230 | 100 | 81MAR/ZAL |
| $1s^22p5p$ | $^3P$ | 2 | 1 988 680 | 100 | 81MAR/ZAL |
| $1s^22p5p$ | $^1D$ | 2 | 1 990 540 | 100 | 81MAR/ZAL |
| $1s^22p5d$ | $^1D^\circ$ | 2 | 1 991 220 | 100 | 81MAR/ZAL |
| $1s^22p5d$ | $^3D^\circ$ | 3 | 1 994 370 | 100 | 81MAR/ZAL |
| $1s^22p5d$ | $^3P^\circ$ | 2 | 1 994 930 | 100 | 81MAR/ZAL |
| | | 1 | 1 995 200? | 100 | 81MAR/ZAL |
| | | 0 | | | |
| $1s^22p5d$ | $^1F^\circ$ | 3 | 1 998 130 | 100 | 81MAR/ZAL |
| $1s^22p6p$? | $^3D$? | 1 | 2 076 930? | 100 | 81MAR/ZAL |
| | | 2 | 2 076 930? | 100 | 81MAR/ZAL |
| | | 3 | 2 076 930? | 100 | 81MAR/ZAL |
| $1s^22p6d$ | $^3D^\circ$ | 1 | 2 080 460 | 100 | 81MAR/ZAL |
| | | 2 | 2 080 460 | 100 | 81MAR/ZAL |
| | | 3 | 2 080 460 | 100 | 81MAR/ZAL |
| $1s^22p6d$ | $^3P^\circ$ | 2 | 2 081 170 | 100 | 81MAR/ZAL |
| | | 1 | 2 081 170 | 100 | 81MAR/ZAL |
| | | 0 | 2 081 170 | 100 | 81MAR/ZAL |
| $1s^22p6d$ | $^1F^\circ$ | 3 | 2 083 210 | 100 | 81MAR/ZAL |
| **Na IX ($^2S_{1/2}$)** | *Limit* | — | 2 131 300 | 250 | 81MAR/ZAL |

### 6.9. Na IX

**Li isoelectronic sequence**
**Ground state** $1s^22s\ ^2S_{1/2}$
**Ionization energy** [2 418 570 cm$^{-1}$]; [299.867 eV]

The analysis of the Na IX spectrum line is based on the measurements of Söderqvist [44SOD], who used a vacuum spark source to measure 21 lines in the 44 Å–82 Å range plus the $1s^22s$-$1s^22p$ transition at 681 Å. Fawcett [70FAW] reported the value of the $1s^22s\ ^2S_{1/2}$-$1s^22p\ ^2P^\circ_{1/2}$ transition observed in a laser-induced plasma and Purcell and Wilding [72PUR/WIL] measured it in a solar flare. Then Feldman *et al.* [97FEL/BEH] obtained an improved value from radiation in the solar corona. Feldman *et al.* [97FEL/BEH] also reported the wavelength of the $1s^22s\ ^2S_{1/2}$-$1s^22p\ ^2P^\circ_{3/2}$ transition. Fawcett [71FAW] observed the $1s^23d\ ^2D$-$1s^24f\ ^2F$ transition in a laser-produced plasma. The $2p\ ^2P^\circ_{1/2}$-$2p\ ^2P^\circ_{3/2}$ interval was determined by interpolation along the lithium isoelectronic series by Edlén [79EDL]. Measurements of satellites around the far ultraviolet He-like transitions in the

11 Å region [74FEL/DOS, 74AGL/BOI, 78BOI/FAE] established levels in the $1s2s2p$, $1s2p^2$, $1s2s3p$, and $1s2s3d$ configurations. Martin and Zalubas [81MAR/ZAL] combined these measurements with theoretical calculations by Vainshtein and Safronova [78VAI/SAF] to obtain the levels given below (see Tables 17 and 18).

The transition probabilities of allowed transitions of Na IX have been calculated by Zhang *et al.* [90ZHA/SAM] using relativistic multibody perturbation theory and Peach *et al.* [88PEA/SAR], who reported comparisons of several theoretical techniques. These, along with multiconfiguration Hartree-Fock calculations of Martin *et al.* [93MAR/KAR] and nonrelativistic close-coupling approximation values by Yan *et al.* [98YAN/TAM], were included in a comprehensive compilation of Na IX transition probabilities by Kelleher and Podobedova [08KEL/POD]. *Ab initio* Breit-Pauli R-matrix calculations by Nahar [02NAH], third-order many-body perturbation values from Johnson *et al.* [96JOH/LIU], and relativistic quantum defect orbital probabilities from Martin *et al.* [93MAR/KAR] all agree with the values by Kelleher and Podobedova [08KEL/POD] within ±4%. The ionization energy cited above was reported by Edlén [79EDL] from an isoelectronic fit of the Li I isoelectronic sequence.

### References for Na IX


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08KEL/POD D. E. Kelleher and L. Podobedova, J. Phys. Chem. Ref. Data **37**, 267 (2008).


TABLE 17. Observed spectral lines of Na IX

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower Level | Upper Level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | | |
| 11.088 | 0.003 | 9 018 759 | | | | $1s^22s\ ^2S_{1/2}$ | $1s(^2S_{1/2})2s2p(^1P^\circ_1)\ ^2P^\circ_{1/2,3/2}$ | 78BOI/FAE | |
| 11.155 | 0.003 | 8 964 590 | | | | $1s^22s\ ^2S_{1/2}$ | $1s(^2S_{1/2})2s2p(^3P^\circ_1)\ ^2P^\circ_{1/2,3/2}$ | 78BOI/FAE | |
| 11.202 | 0.003 | 8 926 977 | | | | $1s^22p\ ^2P^\circ_{1/2,3/2}$ | $1s2p^2\ ^2D_{3/2,5/2}$ | 78BOI/FAE | |
| 44.725 | 0.010 | 2 235 886 | 10* | d | 1.23E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^27p\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 44.725 | 0.010 | 2 235 886 | 10* | d | 1.22E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^27p\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 46.090 | 0.010 | 2 169 668 | 100* | d | 1.95E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^26p\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 46.090 | 0.010 | 2 169 668 | 100* | d | 1.95E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^26p\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 47.776 | 0.010 | 2 093 101 | 10 | | 1.87E+10 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^27d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 47.836 | 0.010 | 2 090 476 | 100* | d | 2.23E+10 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^27d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 47.836 | 0.010 | 2 090 476 | 100* | d | 3.70E+9 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^27d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 48.553 | 0.010 | 2 059 605 | 200* | d | 3.36E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^25p\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 48.553 | 0.010 | 2 059 605 | 200* | d | 3.37E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^25p\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 49.326 | 0.010 | 2 027 328 | 100 | | 3.04E+10 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^26d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 49.386 | 0.010 | 2 024 865 | 200* | d | 3.65E+10 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^26d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 49.386 | 0.010 | 2 024 865 | 200* | d | 6.07E+9 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^26d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 52.116 | 0.010 | 1 918 797 | 100 | | 5.63E+10 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^25d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 52.186 | 0.010 | 1 916 223 | 200* | d | 6.74E+10 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^25d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 52.186 | 0.010 | 1 916 223 | 200* | d | 1.12E+10 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^25d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 52.487 | 0.010 | 1 905 234 | 1 | | 8.88E+9 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^25s\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |

