TABLE OF THREE-QUASIPARTICLE ROTATIONAL BANDS IN DEFORMED NUCLEI, 153≤ A ≤187

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The experimentally observed level structures based on three-quasiparticle (3qp) states are classified according to their intrinsic structures, and other properties deduced from measurements such as B(M1)/B(E2) ratios, $|g_K-g_R|$ values, lifetimes, etc. The present table lists data for a total of 168 such structures which have been extracted from the literature for 55 nuclides in the mass region A=153−187 (Z=63-78, N=88-112), with majority of these bands in the A=180 region; 28 bands in seven Re isotopes alone. Nuclear models used for the interpretation of 3qp structures, generalization of the Gallagher-Moszkowski (G-M) rules to 3qp states, and high-spin features such as t-bands, high-K isomers, signature splitting, signature inversion, alignment, etc. are discussed briefly. The literature cutoff date for extraction of data for known 3qp structures is July 15, 2005.

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1. Introduction

In odd-A nuclei, the states of next higher seniority following the one-quasiparticle excitations are the three-quasiparticle (3qp) states. At excitation energy ≥ 1 MeV, which is approximately the energy gap 2Δ in the rare-earth region, a proton or a neutron pair can break up and form a 3qp state in an odd-A nucleus. Two kinds of 3qp states are possible: those having all the three particles of the same kind (*nnn* and *ppp*) and others having a combination of two kinds of particles (*npp* and *nnp*). In a deformed nucleus, coupling of three-quasiparticles in Nilsson states having K values, say, K_1, K_2 and K_3 leads to a quadruplet with resultant $K=|K_1 \pm K_2 \pm K_3|$. These four intrinsic states split up due to residual interaction among the three nucleons; the residual n-p interaction plays a major role in this splitting [1, 2].

Jain et al. [3] had compiled for the first time the experimental data on 3qp states; data existed for only 20 nuclides and 48 3qp bands at that time. Out of these 48 bands, there are 6 bands that have either been assigned structures different from 3qp or do not possess adequate experimental evidence to qualify as 3qp bands; these are excluded from the present compilation. In addition one band with a tentative 3qp assignment has now been confirmed, and 5 bands have been assigned revised 3qp configurations on the basis of alignments, g_K factors, etc.

The population of 3qp and multi-quasiparticle (MQP) structures is generally weak and these could only be investigated in detail only in recent years by large gamma detector arrays and improved gamma-ray analysis techniques. In the present table, we list energy levels, spins and parities, lifetimes, and other observed or deduced characteristics for all experimentally known 3qp structures in the deformed region, covering a total of 55 nuclides. We have included only those bands which start out as 3qp bands at the bandhead, leaving out those bands which start out as single-particle bands and develop into 3qp bands after band crossing / backbending. However, the complete band, i.e. including the top portion where it may have undergone band crossings/ backbending or band termination, is listed once it starts out as a 3qp band. The cutoff date for collection of data from the original publications is July 15, 2005.

All the nuclei compiled in this table are shown in figure 1. Each nucleus is assigned a box that exhibits the total number of observed 3qp bands, minimum excitation energy, minimum and maximum spins assigned in these bands, the corresponding parities, and the number of bands which exhibit signature splitting and signature inversion. The largest concentration of 3qp bands is found in the A=180 mass region, where seven Re isotopes, six Lu isotopes, six Ta isotopes and eight Hf isotopes, exhibit 28, 27, 25, and 22 bands, respectively. It should be noted that a critical review and evaluation of the experimental data is not the aim of this paper and most of the information has been gleaned from the reference(s) cited for each band. We have, however, included in the table, as much as possible, deduced B(M1)/B(E2) ratios, $|g_K-g_R|$ values in cases where such values were not given in the original papers but could be deduced from available experimental data in the publications.

2. Salient features of 3qp Bands

1. The bandheads generally lie at high excitation energies (≥1 MeV).
2. For ΔI=1 bands, crossover E2 transitions are seen in many cases. The resulting B(M1)/B(E2) ratios and the $|g_K-g_R|$ values lie in the range of 0.01 – 13.8 $(\mu_N/eb)^2$ and 0.01-0.76, respectively. Only in one case (a level in band #5 of ^{183}W), B(M1)/B(E2) ratio is 36.4 $(\mu_N/eb)^2$.
3. These bands carry dynamical moment of inertia $\Im^{(2)}$, close to that for the other normal deformed bands.
4. Signature splitting is observed in many cases while signature inversion is seen in only some of the 3qp bands.
5. Some of these bands display the phenomena of bandcrossing. Few of them also display a backbending feature.

3. Generalization of Gallagher-Moszkowski (GM) rules, Tilted- Rotation, and High-K Isomers

3.1 Generalization of GM rules:

On the basis of a semi-empirical model for the calculation of energies of 3qp states, Jain and Jain [1] proposed two strong rules for (*nnp*) or (*ppn*) configurations. According to these rules, the highest-lying member of a given quadruplet always has a spin combination in which spins of like particles are parallel while those of unlike particles are antiparallel, and states having all three spins in the same direction cannot lie lowest in energy. For (*nnn*) or (*ppp*) configurations, however, the state having all three spins in the same direction will be the highest in energy. These rules were further strengthened by Jain et al. [2,4] who generalized the model as well as these rules for MQP states. The strong rule for MQP states becomes: the highest energy state in a multiplet always has an intrinsic-spin combination in which the intrinsic spins of like particles are parallel and that of unlike particles are antiparallel. In addition, a weak rule was also proposed as: the lowest energy state has the maximum number of antiparallel couplings of the like-particle intrinsic spins. These rules represent a generalization of the GM rules for 2qp states to the MQP states. As an example, we cite the $9/2[514]_\pi \otimes 7/2[514]_\nu \otimes 9/2[624]_\nu$ configuration of ^{177}Lu. Out of four bandheads corresponding to this configuration, the following three (bands 3, 5 and 6 of ^{177}Lu in the table) are experimentally confirmed:

K	E	Spin Combinations (*pnn*)
$11/2^+$	1230.4	↑↑↑
$25/2^+$	1325	↑↓↑
$7/2^+$	1336.5	↑↓↓

The $7/2^+$ state with spin combinations ↑↓↓ is the highest in energy, which is in accordance with the generalized GM rules.

3.2 Tilted Rotational Band (t-band) Phenomenon:

In rapidly rotating nuclei, various angular momentum coupling schemes are generated due to the competition between inertial forces and forces generated by deformed field [5]. As the rotational frequency increases, the quasiparticles in the presence of pairing may undergo a change from the deformed aligned coupling scheme to the Fermi aligned coupling, and finally to the rotation aligned coupling scheme. Details of this change in the coupling scheme depend on the position of the Fermi energy and the quasiparticle angular momentum [6]. Thus, a combination of different coupling schemes is expected at high spins of the MQP bands. It has been shown that [7] the combination and changes in quasiparticle coupling schemes can be successfully described by means of cranking around an axis which is tilted with respect to the principal axes of the deformed field. This type of rotation is called Tilted-Axis Cranking (TAC) and a band built on this rotation is referred to as the Tilted rotational band (t-band). We have seven t-bands in this compilation: band 5 in ^{163}Er, band 4 in ^{179}W, bands 3 and 5 in ^{181}Re, bands 3 and 8 in ^{183}Re, and band 2 in ^{181}Os. The involvement of t-bands in the explanation of anomalous (weakly hindered) K-isomer decays in ^{179}W has been discussed by Walker et al. [8]. A pair of neutrons having high-K, $i_{13/2}$ configuration play an important role in the t-bands. The observation of t-bands in ^{181}Re [9], together with their qualitative description by the TAC model, suggest a more widespread influence of t-bands, which provide a mechanism for the introduction of large-amplitude high-K components in the yrast bands of A~180 region.

3.3 High-K States and Isomers:

One member of the 3qp quadruplet will have $K=K_1 + K_2 + K_3$, which is often quite large. This leads to a K-forbiddenness in the gamma transitions and gives rise to high K-isomers which are found to be concentrated in the A≈ 180 mass region and their detailed understanding presents new challenges [10]. A plot of Log$T_{1/2}$ vs. N and Z for known 3qp isomers is shown in figure 2. All except two lie in the range Z=71 to 77 and N=99 to 112. The two exceptions, not shown in figure 2, are isomers in ^{153}Eu and ^{163}Er with half-lives of 475 ns and ≤ 75 ns, respectively. The bandhead K value for these isomers lies in the range ≈ 19/2 to 29/2. The occurrence of these isomers can be reasonably explained on the basis of the deformed shell model as several high-Ω orbitals lie near the Fermi energy in this mass region. Of particular relevance are the $h_{11/2}$ and $g_{7/2}$ proton and the $h_{9/2}$ and $i_{13/2}$ neutron orbitals.

4. Theoretical Approaches for Identification of 3qp Structures

4.1 Residual Interaction and Splitting of 3qp States:

We notice from our compilation that experimental observation of a complete quadruplet of 3qp states is yet to be confirmed in any of the nuclides listed. The problem of calculating the relative energies of the states resulting from the coupling of the angular momenta of the three valence particles was first considered by Jain and Jain [1], and this model was generalized to the MQP states by Jain et al. [11]. Assuming a rotor plus 3qp model, the excitation energy of a 3qp configuration can be written as [11]

$$E(I) = E_p + E_{rot} + E_{pair} + E_{res} \qquad (1)$$

where E_p is the contribution for particle energies, E_{rot} is the contribution for rotational energies, E_{pair} is the pairing energy, and E_{res} is the energy of residual interaction between pairs of neutrons and protons. For 3qp bands,

$$E_p = \sum_{i=1}^{3} E^{(i)}{}_{qp} , \qquad (2)$$

$$E_{rot} = (\eta^2/2\mathfrak{I}_{3qp})(I(I+1)-K^2) , \qquad (3)$$

and

$$E_{pair} = 2\Delta. \qquad (4)$$

The pairing gap can be taken from the mass data or, can be calculated by using a prescription such as the BCS model. The effective moment of inertia for a 3qp state can be expressed as:

$$\mathfrak{I}_{3qp} = \sum_{i=1}^{3} \mathfrak{I}_{qp} - 2\,\mathfrak{I}_{e\text{-}e} , \qquad (5)$$

where $\Im_{e\text{-}e}$ is the moment of inertia for the even-even core. In an empirical approach, the effective residual interaction, E_{res}, in a 3qp configuration can be taken as a sum of the interactions between three possible 2qp combinations and is given by

$$E_{res} = \sum_{i<j} \left[E_{ij}^{(GM)} (1/2 - \delta_{\Sigma_{ij,0}}) - \delta_{K_{ij,0}} E_{ij}^{(N)} \Pi_{ij} \right], \quad (6)$$

where $E_{ij}^{(GM)}$ is the GM splitting energy between the triplet and the singlet states of a 2qp combination, $\Sigma_{ij,0}$ is the intrinsic spin projection on the symmetry axis, $E_{ij}^{(N)}$ is the odd-even (Newby) shift [12] and Π_{ij} is the parity. This simple empirical formulation has been able to correctly reproduce the ordering and the splitting of the known 3qp states for a given 3qp quadruplet. A generalization of this model to the MQP states has been widely successful in explaining and predicting the MQP states [2, 4, 11]. As an example, we cite the results of a calculation due to Kiran Jain et al. [11], where 3qp and 5qp states in ^{179}W have been calculated and compared successfully with the available data. This model incorporates the residual interaction contribution from the empirical data (GM splitting and Newby shift) and the pairing interaction by using the Lipkin-Nogami approach. In situations, where empirical data on GM splittings and Newby shifts are not available, one may use the results from the residual interaction calculations based on parameters derived from fits to the GM splittings and Newby shifts [13].

4.2 Potential-Energy Surface (PES) and Cranked Shell Model (CSM) Calculations:

In another approach to understand the excitation energies and the shapes of MQP configurations, the potential-energy surface calculations have also been used [14]. For example, Purry et al. [15] apply this method to ^{183}Re where occupied orbitals are fixed for each quasiparticle configuration and the shape is varied to minimize the excitation energy. These calculations ignore the residual nucleon-nucleon interactions.

Many authors have used the Cranked Shell Model (CSM) calculations [16,17] to make specific single-particle configuration assignments. The CSM calculates the quasiparticle energies e' in the rotating frame providing Routhians as a function of the rotational frequency $\eta\omega$. The alignment i can be calculated from $i = - de'/d\omega$. These calculations also ignore the residual nucleon-nucleon interactions. The experimental values of the Routhians and alignments (see sec. 5.2) are also extracted from the data and compared with the theoretical results. As examples, we cite the works of Gale et al. [18] for ^{157}Er and Vlastou et al. [19] for ^{155}Dy.

5. Experimental Inputs to the Quasiparticle Configuration Assignments

5.1 B (M1)/B (E2) ratios and $|g_K\text{-}g_R|$ values:

Several papers, for example Walker et al [20], discuss the most commonly used methodology for the assignment of the spin, parity, and the configuration of each band. If the Coriolis perturbations are not large, it is reasonable to assume that the quantum number K of a band is equal to the spin of the bandhead. If high-j orbitals are involved in the configuration, this assumption is only approximately valid. Most of the papers proceed to extract the intrinsic gyromagnetic factor g_K, and the B(M1)/B(E2) ratio by using the experimental information on the gamma ray energies, intensities and the E2/M1 multipole mixing ratios. Other inputs are the rotational g-factor g_R, and the intrinsic quadrupole moment Q_0.

In view of their importance, we have compiled and/or, deduced in this table, the B(M1)/B(E2) ratios and $|g_K\text{-}g_R|$ values. The B(M1)/B(E2) ratios have been listed for a total of 81 bands; values for 52 bands have been taken from the published works, and for 29 bands, these have been deduced in the present work from available experimental information in the original papers, Evaluated Nuclear Structure Data File (ENSDF) or Experimental Unevaluated Nuclear Data List (XUNDL). Similarly, the $|g_K\text{-}g_R|$ values are listed for a total of 73 bands, out of which values for 19 bands have been deduced in the present work from the available experimental information.

In the strong coupling limit, and assuming pure-K, the general expressions for deducing the B(M1)/B(E2) and the $|g_K\text{-}g_R|$ values are [21]:

$$\lambda = \frac{I_\gamma(I \to I-2)}{I_\gamma(I \to I-1)} \tag{7}$$

$$\frac{\delta^2}{1+\delta^2} = \frac{2K^2(2I-1)}{(I+1)(I+K-1)(I-K-1)} \frac{E_\gamma^5(I \to I-1)}{E_\gamma^5(I \to I-2)} \lambda \tag{8}$$

$$\frac{(g_K - g_R)}{Q_0} = 0.93 \frac{E_\gamma(I \to I-1)}{\delta\sqrt{I^2-1}} \tag{9}$$

$$\frac{B(M1: I \to I-1)}{B(E2: I \to I-2)} = 0.697 \frac{E_\gamma^{\,5}(I \to I-2)}{E_\gamma^{\,3}(I \to I-1)} \frac{1}{\lambda(1+\delta^2)} \tag{10}$$

where λ is the branching ratio, I_γ is the γ-ray transition intensity, δ is the E2/M1 mixing ratio, E_γ is the γ-ray energy in MeV, g_R is the rotational g-factor, Q_0 is the intrinsic quadrupole moment in units of *eb*. Only the angular distribution/correlation measurements can give directly the magnitude and the sign of δ, while the magnitude of δ can also be obtained from conversion electron data. However, since the angular anisotropy data generally have large uncertainties, and the conversion electron measurements are rare, most experimentalists extract the magnitude of δ by using the expression (8) above. Once δ is known, it can be used to extract $|g_K - g_R|$, provided Q_0 is known. In the absence of adequate information, some commonly used practices to determine g_R and Q_0 are:

(i) one can obtain g_R by using the measured magnetic moment (μ) of the ground state band (gsb) in the pure-K formula,

$$\mu = g_R I + (g_K - g_R)\frac{K^2}{I+1} \qquad (11)$$

where $|g_K - g_R|$ is inserted from the expression (9) [21,22,23]. Similarly the value of Q_0 measured for the gsb can be used in eq. (9) for the determination of $|g_K - g_R|$ [e.g. see ref. 23]. Some authors have also used an estimate of Q_0 from the neighboring nuclei [22].

(ii) one can assume the values of g_R and Q_0, which are consistent with the systematics of in a region under study [20, 24].

(iii) one can obtain g_R by using the relation [25],

$$g_R = \frac{Z\Im_p}{N\Im_n + Z\Im_p} \qquad (12)$$

where $\Im_p$ and $\Im_n$ are proton and neutron moments of inertia. $\Im_p$ and $\Im_n$ can be calculated from the pairing parameters $\Delta_{p,n}$ by using the Migdal prescription [26].

The measured g_K value (given by eq. 9) may not always match with the calculated g_K value [20, 27] due to: Coriolis mixing between MQP rotational bands having high-j configurations [27], mixing between MQP rotational bands having different intrinsic configurations, changes in g_R due to reduction of pairing and changes in deformation, which leads to changes in Q_0.

5.2 Aligned Angular Momentum:

The aligned angular momentum or, simply the alignment often assists in making the configuration assignment, particularly when the alignment is large suggesting that the high-j orbitals are involved. The alignment is usually extracted by using the plots of $I_x(\omega)$ and $I_{ref}(\omega)$ vs. the rotational frequency ω, and calculating the difference,

$$i(\omega) = I_x(\omega) - I_{ref}(\omega) \qquad (13)$$

where $I_x(\omega) = \sqrt{I(I+1) - K^2}$ is the component of the total angular momentum I of the band on the rotation axis, and $I_{ref}(\omega)$ corresponds to a reference band (usually that of the even-even core nucleus) having zero alignment. To first order, the total alignment for a 3qp band should be the sum of the constituent one quasiparticle components. However, this additivity may fail due to blocking of pairing correlations as shown by Dracoulis et al. [28].