TABLE 17. Observed spectral lines of Na IX—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Int. | Line Code | $A_{ki}$ (s$^{-1}$) | Lower Level | Upper Level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|---|
| 53.860 | 0.010 | 1 856 665 | 300 | | 6.40E+10 | $1s^22s\ ^2S_{1/2}$ | $1s^24p\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 58.201 | 0.010 | 1 718 184 | 500 | | 1.22E+11 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^24d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 58.279 | 0.010 | 1 715 884 | 600 | | 1.46E+11 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^24d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 58.954 | 0.010 | 1 696 238 | 100 | | 9.05E+9 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^24s\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 59.042 | 0.010 | 1 693 710 | 200 | | 1.82E+10 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^24s\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 70.615 | 0.010 | 1 416 130 | 700 | | 1.40E+11 | $1s^22s\ ^2S_{1/2}$ | $1s^23p\ ^2P^\circ_{3/2}$ | 44SOD | 08KEL/POD |
| 70.653 | 0.010 | 1 415 368 | 600 | | 1.40E+11 | $1s^22s\ ^2S_{1/2}$ | $1s^23p\ ^2P^\circ_{1/2}$ | 44SOD | 08KEL/POD |
| 77.764 | 0.010 | 1 285 942 | 700 | | 3.65E+11 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^23d\ ^2D_{3/2}$ | 44SOD | 08KEL/POD |
| 77.911 | 0.010 | 1 283 516 | 800 | | 4.36E+11 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^23d\ ^2D_{5/2}$ | 44SOD | 08KEL/POD |
| 81.175 | 0.010 | 1 231 906 | 500 | | 2.31E+10 | $1s^22p\ ^2P^\circ_{1/2}$ | $1s^23s\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 81.350 | 0.010 | 1 229 256 | 500 | | 4.62E+10 | $1s^22p\ ^2P^\circ_{3/2}$ | $1s^23s\ ^2S_{1/2}$ | 44SOD | 08KEL/POD |
| 231.78 | 0.05 | 431 444 | | | | $1s^23d\ ^2D_{3/2,5/2}$ | $1s^24f\ ^2F^\circ_{5/2,7/2}$ | 71FAW | |
| 681.725 | 0.015 | 146 687 | 350 | | 6.598E+8 | $1s^22s\ ^2S_{1/2}$ | $1s^22p\ ^2P^\circ_{3/2}$ | 97FEL/BEH | 98YAN/TAM |
| 694.130 | 0.015 | 144 065 | 160 | | 6.233E+8 | $1s^22s\ ^2S_{1/2}$ | $1s^22p\ ^2P^\circ_{1/2}$ | 97FEL/BEH | 98YAN/TAM |

TABLE 18. Energy levels of Na IX

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| $1s^22s$ | $^2S$ | 1/2 | 0 | 5 | 81MAR/ZAL |
| $1s^22p$ | $^2P^\circ$ | 1/2 | 144 062 | 5 | 81MAR/ZAL |
| | | 3/2 | 146 688 | 5 | 81MAR/ZAL |
| $1s^23s$ | $^2S$ | 1/2 | 1 375 950 | 100 | 81MAR/ZAL |
| $1s^23p$ | $^2P^\circ$ | 1/2 | 1 415 370 | 100 | 81MAR/ZAL |
| | | 3/2 | 1 416 130 | 100 | 81MAR/ZAL |
| $1s^23d$ | $^2D$ | 3/2 | 1 430 000 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 430 200 | 100 | 81MAR/ZAL |
| $1s^24s$ | $^2S$ | 1/2 | 1 840 350 | 100 | 81MAR/ZAL |
| $1s^24p$ | $^2P^\circ$ | 1/2 | [1 856 440] | 100 | 81MAR/ZAL |
| | | 3/2 | [1 856 770] | 100 | 81MAR/ZAL |
| $1s^24d$ | $^2D$ | 3/2 | 1 862 250 | 100 | 81MAR/ZAL |
| | | 5/2 | 1 862 570 | 100 | 81MAR/ZAL |
| $1s^24f$ | $^2F^\circ$ | 5/2 | [1 862 930] | 100 | 81MAR/ZAL |
| | | 7/2 | [1 862 980] | 100 | 81MAR/ZAL |
| $1s^25s$ | $^2S$ | 1/2 | [2 051 520] | 100 | 81MAR/ZAL |
| $1s^25p$ | $^2P^\circ$ | 1/2 | 2 059 600 | 100 | 81MAR/ZAL |
| | | 3/2 | 2 059 600 | 100 | 81MAR/ZAL |
| $1s^25d$ | $^2D$ | 3/2 | 2 062 860 | 100 | 81MAR/ZAL |
| | | 5/2 | 2 062 910 | 100 | 81MAR/ZAL |
| $1s^26p$ | $^2P^\circ$ | 1/2 | 2 169 670 | 100 | 81MAR/ZAL |
| | | 3/2 | 2 169 670 | 100 | 81MAR/ZAL |
| $1s^26d$ | $^2D$ | 3/2 | 2 171 390 | 100 | 81MAR/ZAL |
| | | 5/2 | 2 171 550 | 100 | 81MAR/ZAL |
| $1s^27p$ | $^2P^\circ$ | 1/2 | 2 235 890 | 100 | 81MAR/ZAL |
| | | 3/2 | 2 235 890 | 100 | 81MAR/ZAL |

TABLE 18. Energy levels of Na IX—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| $1s^27d$ | $^2D$ | 3/2 | 2 237 160 | 100 | 81MAR/ZAL |
| | | 5/2 | 2 237 170 | 100 | 81MAR/ZAL |
| **Na x ($^1S_0$)** | *Limit* | — | 2 418 570 | 100 | 81MAR/ZAL |
| 1s2s2 | $^2S$ | 1/2 | (8 815 600) | 100 | 81MAR/ZAL |
| $1s(^2S_{1/2})2s2p(^3P^\circ)$ | $^4P^\circ$ | 1/2 | (8 854 500) | 100 | 81MAR/ZAL |
| | | 3/2 | (8 855 100) | 100 | 81MAR/ZAL |
| | | 5/2 | (8 857 000) | 100 | 81MAR/ZAL |
| $1s(^2S_{1/2})2s2p(^3P^\circ)$ | $^2P^\circ$ | 1/2 | (8 963 700) | 100 | 81MAR/ZAL |
| | | 3/2 | (8 965 200) | 100 | 81MAR/ZAL |
| $1s2p^2$ | $^4P$ | 1/2 | (9 008 000) | 100 | 81MAR/ZAL |
| | | 3/2 | (9 009 200) | 100 | 81MAR/ZAL |
| | | 5/2 | (9 010 500) | 100 | 81MAR/ZAL |
| $1s(^2S_{1/2})2s2p(^1P^\circ_1)$ | $^2P^\circ$ | 1/2 | (9 016 900) | 100 | 81MAR/ZAL |
| | | 3/2 | (9 017 500) | 100 | 81MAR/ZAL |
| $1s2p^2$ | $^2D$ | 5/2 | (9 075 600) | 100 | 81MAR/ZAL |
| | | 3/2 | (9 076 400) | 100 | 81MAR/ZAL |
| $1s2p^2$ | $^2P$ | 1/2 | (9 095 100) | 100 | 81MAR/ZAL |
| | | 3/2 | (9 097 700) | 100 | 81MAR/ZAL |
| $1s2p^2$ | $^2S$ | 1/2 | (9 178 900) | 100 | 81MAR/ZAL |
| **Na x (1s2s $^3S_1$)** | *Limit* | — | [11 353 910] | 100 | 81MAR/ZAL |

## 6.10. Na x

**He isoelectronic sequence**
**Ground state** $1s^2\ ^1S_0$
**Ionization energy** (11 817 106.7(2) $cm^{-1}$);
(1465.134 35(3) eV)

Measurements of light from a solar flare by Walker and Rugge [69WAL/RUG] in 1969 yielded the first experimental wavelength for the Na X spectrum—a blend of the transitions to the ground state from the $1s2p\ ^1P_1$ and $1s2p\ ^3P_1$ levels. An increase in resolution allowed Aglitskii *et al.* [74AGL/BOI] and Boiko *et al.* [78BOI/FAE] to report separate wavelengths for those transitions and also the resonance transition from the $1s3p\ ^1P_1$ level based on observations of laser-induced plasmas. Analysis of light from a nonflaring active area of the sun by Parkinson [75PAR] produced confirmation of the $1s2p\ ^1P_1$ and $1s2p\ ^3P_1$ resonance wavelengths and the only experimental value for the parity-forbidden $1s^2\ ^1S_0$ to $1s2s\ ^3S_1$ transition. Although Parkinson gives an uncertainty of ±0.002 Å for strong lines, comparison of values for weak lines such as these for his two different detectors indicates discrepancies of at least ±0.004 Å. Feldman *et al.* [74FEL/DOS] used laser-produced plasmas to obtain values for transitions to the $1s2p$ levels from $2s2p$ and $2p^2$, as well as a blend of lines classified as $1s3s$-$2p3s$ and $1s3p$-$2p3p$ transitions. The resonance transition from the $1s2p\ ^1P_1$ level has also been observed by Kaastra *et al.* [00KAA/MEW] in the spectrum of a Seyfert galaxy. Studies of solar flares allowed Curdt *et al.* [00CUR/LAN] to measure the $1s2s\ ^3S_1$-$1s2p\ ^3P_2$ transition. This wavelength was refined by Feldman *et al.* [00FEL/CUR] using observations in the solar corona (see Table 19).