6. Signature splitting and Signature Inversion

Odd–even staggering in the rotational bands of odd-A [3], and odd-odd nuclei [13] is a commonly observed phenomenon and is linked to the signature quantum number. The Coriolis term in the Hamiltonian splits a given ΔI=1 cascade into two ΔI=2 bands, which are distinguished from each other by the signature quantum number α or r. When $\alpha = +1/2$, I=1/2, 5/2, 9/2… and when $\alpha = -1/2$, I=3/2, 7/2, 11/2… etc. The favored signature (or, the one lying lower in energy) is usually given by:

$$\alpha_f = 1/2\,(-1)^{(j-1/2)}. \qquad (14)$$

for rotational bands in odd-A nuclei. This rule is useful to predict the phase of oscillations, and can be easily extended to the 2qp bands in odd-odd/even-even nuclei, where the favored signature is given by:

$$\alpha_f = 1/2\,(-1)^{(j_1-1/2)} + 1/2\,(-1)^{(j_2-1/2)} \qquad (15)$$

A similar empirical rule, which is an extension of the rule for 2qp bands [13, 29], can be devised to check the favored signature in high-K 3qp bands of odd-A nuclei. In such cases of 3qp bands, the favored spin is given by,

$$I_f = (j_1 + j_2 + j_3) \bmod 2 \qquad (16)$$

and the favored signature is given by,

$$\alpha_f = 1/2\,(-1)^{(j_1-1/2)} + 1/2\,(-1)^{(j_2-1/2)} + 1/2\,(-1)^{(j_3-1/2)} \qquad (17)$$

where j_1, j_2, and j_3 are the angular momentum quantum numbers for the three particles. It may be remarked that j is generally not a good quantum number in deformed nuclei. However, most of these 3qp structures involve more than one, or, sometimes all three orbitals, which have high-j value. Such orbitals usually remain pure, and the corresponding j can be used in the expression given above. However, these rules are useful to predict only the phase of oscillations.

Besides the signature splitting, many bands also display a phenomenon called the signature inversion. In this phenomenon, the levels of the favored signature lie lower in energy at lower spins but the levels of the other signature lie lower in energy beyond a certain angular momentum. This phenomenon has also been shown to be primarily due to higher order Coriolis effects in the case of 2qp bands in odd-odd nuclei [30]. However, no such quantitative calculations are reported for 3qp bands.

In the present compilation, we notice that there are 48 bands, which exhibit a signature splitting, and sometimes signature inversion also. In figure 3, we plot $\Delta E_\gamma(I) = E_\gamma(I+2 \rightarrow I+1) - E_\gamma(I+1 \rightarrow I)$ vs. I for six of the 48 cases; signature splitting and signature inversion is evident from these plots. It is not possible to draw any conclusion for those cases where only 3 or 4 transitions are known; these are not included in the 48 cases. Rule given by eq. (17) has been found to work in all the cases, and is helpful in testing the favored signature.

7. Conclusions

In this table, we present the experimental data extracted from the literature for those structures, which have been interpreted to have intrinsic 3qp character. Data are compiled for a total of 168 such bands in 55 nuclei in the region $153 \leq A \leq 187$. The level and transition energies, spins, parities, configuration assignments, lifetimes and other relevant parameters of 3qp bands are listed in the main Table. A good understanding of these bands and that of high-spin features such as t-band, high-K isomers, signature splitting, signature inversion, backbending, etc. can be obtained by using the various theoretical and semi-empirical approaches and generalization of the GM rules as briefly discussed in this work. However, a detailed understanding of the 3qp states and the rotational bands based on them in terms of the Coriolis effects and the residual interactions is yet to be achieved. Observation of predicted low-K members of a 3qp quadruplet, and hence confirmed identification of a complete 3qp quadruplet remains a challenge to the experimentalists.

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FIGURE CAPTIONS

Figure 1: Chart of Z vs. N for the 3qp states included in this compilation. See the key (inset) for nomenclature of entries in each box.

Figure 2: A plot of the N-Z plane around the A ≈ 180 mass region illustrating the occurrence of the 3qp isomers. The longest half-life is for ^{177}Lu, with $T_{1/2}$=160.4 d. The only examples not shown are ^{153}Eu and ^{163}Er with $T_{1/2}$= 475 ns and ≤ 75 ns, respectively, which lie far from the A=180 mass region.

Figure 3: Plots of $\Delta E_\gamma(I) = E_\gamma(I+2 \rightarrow I+1) - E_\gamma(I+1 \rightarrow I)$ (MeV) vs. I for six of the 48 cases, which exhibit signature splitting and sometimes signature inversion, e.g. ^{155}Dy, ^{157}Ho, and ^{163}Er, exhibit signature inversion.

N→	88	89	90	91	92	93	94	95	96	97
$_{77}$Ir							2 ($23/2^-$) ($37/2^-$)			
$_{76}$Os				1 1.7 ($21/2^-$) ($27/2^-$)				1 2.3 ($25/2^-$) ($53/2^-$) SS(1) SI(1)		
$_{75}$Re							1 1.3 (15/2) (39/2) SS(1)			
$_{74}$W				1 1.9 $23/2^-$ ($59/2^-$) SS(1) SI(1)		1 1.8 $23/2^-$ ($61/2^-$) SS(1) SI(1)				
$_{72}$Hf						1 1.7 $23/2^-$ $67/2^-$				2 1.7 ($15/2^+$) ($53/2^-$) SS(1) SI(1)
$_{71}$Lu	1 2.4 $25/2^+$ $45/2^+$ SS(1)				2 2.4 $21/2^+$ $69/2^+$ SS(2) SI(2)		1 2.5 $27/2^+$ $85/2^+$ SS(1)			
$_{70}$Yb								4 1.7 $5/2^+$ ($69/2^+$)		1 (3.8) ($37/2^-$) ($63/2^-$) SS(1)
$_{69}$Tm	2 2.3 $27/2^+$ $73/2^-$ SS(2) SI(2)								2 1.6 $17/2^-$ ($53/2^-$) SS(2) SI(1)	
$_{68}$Er		1 2.4 ($23/2^-$) ($53/2^-$) SS(1) SI(1)		1 2.3 $21/2^-$ ($87/2^-$) SS(1)				9 1.2 $3/2^+$ $75/2^+$ SS(3) SI(1)		
$_{67}$Ho			2 2.3 $23/2^+$ $73/2^+$ SS(1) SI(1)						1 1.5 ($17/2^+$) ($37/2^+$)	
$_{66}$Dy		1 2.0 $25/2^-$ $93/2^-$ SS(1) SI(1)								
$_{65}$Tb	2 2.6 $23/2^{(+)}$ ($51/2^+$) SS(1)		1 2.7 $27/2^{(+)}$ ($79/2^+$)							
$_{64}$Gd		1 1.5 $21/2^-$ ($45/2^-$)								
$_{63}$Eu			1 1.8 $19/2^-$ $29/2^-$							

Z \ N→	99	100	101
$_{75}$**Re**		1 1.8 (19/2) (41/2)	
$_{73}$**Ta**		3 1.5 $17/2^-$ $(59/2^+)$ SS(2) SI(1)	
$_{72}$**Hf**	2 1.6 $19/2^+$ $47/2^-$ SS(1) SI(1)		3 1.1 $(13/2^+)$ $41/2^+$
$_{71}$**Lu**		4 1.2 $13/2^+$ $(61/2^+)$ SS(2)	

No. of bands	E_{min}(MeV)
I^π(min.)	I^π(max.)
SS=Signature Splitting	SI=Signature Inversion

Z \ N→	102	103	104	105	106	107	108	109	110	112
$_{78}$**Pt**						1 3.1 $(33/2^-)$ $(47/2^-)$ SS(1)				
$_{77}$**Ir**			6 1.8 $19/2^+$ $(53/2^+)$ SS(2)							
$_{76}$**Os**				3 1.7 $21/2^+$ $71/2^-$ SS(2)		2 1.6 $15/2^-$ $(51/2^-)$ SS(1) SI(1)		2 1.6 $19/2^+$ $(55/2^-)$ SS(2)		
$_{75}$**Re**	5 1.4 $15/2^+$ $(49/2^+)$ SS(2)		5 1.3 $15/2^-$ $(31/2^+)$ SS(1)		5 1.7 $17/2^+$ $55/2^-$ SS(4)		9 1.6 $(11/2^+)$ $49/2^+$ SS(1)			2 1.5 $19/2^-$ $(21/2^+)$
$_{74}$**W**		2 1.6 $19/2^+$ $37/2^+$ SS(1)		6 0.7 $(3/2)^+$ $(53/2^-)$ SS(1) SI(1)				5 1.7 $19/2^-$ $31/2^{(-)}$		
$_{73}$**Ta**	4 1.6 $17/2^+$ (47/2) SS(1)		9 1.3 $3/2^-$ $(47/2^+)$ SS(1)		4 1.3 $21/2^-$ $(41/2^-)$ SS(1)		4 1.4 $15/2^-$ $29/2^-$			1 1.3 $21/2^-$
$_{72}$**Hf**		2 1.4 $19/2^+$ $39/2^-$		3 1.3 $19/2^-$ $39/2^+$		6 1.1 $(17/2^+)$ $(37/2^-)$		3 1.0 $(17/2^+)$ $(25/2^-)$		
$_{71}$**Lu**			4 1.4 $(9/2^+)$ $19/2^+$		15 1.0 $7/2^+$ $37/2^-$					
$_{70}$**Yb**				4 1.5 $1/2^+$ $3/2^+$						