Although the experimental data are sparse, theoretical calculations of energy levels in this spectrum provide values for many more levels and also are expected to have substantially smaller uncertainties than the experimental values. Martin and Zalubas [81MAR/ZAL] drew together all the data available up to 1981 to produce a comprehensive compilation of energy levels. Since then there have been calculations of energies for the $n=1$ and $n=2$ levels of heliumlike sodium and the ionization energy by Drake [88DRA], who used the unified-theory method, and Plante *et al.* [94PLA/JOH], who performed a relativistic all-order many-body calculation. Vainshtein and Safronova [85VAI/SAF] obtained values for $1sns$, $1snp$, and $1snd$ levels up to $n=5$ using a relativistic perturbation theory. Kagawa and Safronova [92KAG/SAF] and Safronova *et al.* [94SAF/SAF] further developed the technique, giving coefficients for all but the Lamb shift contributions for $n=1$ and 2 and for doubly excited $n=2$ levels, respectively.

Since the theoretical values for the Na X energy levels have smaller uncertainties than the experimental ones, we retain them in Table 20. The ionization energy and $n=1$ and $n=2$ levels are taken from the theoretical calculations of

Plante *et al.* [94PLA/JOH], who claim the smallest uncertainty. For the higher levels, we retain the values of Martin and Zalubas [81MAR/ZAL], which agree somewhat better with the [94PLA/JOH] energies for the lowest levels than the works of Safronova [85VAI/SAF, 92KAG/SAF]. The [81MAR/ZAL] level values have been adjusted to be consistent with the adopted ionization energy and all uncertainties are given with respect to the $1s\ ^2S_{1/2}$ limit.

Johnson *et al.* [95JOH/PLA] used a relativistic, iterative technique to calculate the $1s^2$-$1s2p$ transition probabilities cited. The [95JOH/PLA] paper also presents a detailed comparison of several methods of calculating transition probabilities for He-like ions. The $1s^2$-$1s3p$ transition probability, not available in [95JOH/PLA], was calculated by Khan *et al.* [88KHA/KHA] using a one-electron hydrogenic model.

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TABLE 19. Observed spectral lines of Na X

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | Line code | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | | |
| 9.427 | 0.003 | 10 608 000 | | 3.74E+12 | $1s^2\ ^1S_0$ | $1s3p\ ^1P^\circ_1$ | 74AGL/BOI | 88KHA/KHA |
| 10.06* | | 9 940 400 | d | | $1s3p\ ^{1,3}P^\circ$ | $2p3p\ ^{1,3}P^{1,3}D$ | 74FEL/DOS | |
| 10.06* | | 9 940 400 | d | | $1s3s\ ^{1,3}S$ | $2p3s\ ^{1,3}P^\circ$ | 74FEL/DOS | |
| 10.119* | 0.001 | 9 882 400 | d | | $1s2p\ ^1P^\circ_1$ | $2p^2\ ^1S_0$ | 74FEL/DOS | |
| 10.119* | 0.001 | 9 882 400 | d | | $1s2s\ ^1S_0$ | $2s2p\ ^1P^\circ_1$ | 74FEL/DOS | |
| 10.157 | 0.001 | 9 845 400 | | | $1s2s\ ^3S_1$ | $2s2p\ ^3P^\circ$ | 74FEL/DOS | |
| 10.170 | 0.001 | 9 832 800 | | | $1s2p\ ^3P^\circ$ | $2p^2\ ^3P$ | 74FEL/DOS | |
| 10.193 | 0.001 | 9 810 700 | | | $1s2p\ ^1P^\circ_1$ | $2p^2\ ^1D_2$ | 74FEL/DOS | |
| 11.004 | 0.003 | 9 087 600 | | 1.34E+13 | $1s^2\ ^1S_0$ | $1s2p\ ^1P^\circ_1$ | 74AGL/BOI | 95JOH/PLA |
| 11.088 | 0.003 | 9 018 800 | | 1.40E+10 | $1s^2\ ^1S_0$ | $1s2p\ ^3P^\circ_1$ | 78BOI/FAE | 95JOH/PLA |
| 11.192 | 0.004 | 8 935 000 | | | $1s^2\ ^1S_0$ | $1s2s\ ^3S_1$ | 75PAR | |
| 1111.759 | 0.017 | 89 947.6 | | 1.27E+8 | $1s2s\ ^3S_1$ | $1s2p\ ^3P^\circ_2$ | 00FEL/CUR | 95JOH/PLA |

TABLE 20. Energy levels of Na X

| Configuration | Term | J | Energy (cm$^{-1}$) | Unc. (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| $1s^2$ | $^1S$ | 0 | 0 | 0.2 | |
| 1s2s | $^3S$ | 1 | (8 935 368.6) | 0.2 | 94PLA/JOH |
| 1s2p | $^3P^\circ$ | 0 | (9 022 385.5) | 0.2 | 94PLA/JOH |
| | | 1 | (9 022 908.5) | 0.2 | 94PLA/JOH |
| | | 2 | (9 025 315.7) | 0.2 | 94PLA/JOH |