Figure 1

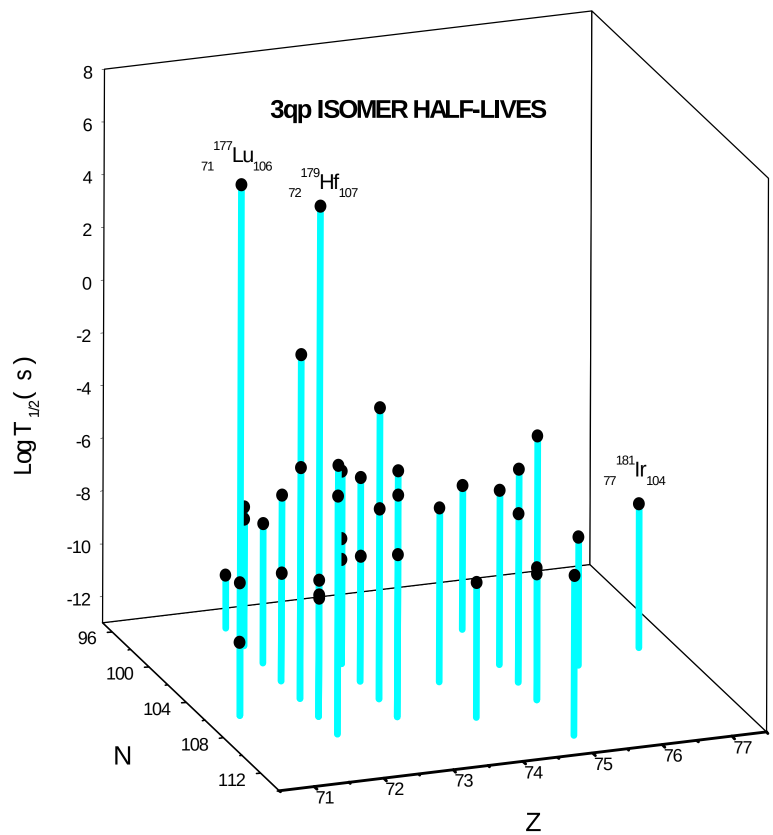
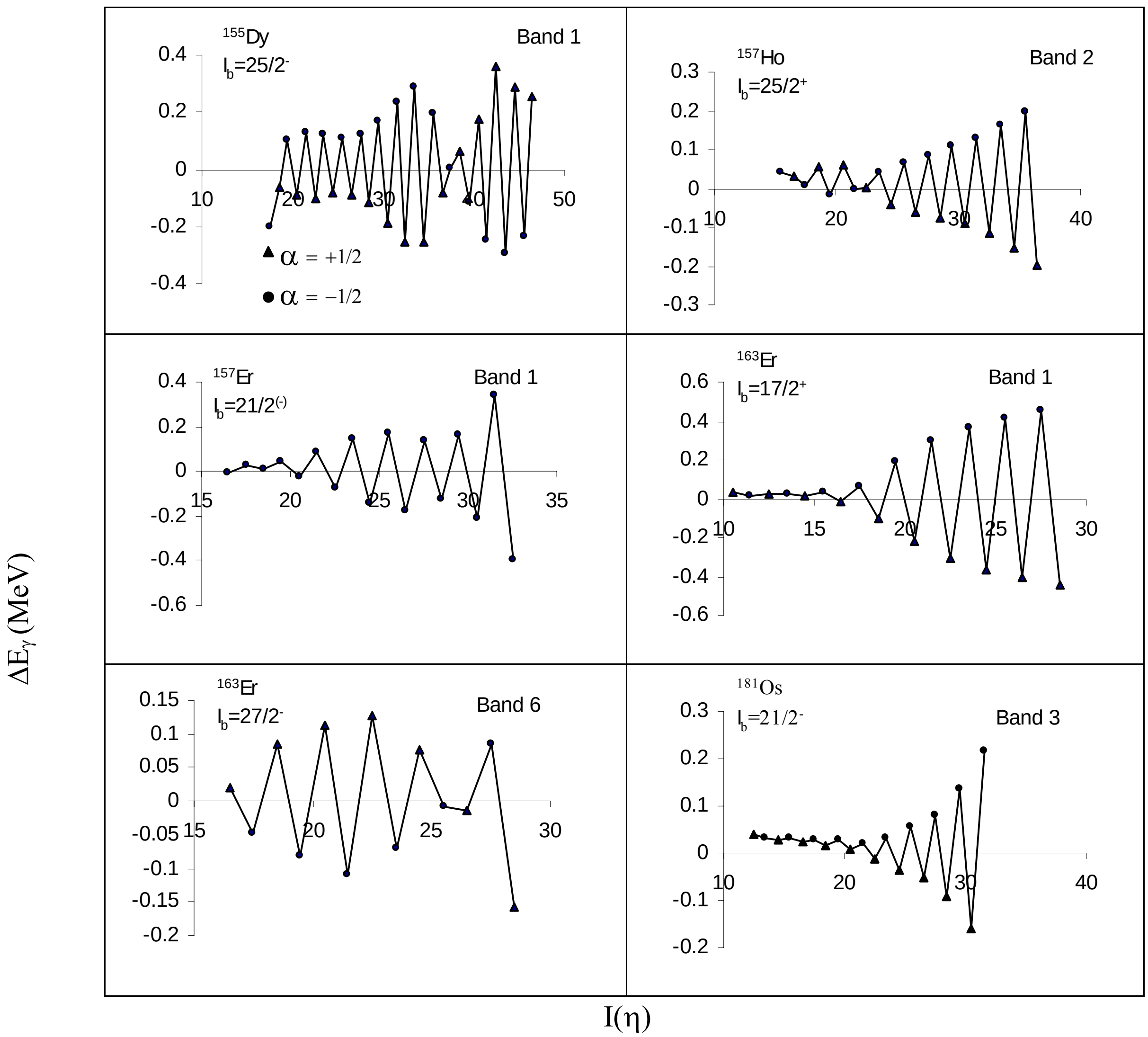

3qp ISOMER HALF-LIVES
Log T 1/2 (s)
8
6
4
2
0
-2
-4
-6
-8
-10
-12
177 Lu 71 106
179 Hf 72 107
181 Ir 77 104
N
96
100
104
108
112
Z
71
72
73
74
75
76
77

Figure 2



ΔEγ (MeV)
I(η)
155Dy
Ib=25/2-
Band 1
α = +1/2
α = −1/2
157Ho
Ib=25/2+
Band 2
157Er
Ib=21/2(-)
Band 1
163Er
Ib=17/2+
Band 1
163Er
Ib=27/2-
Band 6
181Os
Ib=21/2-
Band 3

Figure 3

POLICIES

Level Energies: The listed level energies are taken from the first reference given for a band. In some cases, the energy values are extracted from the ENSDF / XUNDL database with the citation of the original source reference alone. The two signature partners of a band are listed as one composite band.

References: The references are listed in a chronological order in terms of the key numbers as assigned in the Nuclear Science References (NSR) database at the Brookhaven National Laboratory, U.S.A

Configuration assignments: The Configurations given in the Table are those which are considered by the original authors as the favored or the most probable.

Explanation of Table

TABLE: Three-quasiparticle Rotational Bands

$^{A}_{Z}X_{N}$: Denotes the specific nuclide with

X Chemical symbol
A Mass number
Z Atomic number
N Neutron number

A single blank row marks the end of entries for each band. The number in the first column denotes band number.

E_{level} : Level energy in units of keV. The energy in parentheses denotes a tentative level. Labels X and Y indicate that the excitation energy is unknown due to lack of knowledge about linking transitions to the lower levels. The level energies are extracted from the original references or taken from the ENSDF or the XUNDL database, where it is not given in the original reference(s).

I^{π} : Denotes the level spin for each band member. π denotes the parity (+ , or −). I^{π} in parentheses denotes tentative spin and/or parity assignment.

E_{γ} (M1): γ−transition energy in units of keV for M1 ($I \rightarrow I-1$) transition. The energy in parentheses denotes a tentative transition.

E_{γ} (E2) : γ−transition energy in units of keV for E2 ($I \rightarrow I-2$) transition. The energy in parentheses denotes a tentative transition.

ENSDF: Evaluated Nuclear Structure Data File database at www.nndc.bnl.gov

XUNDL: Experimental Unevaluated Nuclear Data List database at www.nndc.bnl.gov

Exp. : denotes Experimental

gsb : denotes the ground state band

B (M1)/B (E2): The ratio of reduced transition probabilities in units of $(\mu_N/eb)^2$ given with the uncertainties in the last digits in parentheses. In cases, where only the plots of these values are given in the original papers, the numerical values have been read from these plots and suitably rounded. When neither numerical values nor plots are available, these ratios have been deduced in the present work by using the Rotational Model formulae, the experimental gamma-ray energies, and intensities. The E2/M1 mixing ratio obtained from the Rotational Model formula is used in these calculations.

$|g_K-g_R|$ The values of $|g_K-g_R|$ are given with the uncertainties in the last digits in parentheses. In cases, where only the plots of these values are given in the original papers, the numerical values have been read from these plots and suitably rounded. When neither numerical values nor plots are available, these ratios have been deduced in the present work by using the Rotational Model formula. Intrinsic quadrupole moment Q_0 given in the original reference(s) and the E2/M1 mixing ratio obtained from the Rotational Model formula are used in these calculations.

References: The references follow key numbers as assigned in the Nuclear Science References (NSR) database at the Brookhaven National Laboratory, USA. The data for a band have been taken from the first reference cited in boldface. Information taken from other references is given under the column “Configuration and Comments”.

Configuration and Comments: The quasiparticle configuration for a band is listed. π stands for protons and ν stands for neutrons. Nilsson quantum numbers are used to label the orbitals. It is customary in the literature to use labels such as A, B, C, etc. for quasineutrons and A_p, B_p, C_p, etc. for quasiprotons to denote the high-j orbitals. However, different authors use quite different notations. Explicit Nilsson configurations are, therefore, given in the table along with the notations used by the authors of the original papers.

Backbending: In a rotational band, the transition energies increase with increase in spins reflecting the I(I+1) behavior, but in some cases e.g. ^{181}Ir, band 5, the moment of inertia increases drastically after the spin ($33/2^-$). This phenomenon is known as backbending and is usually attributed to the crossing of two rotational bands due to the alignment of a pair of either kind of quasiparticles.

Signature Split: For rotational bands with ΔI= 1 between successive members, the members belong to different signatures. When odd-even staggering in energy occurs in a band, the term “signature split” is used. Signature splitting arises basically due to Coriolis coupling.

Signature Inversion Whenever an expected favored signature becomes unfavored at higher spins i.e. a signature branch, which is expected to be lower in energy, becomes higher in energy; the term signature inversion is used.

$^{153}_{63}Eu_{90}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1771.6	$19/2^-$					**2000SM09**	1. π: 5/2[413]
	1971.5	$21/2^-$	200.1					ν: 3/2[651]⊗11/2[505]
	2182.7	$23/2^-$	211.2	411.3	0.383(49)			or π: 5/2[413]
	2402.0	$25/2^-$	219.3	430.5	0.396(91)			ν: 3/2[402]⊗11/2[505]
	2627.2	$27/2^-$	225.2	444.5	0.330(89)			or a mixture of both.
	2859.2	$29/2^-$	232.0	457.6				2. Nuclear Reaction:
								$^{150}Nd(^{7}Li, 4n)^{153}Eu$
								E=35 MeV.
								3. Half-life of bandhead is 475(10) ns.
								4. Negative sign of average value of $(g_K - g_R)/Q_0$ with g_R =0.40(4) gives g_K = 0.02(5).
								5. Assumed Q_0 = 6.6(5) eb.
								6. The $\lvert g_K - g_R \rvert$ values read from plot.

$^{153}_{64}Gd_{89}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1520.3	$21/2^-$				**2002BR52**	1. For α =+1/2 signature:
	1902.9	$25/2^-$		382.7			ν : 3/2[521](α= +1/2)
	2361.5	$29/2^-$		458.5			⊗3/2[651](α= +1/2)
	2884.4	$33/2^-$		523.2			⊗3/2[651](α= −1/2)
	3471.2	$(37/2^-)$		586.3			2. Nuclear Reaction:
	4124.2	$(41/2^-)$		653			$^{124}Sn(^{36}S, \alpha 3n)^{153}Gd$
	4841.2	$(45/2^-)$		717			E=165 MeV.
							3. Mixing of lowest lying spin members with octupole vibrat-ional band is suggested.

$^{153}_{65}Tb_{88}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	2611.8	$27/2^+$				**1998HA37**	1. Competing configurations are:
	2952.3	$31/2^+$		340.5			A_p⊗AF or B_p⊗AE
	3472.4	$35/2^+$		520.1			A_p=7/2[523](α= −1/2)
	4111.1	$39/2^+$		638.7			B_p=7/2[523](α= +1/2)
	4837.4	$(43/2^+)$		726.3			A=3/2[651](α= +1/2)
	5633.4	$(47/2^+)$		796.0			F=3/2[521](α= −1/2)
	(6486.4)	$(51/2^+)$		(853)			E=3/2[521](α= +1/2)
							2. Nuclear Reaction:
							$^{139}La(^{18}O, 4n)^{153}Tb$
							E=100 MeV.

$^{153}_{65}Tb_{88}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	2613.9	$23/2^{(+)}$				**1998HA37**	1. Competing configurations are:
	2706.5	$25/2^{(+)}$					For $\alpha = +1/2$ signature:
	2829.9	$27/2^{(+)}$	124	216.0	0.050(5)		$A_p \otimes AX$ or $B_p \otimes AY$
	2990.8	$29/2^{(+)}$	161	284.3	0.040(4)		For $\alpha = -1/2$ signature:
	3186.1	$31/2^{(+)}$	196	356.2	0.070(7)		$A_p \otimes AY$ or $B_p \otimes AX$
	3414.5	$33/2^{(+)}$	228	423.7	0.110(11)		A_p=7/2[523](α= −1/2)
	3672.2	$35/2^{(+)}$	258	486.1	0.10(1)		B_p=7/2[523](α= +1/2)
	3958.2	$37/2^{(+)}$		543.7			A=3/2[651](α= +1/2)
	4268.4	$39/2^{(+)}$		596.2			X=11/2[505](α= +1/2)
	4601.9	$41/2^{(+)}$		643.7			Y=11/2[505](α= −1/2)
	4956.1	$43/2^{(+)}$		687.7			2. Small signature splitting.
	5330.9	$(45/2^{+})$		729			3. The B(M1)/B(E2) values
	(5722.1)	$(47/2^{+})$		(766)			read from plot assuming
							10% error.

$^{155}_{65}Tb_{90}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2745.2	$27/2^{(+)}$				**1998HA54**	1. For $\alpha = -1/2$ signature:
	3104.5	$31/2^{(+)}$		359.3			π : 7/2[523](α= −1/2)
	3571.7	$35/2^{(+)}$		467.2			ν: 3/2[651](α= +1/2)
	4130.1	$(39/2^{+})$		558.4			$\otimes$3/2[521](α= −1/2)
	4762.1	$(43/2^{+})$		632.0			2. Nuclear Reaction:
	5453	$(47/2^{+})$		691			$^{124}Sn(^{36}S, p4n)\ ^{155}Tb$
	6190	$(51/2^{+})$		737			E=165 MeV.
	6970	$(55/2^{+})$		780			3. BC and B_pC_p band cross-
	7793	$(59/2^{+})$		823			ings are suggested at $\eta\omega_c$
	8662	$(63/2^{+})$		869			= 0.38(1) and 0.47(1) MeV
	9569	$(67/2^{+})$		907			respectively.
	10503	$(71/2^{+})$		934			B=3/2[651](α= −1/2)
	11481	$(75/2^{+})$		978			C=1/2[660](α= +1/2)
	(12513)	$(79/2^{+})$		(1032)			B_p=7/2[523](α= +1/2)
							C_p=5/2[532](α= −1/2)

$^{155}_{66}Dy_{89}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2012.5	25/2-				**1994VL02**	1. For α =+1/2 signature:
	2475.8	29/2-		463.7			ν : 3/2[521](α= +1/2)
	2990.5	33/2-		514.6			⊗1/2[660](α= +1/2)
	3304.5	35/2-					⊗1/2[660](α= −1/2)
	3556.5	37/2-		566.1			For α = −1/2 signature:
	3912.6	39/2-		607			ν : 3/2[521](α= −1/2)
	4180.4	41/2-		623.9			⊗1/2[660](α= +1/2)
	4574.4	43/2-		661.8			⊗1/2[660](α= −1/2)
	4866.0	45/2-		685.6			2. Nuclear reactions:
	5290.2	47/2-		715.8			(a) ^{124}Sn (^{36}S, 5n)^{155}Dy
	5610.4	49/2-		744.4			E=155 MeV.
	6062.3	51/2-		772.1			(b) ^{156}Gd (^{3}He, 4n)^{155}Dy
	6405.4	53/2-		795.0			E=39 MeV.
	6892.6	55/2-		830.3			3. Shows band termination
	7241.6	57/2-		836.2			phenomenon.
	7778.4	59/2-		885.8			4. Strong signature splitting
	8109.9	61/2-		868.3			with signature inversion at
	8696.8	63/2-		918.4			at I=75/2-.
	9008.2	65/2-		898.3			5. At higher frequencies A_pB_p
	9624.8	67/2-		928			crossing is suggested.
	9965.5	69/2-		957.3			A_p=7/2[523](α= +1/2)
	10520.0	71/2-		896.2			B_p=7/2[523](α= −1/2)
	10973	73/2-		1007			6. Comparison of level energies
	11451.0	75/2-		930			with ENSDF has been done.
	11973	77/2-		999.6			
	12401.0	79/2-		(950)			
	12985	81/2-		1011			
	13343.9	83/2-		(942.9)			
	14042	85/2-		1057			
	14469	87/2-		(1125)			
	15161	89/2-		1119			
	15637	91/2-		(1168)			
	16347	93/2-		(1186)			