TABLE 20. Energy levels of Na X—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| 1s2s | $^1S$ | 0 | (9 028 021.4) | 0.2 | 94PLA/JOH |
| 1s2p | $^1P^\circ$ | 1 | (9 088 735.1) | 0.2 | 94PLA/JOH |
| 1s3s | $^3S$ | 1 | (10 558 946) | 20 | 81MAR/ZAL |
| 1s3p | $^3P^\circ$ | 0 | (10 582 781) | 20 | 81MAR/ZAL |
| | | 1 | (10 582 947) | 20 | 81MAR/ZAL |
| | | 2 | (10 583 658) | 20 | 81MAR/ZAL |
| 1s3s | $^1S$ | 0 | (10 583 431) | 20 | 81MAR/ZAL |
| 1s3d | $^3D$ | 1 | (10 596 647) | 20 | 81MAR/ZAL |
| | | 2 | (10 596 667) | 20 | 81MAR/ZAL |
| | | 3 | (10 596 925) | 20 | 81MAR/ZAL |
| 1s3d | $^1D$ | 2 | (10 597 475) | 20 | 81MAR/ZAL |
| 1s3p | $^1P^\circ$ | 1 | (10 601 080) | 20 | 81MAR/ZAL |
| 1s4s | $^3S$ | 1 | (11 115 065) | 20 | 81MAR/ZAL |
| 1s4p | $^3P^\circ$ | 0 | (11 124 873) | 20 | 81MAR/ZAL |
| | | 1 | (11 124 944) | 20 | 81MAR/ZAL |
| | | 2 | (11 125 244) | 20 | 81MAR/ZAL |
| 1s4s | $^1S$ | 0 | (11 124 986) | 20 | 81MAR/ZAL |
| 1s4d | $^3D$ | 1,2,3 | (11 130 639) | 20 | 81MAR/ZAL |
| 1s4d | $^1D$ | 2 | (11 131 017) | 20 | 81MAR/ZAL |
| 1s4f | $^3F^\circ$ | 2,3,4 | (11 131 051) | 20 | 81MAR/ZAL |
| 1s4f | $^1F^\circ$ | 3 | (11 131 056) | 20 | 81MAR/ZAL |
| 1s4p | $^1P^\circ$ | 1 | (11 132 393) | 20 | 81MAR/ZAL |
| 1s5s | $^3S$ | 1 | (11 369 887) | 20 | 81MAR/ZAL |
| 1s5p | $^3P^\circ$ | 0 | (11 374 842) | 20 | 81MAR/ZAL |
| | | 1 | (11 374 879) | 20 | 81MAR/ZAL |
| | | 2 | (11 375 032) | 20 | 81MAR/ZAL |
| 1s5s | $^1S$ | 0 | (11 374 868) | 20 | 81MAR/ZAL |
| 1s5d | $^3D$ | 1,2,3 | (11 377 767) | 20 | 81MAR/ZAL |
| 1s5d | $^1D$ | 2 | (11 377 984) | 20 | 81MAR/ZAL |
| 1s5f | $^3F^\circ$ | 2,3,4 | (11 377 987) | 20 | 81MAR/ZAL |
| 1s5f | $^1F^\circ$ | 3 | (11 377 991) | 20 | 81MAR/ZAL |
| 1s5p | $^1P^\circ$ | 1 | (11 378 646) | 20 | 81MAR/ZAL |
| 1s6s | $^3S$ | 1 | (11 507 469) | 20 | 81MAR/ZAL |
| 1s6s | $^1S$ | 0 | (11 510 320) | 20 | 81MAR/ZAL |
| 1s6p | $^3P^\circ$ | 0,1,2 | (11 510 387) | 20 | 81MAR/ZAL |
| 1s6d | $^3D$ | 1,2,3 | (11 512 003) | 20 | 81MAR/ZAL |
| 1s6f | $^3F^\circ$ | 2,3,4 | (11 512 130) | 20 | 81MAR/ZAL |
| 1s6f | $^1F^\circ$ | 3 | (11 512 133) | 20 | 81MAR/ZAL |

TABLE 20. Energy levels of Na X—Continued

| Configuration | Term | J | Energy ($cm^{-1}$) | Unc. ($cm^{-1}$) | Reference |
|---|---|---|---|---|---|
| 1s6d | $^1$D | 2 | (11 512 137) | 20 | 81MAR/ZAL |
| 1s6p | $^1$P° | 1 | (11 512 505) | 20 | 81MAR/ZAL |
| 1s7s | $^3$S | 1 | (11 590 091) | 20 | 81MAR/ZAL |
| 1s7s | $^1$S | 0 | (11 591 874) | 20 | 81MAR/ZAL |
| 1s7p | $^3$P° | 0,1,2 | (11 591 920) | 20 | 81MAR/ZAL |
| 1s7p | $^1$P° | 1 | (11 593 248) | 20 | 81MAR/ZAL |
| 1s8s | $^3$S | 1 | (11 643 558) | 20 | 81MAR/ZAL |
| 1s8s | $^1$S | 0 | (11 644 747) | 20 | 81MAR/ZAL |
| 1s8p | $^3$P° | 0,1,2 | (11 644 781) | 20 | 81MAR/ZAL |
| 1s8p | $^1$P° | 1 | (11 645 667) | 20 | 81MAR/ZAL |
| 1s9s | $^3$S | 1 | (11 680 134) | 20 | 81MAR/ZAL |
| 1s9s | $^1$S | 0 | (11 680 966) | 20 | 81MAR/ZAL |
| 1s9p | $^3$P° | 0,1,2 | (11 680 991) | 20 | 81MAR/ZAL |
| 1s9p | $^1$P° | 1 | (11 681 612) | 20 | 81MAR/ZAL |
| 1s10s | $^3$S | 1 | (11 706 251) | 20 | 81MAR/ZAL |
| 1s10s | $^1$S | 0 | (11 706 856) | 20 | 81MAR/ZAL |
| 1s10p | $^3$P° | 0,1,2 | (11 706 875) | 20 | 81MAR/ZAL |
| 1s10p | $^1$P° | 1 | (11 707 327) | 20 | 81MAR/ZAL |
| **Na XI (1s $^2S_{1/2}$)** | *Limit* | — | (11 817 106.7) | | 94PLA/JOH |
| 2s$^2$ | $^1$S | 0 | (18 757 400) | 2000 | 81MAR/ZAL |
| 2s2p | $^3$P° | 0 | (18 780 000) | 2000 | 81MAR/ZAL |
| | | 1 | (18 781 500) | 2000 | 81MAR/ZAL |
| | | 2 | (18 784 900) | 2000 | 81MAR/ZAL |
| 2p$^2$ | $^3$P | 0 | (18 856 100) | 2000 | 81MAR/ZAL |
| | | 1 | (18 857 800) | 2000 | 81MAR/ZAL |
| | | 2 | (18 860 700) | 2000 | 81MAR/ZAL |
| 2p$^2$ | $^1$D | 2 | (18 900 900) | 2000 | 81MAR/ZAL |
| 2s2p | $^1$P° | 1 | (18 909 900) | 2000 | 81MAR/ZAL |
| 2p$^2$ | $^1$S | 0 | (19 034 800) | 2000 | 81MAR/ZAL |
| **Na XI (2p $^2P^\circ_{1/2}$)** | *Limit* | — | (21 788 480) | | 81MAR/ZAL |

## 6.11. Na XI

**H isoelectronic sequence**
**Ground state** $1s\ ^2S_{1/2}$
**Ionization energy** (13 297 680(1) $cm^{-1}$); (1648.7020(1) eV)

Although some spectral lines of the Na XI spectrum have been observed experimentally, more accurate values of the wavelengths and levels can be obtained from theoretical calculations. The wavelength of the blended Lyman-$\alpha$ line ($1s\ ^2S_{1/2}$-$2p\ ^2P^\circ_{1/2,3/2}$) was measured by Aglitskii *et al.* [74AGL/BOI] to be 10.026(3) Å. This line was also observed in a Seyfert galaxy by Kaastra *et al.* [00KAA/MEW]. Lyman-$\beta$ ($1s\ ^2S_{1/2}$-$3p\ ^2P^\circ_{1/2,3/2}$) was first measured by [74AGL/BOI] and later remeasured with a lower uncertainty by Seely and Feldman [86SEE/FEL], who reported the wavelength of 8.4588(7) Å. In studies by Kato *et al.* [90KAT/MIU, 90AZU/KAT, 94DAI/AZU] of recombination-pumped lasers, the Balmer-$\alpha$ line (the group of transitions from $n=2$ to 3 levels with wavelengths of about 54.2 Å) was observed, but the wavelength was not determined (see Table 21).

Erickson [77ERI] calculated all energy levels of $^{23}$Na for $n=1-11$. For levels with $n=12-20$, Erickson gives $ns\ ^2S_{1/2}$ and $np\ ^2P^{\circ}_{1/2}$ levels, in addition to the levels with $J=n-1/2$. The level values in [77ERI] given here are corrected for the 2002 CODATA recommended value of the Rydberg constant, $R=109\ 737.315\ 685\ 25(73)$ cm$^{-1}$ [05MOH/TAY]. The wavelengths listed are computed using the differences of the levels. Only transitions involving lower levels with $n\leqslant 4$ are tabulated here. Uncertainties in the wavelengths are calculated from those given in [77ERI] for the energy levels; however, this is not a rigorous method since errors in the level value calculations are not statistically independent. Na XI energy level separations between levels with $n=1$ and 2 have been calculated by Mohr [83MOH] and Johnson and Soff [85JOH/SOF], who agree well with each other and have smaller reported uncertainties. To obtain a consistent set of results for a substantial number of levels, however, we have retained the [77ERI] values in these tables and report the uncertainties from that work, which are given relative to the ionization limit. The ionization energy given above is taken from Johnson and Soff [85JOH/SOF] and Mohr [83MOH]. It should be noted that although Erickson's reported uncertainty for the ionization potential is $\pm 2$ cm$^{-1}$, his value differs from the results of [85JOH/SOF] and [83MOH] by 9 cm$^{-1}$. It is likely that the values for other levels of [77ERI] may also have errors larger than those reported (see Table 22).