$^{157}_{67}Ho_{90}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	2270.3	$23/2^+$					**1992RA17**	1. For $\alpha = +1/2$ signature:
	2369.5	$25/2^+$	99.3					$A_p\otimes AX$
	2513.5	$27/2^+$	144.0	243.2	0.04(1)	0.45(4)		For $\alpha = -1/2$ signature:
	2692.8	$29/2^+$	179.3	323.3	0.02(1)	0.223(19)		$A_p\otimes AY$
	2903.5	$31/2^+$	210.7	390.0	0.02(1)	0.194(15)		A_p=7/2[523](α= −1/2)
	3142.5	$33/2^+$	239.0	449.7	0.04(1)	0.129(14)		A=3/2[651](α= +1/2)
	3406.9	$35/2^+$	264.5	503.4	0.05(3)	0.096(16)		X=11/2[505](α= +1/2)
	3695.1	$37/2^+$	288.1	552.6	0.06(6)	0.063(13)		Y=11/2[505](α= −1/2)
	4003.7	$39/2^+$	(308.7)	596.8	0.04(4)	0.11(3)		2. Nuclear Reaction:
	4330.7	$41/2^+$	(327.0)	635.6	0.03(3)	0.12(3)		$^{124}Sn\ (^{37}Cl, 4n)^{157}Ho$
	4673.7	$43/2^+$	(343.0)	670.0	0.04(4)	0.10(3)		E=155 MeV and
	5031.9	$45/2^+$		701.2				E=165 MeV.
	5399.3	$47/2^+$		725.6				3. Band 1 and band 2 cross
	5777.0	$49/2^+$		745.1				each other at least 3 times.
	6163.1	$51/2^+$		763.8				4. BC crossing at $\eta\omega_c$=0.37
	6557.3	$53/2^+$		780.3				MeV is suggested.
	6961.0	$55/2^+$		798.0				B=3/2[651](α= −1/2)
	7377.7	$57/2^+$		820.4				C=1/2[660](α= +1/2)
	7808.3	$59/2^+$		847.3				5.The $\lvert g_K-g_R \rvert$ values deduced
	8252.5	$61/2^+$		874.8				in the present work.
	8713.6	$(63/2^+)$		905.3				6. Assumed Q_0 = 5.5 eb.
	9192.5	$65/2^+$		940.0				
	9688.4	$(67/2^+)$		974.8				
	10203.4	$(69/2^+)$		1010.9				
	(10734.9)	$(71/2^+)$		(1046.6)				
	11280.6	$(73/2^+)$		1077.2				
2	2367.6	$25/2^+$					**1992RA17**	1. For $\alpha = +1/2$ signature:
	2554.8	$27/2^+$	187.2					$A_p\otimes AE$
	2721.0	$29/2^+$	166.2	353.4	0.12(1)	1.51(22)		For $\alpha = -1/2$ signature:
	2928.0	$31/2^+$	207.0	373.2	0.10(1)	0.67(4)		$B_p\otimes AE$ or $A_p\otimes AF$
	3164.2	$33/2^+$	236.3	443.3	0.10(1)	0.52(4)		A_p=7/2[523](α= −1/2)
	3408.4	$35/2^+$	244.1	480.4	0.13(1)	0.63(5)		B_p=7/2[523](α= +1/2)
	3710.8	$37/2^+$	302.4	546.5	0.13(1)	0.59(5)		A=3/2[651](α= +1/2)
	3994.5	$39/2^+$	283.8	586.2	0.17(1)	0.68(6)		E=3/2[521](α= +1/2)
	4340.2	$41/2^+$	345.6	629.4	0.18(2)	0.78(12)		F=3/2[521](α= −1/2)
	4684.2	$43/2^+$	344.0	689.7	0.17(1)	0.65(10)		2. Strong signature splitting
	5029.4	$45/2^+$	345.3	689.3	0.08(10)	0.25(25)		with signature inversion
	5418.3	$47/2^+$	388.9	734.1	0.13(1)	0.42(8)		inversion at I = $43/2^+$.
	5763.9	$49/2^+$	345.6	734.4	0.27(3)	1.1(3)		3. Band 2 and band 1 cross
	6176.6	$51/2^+$	412.8	758.3	0.22(1)	0.78(10)		each other at least 3 times.
	6530.5	$53/2^+$	353.9	766.6	0.22(1)	0.72(11)		4. BC crossing at $\eta\omega_c$=0.37
	6970.8	$55/2^+$	440.4	794.2	0.24(2)	0.86(15)		MeV is suggested.
	7336.2	$57/2^+$	365.3	805.7	0.23(1)	0.72(11)		B=3/2[651](α= −1/2)
	7810.6	$59/2^+$		839.8				C=1/2[660](α= +1/2)
	8193.6	$61/2^+$		857.5				5. Assumed Q_0 = 5.5 eb.
	8708.2	$63/2^+$		897.6				6. The $\lvert g_K-g_R \rvert$ values deduced
	9108.6	$65/2^+$		915.5				in the present work.
	9670.7	$(67/2^+)$		962.5				
	10078.8	$69/2^+$		970.2				
	10683.3	$(71/2^+)$		1012.6				
	11088.3	$73/2^+$		1009.5				

$^{163}_{67}Ho_{96}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1504.9	$(17/2^+)$				**2004HO19**	1. π : 7/2[523]
	1627.1	$(19/2^+)$	122.2				ν: 5/2[642]⊗5/2[523]
	1767.1	$(21/2^+)$	140.0				2. Nuclear Reaction:
	1924.0	$(23/2^+)$	156.9	296.8			$^{160}Gd(^{11}B, \alpha 4n)^{163}Ho$
	2097.9	$(25/2^+)$	173.9	331.2			E= 61MeV.
	2288.4	$(27/2^+)$	190.5	364.3			
	2495.0	$(29/2^+)$	206.6	397.1			
	2717.4	$(31/2^+)$	222.4	429.4			
	2955.2	$(33/2^+)$	237.8	459.8			
	3208.2	$(35/2^+)$	253.0	491.2			
	3474.2	$(37/2^+)$	(266.0)	(519)			

$^{157}_{68}Er_{89}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2395.7+X	$(23/2^-)$				**1995GA13**	1. For α =+1/2 signature:
	2500.5+X	$(25/2^-)$	104.8				π : 7/2[523](α= −1/2)
	2649.4+X	$(27/2^-)$	148.9	254.1			⊗7/2[404](α= +1/2)
	2842.3+X	$(29/2^-)$	192.9	342.2	3.8(6)		ν: 3/2[651](α= +1/2)
	3067.7+X	$(31/2^-)$	225.4	418.3			For α = −1/2 signature:
	3328.9+X	$(33/2^-)$	261.2	486.7	4.9(6)		π : 7/2[523](α= −1/2)
	3614.2+X	$(35/2^-)$	285.3	544.9	3.7(4)		⊗7/2[404](α= −1/2)
	3922.1+X	$(37/2^-)$	307.9	593.2	3.5(4)		ν: 3/2[651](α= +1/2)
	4254.1+X	$(39/2^-)$	332.0	639.9	3.6(5)		2. Nuclear Reaction:
	4602.0+X	$(41/2^-)$	347.9	679.9	2.9(6)		$^{114}Cd(^{48}Ca, 5n)^{157}Er$
	4972.2+X	$(43/2^-)$	370.4	717.8	3.1(6)		E=210 MeV.
	5350.6+X	$(45/2^-)$	378.1	748.6	3.5(6)		3. Signature splitting with
	5752.5+X	$(47/2^-)$	401.9	780.9	2.5(5)		signature inversion at $I= 37/2^-$.
	6158.4+X	$(49/2^-)$	405.9	807.8			4. BC crossing at $\eta\omega_c$=0.4 MeV is
	6581.8+X	$(51/2^-)$	423.2	829.0			expected.
	7006.5+X	$(53/2^-)$		848.0			B=3/2[651](α= −1/2)
							C=1/2[660](α= +1/2)
							5. All level energies are relative to
							the $13/2^+$ state at 0+X, where
							X≥180 keV.

$^{159}_{68}Er_{91}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2293	$21/2^-$				**1998SI03**	1. For α =+1/2 signature:
	2394	$23/2^-$					π : 7/2[523](α= −1/2)
	2523	$25/2^-$	131				⊗7/2[404](α= +1/2)
	2689	$27/2^-$	163	294			ν: 3/2[651](α= +1/2)
	2883	$29/2^-$	194	359			For α = −1/2 signature:
	3106	$31/2^-$	223	417			π : 7/2[523](α= −1/2)
	3356	$33/2^-$	250	473	2.03(8)		⊗7/2[404](α= −1/2)
	3629	$35/2^-$	274	523	2.10(1)		ν: 3/2[651](α= +1/2)
	3923	$37/2^-$	294	567	1.80(8)		2. Nuclear Reaction:
	4236	$39/2^-$	313	607	1.45		$^{116}Cd(^{48}Ca, 5n)^{159}Er$
	4564	$41/2^-$	328	641	1.30(1)		E=215 MeV.
	4906	$43/2^-$	342	669	1.40		3. BC band crossing at $\eta\omega_c$
	5256	$45/2^-$	351	692			=0.33 MeV is suggested.
	5615	$47/2^-$	359	710			B=3/2[651]((α= −1/2)
	5980	$49/2^-$	364	723	1.37(1)		C=1/2[660]((α= +1/2)
	6350	$51/2^-$	371	735			4. Level energies are adoped
	6729	$53/2^-$	379	749	1.48(1)		from ENSDF.
	7117	$55/2^-$	388	767	1.60(15)		5. Strong signature splitting
	7519	$57/2^-$	402	790	1.35(10)		at higher spins.
	7934	$59/2^-$	415	816			6. The B(M1)/B(E2) values
	8365	$61/2^-$	432	846	1.32(10)		read from plot.
	8812	$63/2^-$	447	878	1.30(15)		
	9276	$(65/2^-)$	464	911			
	9757	$(67/2^-)$	481	945	1.21(20)		
	10255	$(69/2^-)$	499	979	1.10(18)		
	10768	$(71/2^-)$	513	1012			
	11300	$(73/2^-)$	532	1044			
	11843	$(75/2^-)$	543	1074			
	12411	$(77/2^-)$	568	1112			
	12969	$(79/2^-)$	558	1126			
	13553	$(81/2^-)$		1142			
	14134	$(83/2^-)$		1165			
	14747	$(85/2^-)$		1194			
	15342	$(87/2^-)$		1209			

$^{163}_{68}Er_{95}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1214.6	$17/2^+$				**1997HA23**	1. Tentative configuration is:
	1352.8	$19/2^+$					For α = +1/2 signature:
	1529.8	$21/2^+$		315.2			ν: 5/2[642](α= +1/2)
	1717.2	$23/2^+$		364.5			⊗5/2[523](α= +1/2)
	1932.0	$25/2^+$		402.2			⊗3/2[521](α= −1/2)
	2167.6	$27/2^+$		450.5			For α = −1/2 signature:
	2415.6	$29/2^+$		483.6			ν: 5/2[642](α= +1/2)
	2698.7	$31/2^+$		531.1			⊗5/2[523](α= +1/2)
	2967.4	$33/2^+$		551.8			⊗3/2[521](α= +1/2)
	3299.2	$35/2^+$		600.5			2. Nuclear Reaction:
	3530.5	$37/2^+$		563.1			$^{150}Nd(^{18}O, 5n)^{163}Er$
	3952.1	$39/2^+$		652.9			E=87 MeV.
	4149.9	$41/2^+$		619.4			3. BC band crossing is
	4643.3	$43/2^+$		691.2			is suggested.
	4825.0	$45/2^+$		675.1			B=5/2[642](α= −1/2)
	5372.5	$47/2^+$		729.2			C=3/2[651](α= +1/2)
	5553.1	$49/2^+$		728.1			4. Strong signature splitting.
	6146.7	$51/2^+$		774.2			
	6336.4	$53/2^+$		783.3			
	6977.8	$55/2^+$		831.1			
	7175.7	$57/2^+$		839.3			
	8067.4	$61/2^+$		891.6			
	9001.9	$65/2^+$		934.2			
2	1538.8	$3/2^+$				**1982VY07**	1. Tentative configuration is:
							π : 7/2[523]⊗1/2[411]
							ν: 5/2[523]
							2. Decay study.
							3. Level energy is adopted from ENSDF.
3	1607.4	$21/2^+$				**1997HA23**	For α = +1/2 signature:
	2044.2	$25/2^+$		436.7			ν: 5/2[642](α= +1/2)
	2540.9	$29/2^+$		496.8			⊗5/2[523](α= −1/2)
	3074.1	$33/2^+$		533.1			⊗3/2[521](α= +1/2)
	3680.6	$37/2^+$		606.5			
	4336.2	$41/2^+$		655.6			
	5017.3	$45/2^+$		681.1			
	5738.2	$49/2^+$		721.0			
	6521.0	$53/2^+$		782.8			
	7349.0	$57/2^+$		828.0			
	8196.1	$61/2^+$		847.1			
	9106.3	$65/2^+$		910.1			
	10076.6	$69/2^+$		970.3			

$^{163}_{68}Er_{95}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
4	1801.6	$3/2^+$					**1982VY07**	1. Tentative configuration is: π : 7/2[523]⊗1/2[411] ν: 5/2[523] 2. Decay study. 3. Level energy is adopted from ENSDF.
5	1845.6	$19/2^-$					**1997HA23**	1. For $\alpha = -1/2$ signature:
	1962.0	$21/2^-$	116.4				1994BR09	π: 7/2[523](α= +1/2)
	2104.7	$23/2^-$	142.7	259.1				⊗7/2[404](α= +1/2)
	2271.5	$25/2^-$	166.7	309.9				ν: 5/2[642](α= +1/2)
	2461.4	$27/2^-$	190.0	356.7	0.42(7)	2.74(87)		For $\alpha = +1/2$ signature:
	2673.1	$29/2^-$	211.8	401.7	0.40(9)	2.04(36)		π: 7/2[523](α= −1/2)
	2905.8	$31/2^-$	232.7	444.1	0.37(5)	1.59(22)		⊗7/2[404](α= +1/2)
	3158.1	$33/2^-$	252.3	485.1	0.38(7)	1.53(31)		ν: 5/2[642](α= +1/2)
	3429.1	$35/2^-$	271.0	523.2	0.41(6)	1.62(18)		2. It is explained as a Tilted
	3718.3	$37/2^-$	289.1	560.3	0.42(6)	1.62(36)		rotational band with ε_2=0.252,
	4024.1	$39/2^-$	305.7	595.1	0.35(9)	1.08(45)		ε_4 = -0.004.
	4346.9	$41/2^-$	322.8	628.9	0.36(5)	1.05(13)		3. Half-life of band head is
	4684.0	$43/2^-$	337.1	659.7	0.50(14)	2.00(72)		$\leq$ 75 ns.
	5038.3	$45/2^-$	354.2	691.4				4. BC band crossing is suggested.
	5404.0	$47/2^-$	365.4	720.2				B=5/2[642](α= −1/2)
	5784.0	$49/2^-$	380.1	745.7				C=3/2[651](α= +1/2)
	6174.6	$51/2^-$	390.3	770.8				5. The B(M1)/B(E2) values read
	6573.1	$53/2^-$	398.4	789.0				from plot shown in 1994BR09.
	6989.1	$55/2^-$	415.9	814.6				6. Assumed Q_0 = 7 eb.
	7414.0	$57/2^-$		840.9				7. The $\lvert g_K-g_R \rvert$ values deduced
	7832.4	$59/2^-$		843.3				in the present work.
	8306.8	$61/2^-$		892.8				
	8698.3	$63/2^-$		865.9				
	9608.3	$67/2^-$		910.0				
	10570.3	$71/2^-$		962.0				
6	1982.9	$19/2^+$					**1997HA23**	1. For $\alpha = -1/2$ signature:
	2144.8	$21/2^+$	162.0				1994BR09	ν: 11/2[505](α= +1/2)
	2332.2	$23/2^+$	187.5	349.0	0.19(2)	1.58(58)		⊗5/2[642](α= +1/2)
	2542.6	$25/2^+$	210.3	398.0	0.20(5)	1.09(42)		⊗3/2[521](α= +1/2)
	2773.2	$27/2^+$	230.5	441.2	0.21(4)	0.81(31)		For $\alpha = +1/2$ signature:
	3022.6	$29/2^+$	249.4	480.1	0.29(7)	1.22(51)		ν: 11/2[505](α= −1/2)
	3289.2	$31/2^+$	266.5	516.1	0.26(6)	0.85(36)		⊗5/2[642](α= +1/2)
	3571.2	$33/2^+$	281.9	548.6	0.24(6)	0.67(31)		⊗3/2[521](α= +1/2)
	3867.6	$35/2^+$	296.3	578.6	0.34(7)	1.21(58)		2. The B(M1)/B(E2) values read
	4176.4	$37/2^+$	308.8	605.1				from plot shown in 1994BR09.
	4496.5	$39/2^+$	319.7	629.1				3. Assumed Q_0 = 7 eb.
	4821.9	$41/2^+$	325.5	645.4				4. The $\lvert g_K-g_R \rvert$ values deduced
	5183.3	$43/2^+$	361.0	686.9				in the present work.
	5537.6	$45/2^+$	354.2	716.9				
	5906.0	$47/2^+$	368.4	722.8				
	6288.2	$49/2^+$	382.4	750.4				
	6682.8	$51/2^+$	394.5	776.9				
	7090.8	$53/2^+$		802.6				
	7518.4	$55/2^+$		835.6				
	7955.0	$57/2^+$		864.2				