Relativistic transition probabilities obtained using point-nucleus Dirac eigenfunctions have been reported by Pal'chikov [98PAL] for transitions between levels with $n=1$ and 2 and by Jitrik and Bunge [04JIT/BUN] for a more extended set of spectral lines (available at the website http://www.fisica.unam.mx/research/tables/spectra/1el/set1/Tables/opt1/E1_Aki_Z_19). The two agree to the number of significant digits reported.

### References for Na XI


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TABLE 21. Spectral lines of Na XI

| λ (Å) | Unc. (Å) | $\sigma$ (cm$^{-1}$) | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|
| *Vacuum* | | | | | | | |
| (7.676 602 3) | 0.000 001 2 | (13 026 596.) | 1.81E+11 | 1s $^2S_{1/2}$ | 7p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (7.676 676 3) | 0.000 001 2 | (13 026 471.) | 1.81E+11 | 1s $^2S_{1/2}$ | 7p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (7.734 734 0) | 0.000 001 2 | (12 928 693.) | 2.88E+11 | 1s $^2S_{1/2}$ | 6p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (7.734 853 2) | 0.000 001 2 | (12 928 494.) | 2.88E+11 | 1s $^2S_{1/2}$ | 6p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (7.833 113 0) | 0.000 001 2 | (12 766 317.) | 5.03E+11 | 1s $^2S_{1/2}$ | 5p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (7.833 324 3) | 0.000 001 2 | (12 765 972.) | 5.02E+11 | 1s $^2S_{1/2}$ | 5p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (8.020 927 6) | 0.000 001 3 | (12 467 386.) | 9.98E+11 | 1s $^2S_{1/2}$ | 4p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (8.021 360 3) | 0.000 001 3 | (12 466 713.) | 9.97E+11 | 1s $^2S_{1/2}$ | 4p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (8.459 121 2) | 0.000 001 4 | (11 821 559.) | 2.45E+12 | 1s $^2S_{1/2}$ | 3p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (8.460 262 3) | 0.000 001 4 | (11 819 964.) | 2.45E+12 | 1s $^2S_{1/2}$ | 3p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (10.023 188) | 0.000 002 | (9 976 866.) | 9.16E+12 | 1s $^2S_{1/2}$ | 2p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (10.028 597) | 0.000 002 | (9 971 485.) | 9.18E+12 | 1s $^2S_{1/2}$ | 2p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (32.732 033) | 0.000 002 | (3 055 111.2) | 3.84E+10 | 2p $^2P^{\circ}_{1/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (32.733 316) | 0.000 002 | (3 054 991.4) | 2.25E+9 | 2p $^2P^{\circ}_{1/2}$ | 7s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (32.734 483) | 0.000 002 | (3 054 882.5) | 2.63E+10 | 2s $^2S_{1/2}$ | 7p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (32.735 827) | 0.000 002 | (3 054 757.1) | 2.64E+10 | 2s $^2S_{1/2}$ | 7p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |

TABLE 21. Spectral lines of Na XI—Continued

| λ (Å) | Unc. (Å) | σ ($cm^{-1}$) | $A_{ki}$ ($s^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|
| (32.789 335 1) | 0.000 001 0 | (3 049 772.12) | 4.59E+10 | 2p $^2P^\circ_{3/2}$ | 7d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (32.789 783 7) | 0.000 001 0 | (3 049 730.40) | 7.63E+9 | 2p $^2P^\circ_{3/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (32.791 071 8) | 0.000 001 0 | (3 049 610.59) | 4.55E+9 | 2p $^2P^\circ_{3/2}$ | 7s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (33.815 685) | 0.000 002 | (2 957 207.6) | 6.31E+10 | 2p $^2P^\circ_{1/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (33.817 860) | 0.000 002 | (2 957 017.3) | 3.60E+9 | 2p $^2P^\circ_{1/2}$ | 6s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (33.818 298) | 0.000 002 | (2 956 979.1) | 4.19E+10 | 2s $^2S_{1/2}$ | 6p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (33.820 577) | 0.000 002 | (2 956 779.8) | 4.20E+10 | 2s $^2S_{1/2}$ | 6p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (33.876 566 1) | 0.000 001 0 | (2 951 893.05) | 7.54E+10 | 2p $^2P^\circ_{3/2}$ | 6d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (33.877 326 5) | 0.000 001 0 | (2 951 826.80) | 1.25E+10 | 2p $^2P^\circ_{3/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (33.879 510 3) | 0.000 001 0 | (2 951 636.53) | 7.29E+9 | 2p $^2P^\circ_{3/2}$ | 6s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (35.780 338) | 0.000 003 | (2 794 831.0) | 1.16E+11 | 2p $^2P^\circ_{1/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (35.783 261) | 0.000 003 | (2 794 602.7) | 7.25E+10 | 2s $^2S_{1/2}$ | 5p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (35.784 549) | 0.000 003 | (2 794 502.2) | 6.32E+9 | 2p $^2P^\circ_{1/2}$ | 5s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (35.787 671) | 0.000 003 | (2 794 258.4) | 7.27E+10 | 2s $^2S_{1/2}$ | 5p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (35.847 886 9) | 0.000 001 2 | (2 789 564.70) | 1.38E+11 | 2p $^2P^\circ_{3/2}$ | 5d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (35.849 358 2) | 0.000 001 2 | (2 789 450.22) | 2.30E+10 | 2p $^2P^\circ_{3/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (35.853 585 0) | 0.000 001 2 | (2 789 121.37) | 1.28E+10 | 2p $^2P^\circ_{3/2}$ | 5s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (40.065 710) | 0.000 003 | (2 495 899.8) | 2.53E+11 | 2p $^2P^\circ_{1/2}$ | 4d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (40.069 366) | 0.000 003 | (2 495 672.1) | 1.42E+11 | 2s $^2S_{1/2}$ | 4p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (40.076 026) | 0.000 003 | (2 495 257.4) | 1.26E+10 | 2p $^2P^\circ_{1/2}$ | 4s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (40.080 168) | 0.000 003 | (2 494 999.5) | 1.42E+11 | 2s $^2S_{1/2}$ | 4p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (40.148 668 6) | 0.000 001 5 | (2 490 742.62) | 3.02E+11 | 2p $^2P^\circ_{3/2}$ | 4d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (40.152 273 1) | 0.000 001 5 | (2 490 519.03) | 5.03E+10 | 2p $^2P^\circ_{3/2}$ | 4d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (40.162 633 2) | 0.000 001 5 | (2 489 876.58) | 2.56E+10 | 2p $^2P^\circ_{3/2}$ | 4s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (54.051 971) | 0.000 006 | (1 850 071.3) | 7.91E+11 | 2p $^2P^\circ_{1/2}$ | 3d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (54.058 580) | 0.000 006 | (1 849 845.1) | 3.28E+11 | 2s $^2S_{1/2}$ | 3p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (54.096 512) | 0.000 006 | (1 848 548.0) | 3.10E+10 | 2p $^2P^\circ_{1/2}$ | 3s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (54.105 216) | 0.000 006 | (1 848 250.6) | 3.30E+11 | 2s $^2S_{1/2}$ | 3p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (54.194 067) | 0.000 003 | (1 845 220.42) | 9.47E+11 | 2p $^2P^\circ_{3/2}$ | 3d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (54.209 636) | 0.000 003 | (1 844 690.49) | 1.58E+11 | 2p $^2P^\circ_{3/2}$ | 3d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (54.254 438) | 0.000 003 | (1 843 167.19) | 6.27E+10 | 2p $^2P^\circ_{3/2}$ | 3s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (82.875 330) | 0.000 003 | (1 206 631.69) | 1.40E+10 | 3p $^2P^\circ_{1/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (82.880 019) | 0.000 005 | (1 206 563.43) | 8.82E+9 | 3s $^2S_{1/2}$ | 7p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (82.883 560) | 0.000 003 | (1 206 511.89) | 1.53E+9 | 3p $^2P^\circ_{1/2}$ | 7s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (82.888 637) | 0.000 005 | (1 206 437.98) | 8.85E+9 | 3s $^2S_{1/2}$ | 7p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (82.981 936 0) | 0.000 000 1 | (1 205 081.550) | 1.65E+10 | 3d $^2D_{3/2}$ | 7f $^2F^\circ_{5/2}$ | 77ERI | 04JIT/BUN |
| (82.982 118) | 0.000 002 | (1 205 078.91) | 1.68E+10 | 3p $^2P^\circ_{3/2}$ | 7d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (82.984 788 3) | 0.000 000 2 | (1 205 040.129) | 6.80E+7 | 3d $^2D_{3/2}$ | 7p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (82.984 991) | 0.000 002 | (1 205 037.19) | 2.81E+9 | 3p $^2P^\circ_{3/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (82.993 242) | 0.000 002 | (1 204 917.39) | 3.10E+9 | 3p $^2P^\circ_{3/2}$ | 7s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (82.993 428 4) | 0.000 000 3 | (1 204 914.678) | 6.92E+8 | 3d $^2D_{3/2}$ | 7p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (83.017 006 4) | 0.000 000 1 | (1 204 572.465) | 1.77E+10 | 3d $^2D_{5/2}$ | 7f $^2F^\circ_{7/2}$ | 77ERI | 04JIT/BUN |
| (83.018 443 1) | 0.000 000 1 | (1 204 551.618) | 1.18E+9 | 3d $^2D_{5/2}$ | 7f $^2F^\circ_{5/2}$ | 77ERI | 04JIT/BUN |
| (83.021 298 0) | 0.000 000 2 | (1 204 510.197) | 5.15E+8 | 3d $^2D_{5/2}$ | 7p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (90.193 440) | 0.000 004 | (1 108 728.09) | 2.30E+10 | 3p $^2P^\circ_{1/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (90.198 982) | 0.000 006 | (1 108 659.96) | 1.40E+10 | 3s $^2S_{1/2}$ | 6p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (90.208 920) | 0.000 004 | (1 108 537.82) | 2.48E+9 | 3p $^2P^\circ_{1/2}$ | 6s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (90.215 194) | 0.000 006 | (1 108 460.73) | 1.40E+10 | 3s $^2S_{1/2}$ | 6p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (90.317 720 6) | 0.000 000 2 | (1 107 202.434) | 2.94E+10 | 3d $^2D_{3/2}$ | 6f $^2F^\circ_{5/2}$ | 77ERI | 04JIT/BUN |
| (90.317 932) | 0.000 002 | (1 107 199.84) | 2.75E+10 | 3p $^2P^\circ_{3/2}$ | 6d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (90.323 086 7) | 0.000 000 3 | (1 107 136.655) | 1.15E+8 | 3d $^2D_{3/2}$ | 6p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (90.323 337) | 0.000 002 | (1 107 133.59) | 4.59E+9 | 3p $^2P^\circ_{3/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (90.338 862) | 0.000 002 | (1 106 943.32) | 5.02E+9 | 3p $^2P^\circ_{3/2}$ | 6s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (90.339 343 4) | 0.000 000 7 | (1 106 937.424) | 1.17E+9 | 3d $^2D_{3/2}$ | 6p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (90.358 266 4) | 0.000 000 2 | (1 106 705.606) | 3.14E+10 | 3d $^2D_{5/2}$ | 6f $^2F^\circ_{7/2}$ | 77ERI | 04JIT/BUN |
| (90.360 969 4) | 0.000 000 2 | (1 106 672.502) | 2.09E+9 | 3d $^2D_{5/2}$ | 6f $^2F^\circ_{5/2}$ | 77ERI | 04JIT/BUN |
| (90.366 340 6) | 0.000 000 3 | (1 106 606.723) | 1.04E+9 | 3d $^2D_{5/2}$ | 6p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (105.668 981) | 0.000 006 | (946 351.51) | 4.15E+10 | 3p $^2P^\circ_{1/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (105.676 561) | 0.000 008 | (946 283.63) | 2.40E+10 | 3s $^2S_{1/2}$ | 5p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (105.705 713) | 0.000 006 | (946 022.66) | 4.43E+9 | 3p $^2P^\circ_{1/2}$ | 5s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (105.715 026) | 0.000 008 | (945 939.32) | 2.41E+10 | 3s $^2S_{1/2}$ | 5p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |
| (105.834 216 9) | 0.000 000 3 | (944 874.002) | 6.22E+10 | 3d $^2D_{3/2}$ | 5f $^2F^\circ_{5/2}$ | 77ERI | 04JIT/BUN |
| (105.834 498) | 0.000 003 | (944 871.49) | 4.97E+10 | 3p $^2P^\circ_{3/2}$ | 5d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |

TABLE 21. Spectral lines of Na XI—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|
| (105.846 951 1) | 0.000 000 8 | (944 760.326) | 2.19E+8 | 3d $^2D^{\circ}_{3/2}$ | 5p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (105.847 322) | 0.000 003 | (944 757.01) | 8.28E+9 | 3p $^2P^{\circ}_{3/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (105.884 178) | 0.000 004 | (944 428.16) | 8.96E+9 | 3p $^2P^{\circ}_{3/2}$ | 5s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (105.885 540 0) | 0.000 001 1 | (944 416.02) | 2.23E+9 | 3d $^2D^{\circ}_{3/2}$ | 5p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (105.887 193 2) | 0.000 000 3 | (944 401.273) | 6.65E+10 | 3d $^2D^{\circ}_{5/2}$ | 5f $^2F^{\circ}_{7/2}$ | 77ERI | 04JIT/BUN |
| (105.893 6072) | 0.000 0003 | (944 344.070) | 4.43E+9 | 3d $^2D^{\circ}_{5/2}$ | 5f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (105.906 355 8) | 0.000 000 8 | (944 230.394) | 1.98E+9 | 3d $^2D^{\circ}_{5/2}$ | 5p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (154.459 162) | 0.000 012 | (647 420.32) | 8.59E+10 | 3p $^2P^{\circ}_{1/2}$ | 4d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (154.475 225) | 0.000 017 | (647 353.00) | 4.48E+10 | 3s $^2S_{1/2}$ | 4p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (154.612 586) | 0.000 014 | (646 777.88) | 8.99E+9 | 3p $^2P^{\circ}_{1/2}$ | 4s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (154.635 889) | 0.000 017 | (646 680.41) | 4.51E+10 | 3s $^2S_{1/2}$ | 4p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (154.786 367 9) | 0.000 000 7 | (646 051.725) | 1.89E+11 | 3d $^2D^{\circ}_{3/2}$ | 4f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (154.786 922) | 0.000 007 | (646 049.41) | 1.03E+11 | 3p $^2P^{\circ}_{3/2}$ | 4d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (154.839 582) | 0.000 002 | (645 829.69) | 5.10E+8 | 3d $^2D^{\circ}_{3/2}$ | 4p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (154.840 511) | 0.000 007 | (645 825.82) | 1.72E+10 | 3p $^2P^{\circ}_{3/2}$ | 4d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (154.886 632 6) | 0.000 000 7 | (645 633.508) | 2.02E+11 | 3d $^2D^{\circ}_{5/2}$ | 4f $^2F^{\circ}_{7/2}$ | 77ERI | 04JIT/BUN |
| (154.913 437 6) | 0.000 000 7 | (645 521.793) | 1.35E+10 | 3d $^2D^{\circ}_{5/2}$ | 4f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (154.966 740) | 0.000 002 | (645 299.76) | 4.61E+9 | 3d $^2D^{\circ}_{5/2}$ | 4p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (154.994 694) | 0.000 010 | (645 183.38) | 1.83E+10 | 3p $^2P^{\circ}_{3/2}$ | 4s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (155.001 006) | 0.000 005 | (645 157.10) | 5.19E+9 | 3d $^2D^{\circ}_{3/2}$ | 4p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (178.608 808) | 0.000 006 | (559 882.80) | 6.52E+9 | 4p $^2P^{\circ}_{1/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (178.617 985) | 0.000 010 | (559 854.04) | 4.13E+9 | 4s $^2S_{1/2}$ | 7p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (178.647 035) | 0.000 006 | (559 763.00) | 1.06E+9 | 4p $^2P^{\circ}_{1/2}$ | 7s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (178.658 019) | 0.000 010 | (559 728.58) | 4.15E+9 | 4s $^2S_{1/2}$ | 7p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (178.809 943) | 0.000 003 | (559 253.016) | 1.00E+10 | 4d $^2D^{\circ}_{3/2}$ | 7f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (178.810 290) | 0.000 003 | (559 251.93) | 7.82E+9 | 4p $^2P^{\circ}_{3/2}$ | 7d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (178.823 188) | 0.000 003 | (559 211.595) | 7.90E+7 | 4d $^2D^{\circ}_{3/2}$ | 7p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (178.823 629) | 0.000 003 | (559 210.21) | 1.30E+9 | 4p $^2P^{\circ}_{3/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (178.861 948) | 0.000 003 | (559 090.41) | 2.15E+9 | 4p $^2P^{\circ}_{3/2}$ | 7s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (178.863 313) | 0.000 003 | (559 086.144) | 8.03E+8 | 4d $^2D^{\circ}_{3/2}$ | 7p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (178.874 674 9) | 0.000 001 0 | (559 050.632) | 9.13E+9 | 4f $^2F^{\circ}_{5/2}$ | 7g $^2G_{7/2}$ | 77ERI | 04JIT/BUN |
| (178.874 791) | 0.000 003 | (559 050.268) | 1.08E+10 | 4d $^2D^{\circ}_{5/2}$ | 7f $^2F^{\circ}_{7/2}$ | 77ERI | 04JIT/BUN |
| (178.881 308 3) | 0.000 001 3 | (559 029.901) | 7.84E+6 | 4f $^2F^{\circ}_{5/2}$ | 7d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (178.881 462) | 0.000 003 | (559 029.421) | 7.17E+8 | 4d $^2D^{\circ}_{5/2}$ | 7f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (178.894 658 7) | 0.000 001 3 | (558 988.182) | 1.66E+8 | 4f $^2F^{\circ}_{5/2}$ | 7d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (178.894 717) | 0.000 003 | (558 988.000) | 7.15E+8 | 4d $^2D^{\circ}_{5/2}$ | 7p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (178.906 423 9) | 0.000 001 0 | (558 951.422) | 9.46E+9 | 4f $^2F^{\circ}_{7/2}$ | 7g $^2G_{9/2}$ | 77ERI | 04JIT/BUN |
| (178.910 426 5) | 0.000 001 0 | (558 938.917) | 3.38E+8 | 4f $^2F^{\circ}_{7/2}$ | 7g $^2G_{7/2}$ | 77ERI | 04JIT/BUN |
| (178.917 062 6) | 0.000 001 3 | (558 918.186) | 1.57E+8 | 4f $^2F^{\circ}_{7/2}$ | 7d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (216.459 961) | 0.000 009 | (461 979.20) | 1.05E+10 | 4p $^2P^{\circ}_{1/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (216.473 381) | 0.000 014 | (461 950.56) | 6.51E+9 | 4s $^2S_{1/2}$ | 6p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (216.549 149) | 0.000 009 | (461 788.93) | 1.75E+9 | 4p $^2P^{\circ}_{1/2}$ | 6s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (216.566 783) | 0.000 014 | (461 751.33) | 6.55E+9 | 4s $^2S_{1/2}$ | 6p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (216.743 947) | 0.000 004 | (461 373.900) | 1.76E+10 | 4d $^2D^{\circ}_{3/2}$ | 6f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (216.744 435) | 0.000 005 | (461 372.86) | 1.26E+10 | 4p $^2P^{\circ}_{3/2}$ | 6d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (216.774 853) | 0.000 004 | (461 308.121) | 1.38E+8 | 4d $^2D^{\circ}_{3/2}$ | 6p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (216.775 562) | 0.000 005 | (461 306.61) | 2.11E+9 | 4p $^2P^{\circ}_{3/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (216.833 312 1) | 0.000 001 4 | (461 183.750) | 1.94E+10 | 4f $^2F^{\circ}_{5/2}$ | 6g $^2G_{7/2}$ | 77ERI | 04JIT/BUN |
| (216.833 473) | 0.000 004 | (461 183.409) | 1.89E+10 | 4d $^2D^{\circ}_{5/2}$ | 6f $^2F^{\circ}_{7/2}$ | 77ERI | 04JIT/BUN |
| (216.848 791) | 0.000 002 | (461 150.830) | 1.50E+7 | 4f $^2F^{\circ}_{5/2}$ | 6d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (216.849 038) | 0.000 004 | (461 150.305) | 1.26E+9 | 4d $^2D^{\circ}_{5/2}$ | 6f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |
| (216.865 010) | 0.000 005 | (461 116.34) | 3.54E+9 | 4p $^2P^{\circ}_{3/2}$ | 6s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (216.868 515) | 0.000 005 | (461 108.89) | 1.40E+9 | 4d $^2D^{\circ}_{3/2}$ | 6p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (216.876 509 3) | 0.000 001 4 | (461 091.892) | 2.01E+10 | 4f $^2F^{\circ}_{7/2}$ | 6g $^2G_{9/2}$ | 77ERI | 04JIT/BUN |
| (216.879 949) | 0.000 002 | (461 084.580) | 3.17E+8 | 4f $^2F^{\circ}_{5/2}$ | 6d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (216.879 974) | 0.000 004 | (461 084.526) | 1.25E+9 | 4d $^2D^{\circ}_{5/2}$ | 6p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (216.885 849 5) | 0.000 001 4 | (461 072.035) | 7.18E+8 | 4f $^2F^{\circ}_{7/2}$ | 6g $^2G_{7/2}$ | 77ERI | 04JIT/BUN |
| (216.901 336) | 0.000 002 | (461 039.115) | 3.00E+8 | 4f $^2F^{\circ}_{7/2}$ | 6d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (333.775 45) | 0.000 02 | (299 602.62) | 1.81E+10 | 4p $^2P^{\circ}_{1/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (333.807 08) | 0.000 03 | (299 574.23) | 1.08E+10 | 4s $^2S_{1/2}$ | 5p $^2P^{\circ}_{3/2}$ | 77ERI | 04JIT/BUN |
| (334.142 21) | 0.000 03 | (299 273.77) | 3.16E+9 | 4p $^2P^{\circ}_{1/2}$ | 5s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (334.191 17) | 0.000 03 | (299 229.92) | 1.08E+10 | 4s $^2S_{1/2}$ | 5p $^2P^{\circ}_{1/2}$ | 77ERI | 04JIT/BUN |
| (334.397 310) | 0.000 009 | (299 045.468) | 3.53E+10 | 4d $^2D^{\circ}_{3/2}$ | 5f $^2F^{\circ}_{5/2}$ | 77ERI | 04JIT/BUN |

TABLE 21. Spectral lines of Na XI—Continued

| λ (Å) | Unc. (Å) | σ (cm$^{-1}$) | $A_{ki}$ (s$^{-1}$) | Lower level | Upper level | λ Ref. | $A_{ki}$ Ref. |
|---|---|---|---|---|---|---|---|
| (334.398 374) | 0.000 011 | (299 044.52) | 2.18E+10 | 4p $^2P^\circ_{3/2}$ | 5d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (334.524 473) | 0.000 011 | (298 931.79) | 2.76E+8 | 4d $^2D_{3/2}$ | 5p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (334.526 439) | 0.000 011 | (298 930.03) | 3.63E+9 | 4p $^2P^\circ_{3/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (334.583 145) | 0.000 003 | (298 879.371) | 6.01E+10 | 4f $^2F^\circ_{5/2}$ | 5g $^2G_{7/2}$ | 77ERI | 04JIT/BUN |
| (334.583 476) | 0.000 009 | (298 879.076) | 3.79E+10 | 4d $^2D_{5/2}$ | 5f $^2F^\circ_{7/2}$ | 77ERI | 04JIT/BUN |
| (334.646 840) | 0.000 007 | (298 822.485) | 3.52E+7 | 4f $^2F^\circ_{5/2}$ | 5d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (334.647 525) | 0.000 009 | (298 821.873) | 2.52E+9 | 4d $^2D_{5/2}$ | 5f $^2F^\circ_{5/2}$ | 77ERI | 04JIT/BUN |
| (334.669 818) | 0.000 003 | (298 801.967) | 6.23E+10 | 4f $^2F^\circ_{7/2}$ | 5g $^2G_{9/2}$ | 77ERI | 04JIT/BUN |
| (334.708 252) | 0.000 003 | (298 767.656) | 2.23E+9 | 4f $^2F^\circ_{7/2}$ | 5g $^2G_{7/2}$ | 77ERI | 04JIT/BUN |
| (334.771 994) | 0.000 007 | (298 710.770) | 7.07E+8 | 4f $^2F^\circ_{7/2}$ | 5d $^2D_{5/2}$ | 77ERI | 04JIT/BUN |
| (334.774 878) | 0.000 011 | (298 708.20) | 2.50E+9 | 4d $^2D_{5/2}$ | 5p $^2P^\circ_{3/2}$ | 77ERI | 04JIT/BUN |
| (334.775 095) | 0.000 007 | (298 708.003) | 7.45E+8 | 4f $^2F^\circ_{5/2}$ | 5d $^2D_{3/2}$ | 77ERI | 04JIT/BUN |
| (334.894 85) | 0.000 02 | (298 601.18) | 6.39E+9 | 4p $^2P^\circ_{3/2}$ | 5s $^2S_{1/2}$ | 77ERI | 04JIT/BUN |
| (334.910 221) | 0.000 011 | (298 587.48) | 2.81E+9 | 4d $^2D_{3/2}$ | 5p $^2P^\circ_{1/2}$ | 77ERI | 04JIT/BUN |

TABLE 22. Energy levels of Na XI

| Configuration | Term | J | Energy (cm$^{-1}$) | Uncertainty (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| 1s | $^2S$ | 1/2 | (0.) | 2 | 77ERI |
| 2p | $^2P^\circ$ | 1/2 | (9 971 484.9) | 0.2 | 77ERI |
| | | 3/2 | (9 976 865.74) | 0.09 | 77ERI |
| 2s | $^2S$ | 1/2 | (9 971 713.8) | 0.2 | 77ERI |
| 3p | $^2P^\circ$ | 1/2 | (11 819 964.44) | 0.05 | 77ERI |
| | | 3/2 | (11 821 558.94) | 0.03 | 77ERI |
| 3s | $^2S$ | 1/2 | (11 820 032.92) | 0.07 | 77ERI |
| 3d | $^2D$ | 3/2 | (11 821 556.228) | 0.001 | 77ERI |
| | | 5/2 | (11 822 086.160) | 0.001 | 77ERI |
| 4p | $^2P^\circ$ | 1/2 | (12 466 713.33) | 0.02 | 77ERI |
| | | 3/2 | (12 467 385.92) | 0.01 | 77ERI |
| 4s | $^2S$ | 1/2 | (12 466 742.32) | 0.03 | 77ERI |
| 4d | $^2D$ | 3/2 | (12 467 384.762) | 0.008 | 77ERI |
| | | 5/2 | (12 467 608.357) | 0.008 | 77ERI |
| 4f | $^2F^\circ$ | 5/2 | (12 467 607.953) | 0.003 | 77ERI |
| | | 7/2 | (12 467 719.668) | 0.003 | 77ERI |
| 5p | $^2P^\circ$ | 1/2 | (12 765 972.25) | 0.01 | 77ERI |
| | | 3/2 | (12 766 316.554) | 0.007 | 77ERI |
| 5s | $^2S$ | 1/2 | (12 765 987.11) | 0.02 | 77ERI |
| 5d | $^2D$ | 3/2 | (12 766 315.956) | 0.005 | 77ERI |
| | | 5/2 | (12 766 430.438) | 0.005 | 77ERI |
| 5f | $^2F^\circ$ | 5/2 | (12 766 430.230) | 0.003 | 77ERI |
| | | 7/2 | (12 766 487.433) | 0.003 | 77ERI |
| 5g | $^2G$ | 7/2 | (12 766 487.324 1) | 0.000 7 | 77ERI |
| | | 9/2 | (12 766 521.635 5) | 0.000 7 | 77ERI |
| 6p | $^2P^\circ$ | 1/2 | (12 928 493.652) | 0.008 | 77ERI |
| | | 3/2 | (12 928 692.883) | 0.004 | 77ERI |
| 6s | $^2S$ | 1/2 | (12 928 502.263) | 0.009 | 77ERI |

TABLE 22. Energy levels of Na XI—Continued

| Configuration | Term | J | Energy (cm$^{-1}$) | Uncertainty (cm$^{-1}$) | Reference |
|---|---|---|---|---|---|
| 6d | $^2$D | 3/2 | (12 928 692.533) | 0.004 | 77ERI |
| | | 5/2 | (12 928 758.783) | 0.004 | 77ERI |
| 6f | $^2$F° | 5/2 | (12 928 758.662) | 0.003 | 77ERI |
| | | 7/2 | (12 928 791.766) | 0.003 | 77ERI |
| 6g | $^2$G | 7/2 | (12 928 791.703 1) | 0.000 8 | 77ERI |
| | | 9/2 | (12 928 811.560 1) | 0.000 8 | 77ERI |
| 6h | $^2$H° | 9/2 | (12 928 811.521 2) | 0.000 2 | 77ERI |
| | | 11/2 | (12 928 824.757 2) | 0.000 2 | 77ERI |
| 7p | $^2$P° | 1/2 | (13 026 470.906) | 0.005 | 77ERI |
| | | 3/2 | (13 026 596.357) | 0.003 | 77ERI |
| 7s | $^2$S | 1/2 | (13 026 476.331) | 0.006 | 77ERI |
| 7d | $^2$D | 3/2 | (13 026 596.135) | 0.002 | 77ERI |
| | | 5/2 | (13 026 637.854) | 0.002 | 77ERI |
| 7f | $^2$F° | 5/2 | (13 026 637.778) | 0.002 | 77ERI |
| | | 7/2 | (13 026 658.625) | 0.002 | 77ERI |
| 7g | $^2$G | 7/2 | (13 026 658.584 9) | 0.000 7 | 77ERI |
| | | 9/2 | (13 026 671.089 9) | 0.000 7 | 77ERI |
| 7h | $^2$H° | 9/2 | (13 026 671.065 4) | 0.000 2 | 77ERI |
| | | 11/2 | (13 026 679.400 84) | 0.000 2 | 77ERI |
| 7i | $^2$I | 11/2 | (13 026 679.3584 1) | 0.000 07 | 77ERI |
| | | 13/2 | (13 026 685.337 54) | 0.000 07 | 77ERI |
| | | *Limit* | (13 297 671.) | 2 | 77ERI |

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