$^{163}_{68}Er_{95}$

	E_{level} keV	I^π	E_γ (M1) keV	E_γ (E2) keV	$\lvert g_K\text{-}g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
7	2120.5	$19/2^+$					**1997HA23**	1. For $\alpha = -1/2$ signature:
	2314.2	$21/2^+$	193.7					π : 7/2[523](α= +1/2)
	2524.2	$23/2^+$	210.3	403.4	0.28(20)	2.10(55)		$\otimes$7/2[404](α= +1/2)
	2749.0	$25/2^+$	225.4	434.5	0.29(9)	1.75(33)		ν: 5/2[523](α= +1/2)
	2987.3	$27/2^+$	238.3	463.0	0.32(2)	1.50(44)		For $\alpha = + 1/2$ signature:
	3236.6	$29/2^+$	249.4	487.7	0.38(3)	1.80(33)		π : 7/2[523](α= −1/2)
	3495.0	$31/2^+$	258.4	507.3	0.35(1)	1.30(11)		$\otimes$7/2[404](α= +1/2)
	3758.8	$33/2^+$	263.7	522.3	0.40(1)	1.30(24)		ν: 5/2[523](α= +1/2)
	4025.3	$35/2^+$	266.3	530.4	0.31(1)	1.60(13)		2. Signature splitting after the
	4293.0	$37/2^+$	267.7	534.1	0.32(1)	3.62		band crossing.
	4564.8	$39/2^+$	271.7	539.5	0.52(3)	3.30(16)		3. AB band crossing is suggested
	4851.0	$41/2^+$	286.1	558.3	0.42(2)	3.63(66)		A=5/2[642](α= +1/2)
	5124.4	$43/2^+$	273.4	559.7	0.69(2)			B=5/2[642](α= −1/2)
	5428.1	$45/2^+$	303.7	577.2	0.76(4)			4. The B(M1)/B(E2) values read
	5745.3	$47/2^+$	317.1	621.0	0.49(1)	2.40(11)		from plot.
	6077.2	$49/2^+$	331.9	649.4	0.59(2)	2.70(13)		5. Assumed Q_0 = 7 eb.
	6426.9	$51/2^+$	349.5	681.8	0.58(2)	2.80(33)		6. The $\lvert g_K\text{-}g_R \rvert$ values deduced
	6792.3	$53/2^+$	365.4	715.1	0.50(2)	2.37(13)		in the present work.
	7173.7	$55/2^+$	381.4	746.9	0.60(2)	2.50(16)		
	7574.1	$57/2^+$	400.0	781.9	0.37(1)	1.80(16)		
	7988.4	$59/2^+$	414.1	815.0	0.81(4)	2.40(52)		
	8420.1	$61/2^+$	431.6	846.6	0.83(4)			
	8866.7	$63/2^+$	446.6	878.6	0.55(2)	2.00(38)		
	9330.3	$65/2^+$		910.2				
	9806.3	$67/2^+$		939.7				
	10300.0	$69/2^+$		969.6				
	10808.5	$71/2^+$		1002.2				
	11325.0	$73/2^+$		1025.1				
	11869.8	$75/2^+$		1061.3				
8	2418.0	$27/2^-$					**1997HA23**	1. Tentative configuration is:
	2890.5	$31/2^-$		472.5				ν: 5/2[523](α= +1/2)
	3434.7	$35/2^-$		544.1				$\otimes$5/2[642](α= +1/2)
	4037.0	$39/2^-$		602.3				$\otimes$3/2[651](α= +1/2)
	4686.4	$43/2^-$		649.4				
	5387.5	$47/2^-$		701.1				
	6145.0	$51/2^-$		757.5				
	6936.0	$55/2^-$		791.0				
	7733.9	$59/2^-$		797.9				
	8551.8	$63/2^-$		817.9				
	9440.7	$67/2^-$		888.9				
	10380.2	$71/2^-$		939.5				
	11377.7	$75/2^-$		997.5				

${}^{163}_{68}Er_{95}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
9	2630.2	$(29/2^+)$				**1997HA23**	1. Tentative configuration is:
	2912.7	$(31/2^+)$					For α = +1/2 signature:
	3214.9	$(33/2^+)$		585.1			BEG/BFH
	3469.6	$(35/2^+)$		556.9			For α = −1/2 signature:
	3809.9	$(37/2^+)$		595.2			BEH/BFG
	4067.8	$(39/2^+)$		598.2			B=5/2[642](α= −1/2)
	4438.8	$(41/2^+)$		629.0			E=5/2[523](α= +1/2)
	4700.3	$(43/2^+)$		632.5			G=3/2[521](α= +1/2)
	5089.0	$(45/2^+)$		650.4			F=5/2[523](α= −1/2)
	5407.5	$(47/2^+)$		707.2			H=3/2[521](α= −1/2)
	5802.6	$(49/2^+)$		713.7			2. BC band crossing is suggested.
	6189.1	$(51/2^+)$		781.6			B=5/2[642](α= −1/2)
	6562.3	$(53/2^+)$		759.7			C=3/2[651](α= +1/2)
	7020.9	$(55/2^+)$		831.8			3. Signature splitting with
	7322.9	$(57/2^+)$		760.5			signature inversion at $I=53/2^+$.
	8127.9	$(61/2^+)$		805.0			4. The cross band transitions
	8986.9	$(65/2^+)$		858.8			too weak to determine
	9909.5	$(69/2^+)$		922.4			DCO ratios, so uncertainty of
	10909.1	$(73/2^+)$		999.6			1 or 2 units in spin values of
							α=+1/2 signature is suggested.

${}^{157}_{69}Tm_{88}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2338.6+X	$27/2^+$					**1995RI01**	1. For α = −1/2 signature:
	2814.3+X	$31/2^+$		475.5				π : 7/2[523](α= +1/2)
	3210.0+X	$33/2^+$	395.9					ν: 3/2[651](α= +1/2)
	3382.9+X	$35/2^+$	172.8	568.6	0.09(2)	0.95(8)		⊗3/2[521](α= +1/2)
	3788.4+X	$37/2^+$	405.1	578.5	0.10(2)			For α =+1/2 signature:
	4025.3+X	$39/2^+$	236.8	642.5	0.10(1)	1.10(15)		π : 7/2[523](α= −1/2)
	4426.6+X	$41/2^+$	400.9	638.3	0.16(1)	0.87(17)		ν: 3/2[651](α= +1/2)
	4728.3+X	$43/2^+$	301.3	703.3				⊗3/2[521](α= +1/2)
	5120.6+X	$45/2^+$	392.0	695.0				2. Nuclear Reaction:
	5564.1+X	$47/2^+$	443.0	836.0	0.08(3)	0.76(8)		${}^{110}Pd$ (${}^{51}V$, 4n)${}^{157}Tm$
	5953.4+X	$49/2^+$	389.0	832.8	0.21(6)	1.69(17)		E=220 MeV.
	6414.8+X	$51/2^+$	461.3	850.8	0.14(3)	1.00(12)		3. Strong signature splitting
	6808.6+X	$53/2^+$	393.8	855.1				with signature inversion
	7184.3+X	$55/2^+$	375.7	769.5	0.36(10)	0.91(12)		at $I=47/2^+$.
	7601.3+X	$57/2^+$	417.1	793.2				4. All level energies are relative
								to energy of the $h_{11/2,}$ $11/2^-$
								level at 0+X; X is unknown.
								5. The B(M1)/B(E2) values read
								from plot.
								6. Assumed Q_0 = 4.2 eb.
								7. The $\lvert g_K-g_R \rvert$ values deduced
								in the present work.

$^{157}_{69}Tm_{88}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	3141.6+X	$31/2^-$					**1995RI01**	1. For $\alpha = +1/2$ signature:
	3297.4+X	$33/2^-$	155.3					π: 7/2[523] (α= +1/2)
	3638.8+X	$35/2^-$	341.0	496.9	0.04(3)	2.30(12)		ν: 3/2[651] (α= +1/2)
	3877.9+X	$37/2^-$	239.1	580.6	0.08(1)	2.05(17)		⊗3/2[651] (α= −1/2)
	4232.9+X	$39/2^-$	354.9	594.2	0.08(1)	1.81(34)		For $\alpha = -1/2$ signature:
	4508.7+X	$41/2^-$	275.9	630.7	0.08(1)	1.23(8)		π: 7/2[523] (α= −1/2)
	4876.7+X	$43/2^-$	368.0	643.5	0.09(2)	1.77(25)		ν: 3/2[651] (α= +1/2)
	5168.2+X	$45/2^-$	291.2	659.4	0.10(1)	1.38(30)		⊗3/2[651] (α= −1/2)
	5534.6+X	$47/2^-$	366.5	657.9	0.15(1)	2.51(43)		2. Strong signature splitting with
	5976.1+X	$49/2^-$	440.9	808.0	0.11(2)	1.51(43)		signature inversion at $I=47/2^-$.
	6321.4+X	$51/2^-$	345.2	786.9				3. All level energies are relative
	6749.7+X	$53/2^-$	428.3	773.7	0.11(1)	1.17(19)		to energy of the $h_{11/2,}$ $11/2^-$
	7136.0+X	$55/2^-$	386.3	814.6	0.18(3)	2.43(38)		level at 0+X; X is unknown.
	7486.5+X	$57/2^-$	350.4	736.8	0.21(2)	3.38(47)		4. The B(M1)/B(E2) values read
	8272.7+X	$61/2^-$		786.2				from plot.
	9352.4+X	$65/2^-$		1079.6				5. Assumed Q_0 = 4.2 eb.
	9906.6+X	$69/2^-$		554.1				6. The $\lvert g_K-g_R \rvert$ values deduced
	10638.8+X	$73/2^-$		732.2				in the present work.

$^{165}_{69}Tm_{96}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1633.3	$17/2^-$					**2001JE09**	1. π: 7/2[404]
	1753.5	$19/2^-$	120.3					ν: 5/2[642]⊗5/2[523]
	1899.0	$21/2^-$	145.5	265.8	0.13(2)	0.61(13)		2. Nuclear Reactions:
	2067.4	$23/2^-$	168.4	314.0	0.16(2)	0.48(10)		(a) ^{150}Nd (^{19}F, 4n)^{165}Tm
	2256.8	$25/2^-$	189.3	357.8	0.13(1)	0.29(5)		E=85 MeV
	2465.5	$27/2^-$	208.6	398.0	0.13(2)	0.23(5)		(b) ^{154}Sm (^{15}N, 4n)^{165}Tm
	2692.1	$29/2^-$	226.5	435.3	0.14(2)	0.23(5)		E= 70 MeV.
	2934.3	$31/2^-$	242.1	468.8	0.17(3)	0.28(9)		3. Signature splitting with
	3193.0	$33/2^-$	258.7	500.9	0.12(2)	0.17(5)		signature inversion at $I=35/2^-$.
	3464.9	$35/2^-$	271.8	530.6	0.19(3)	0.28(9)		4. Assumed Q_0 = 7.2 eb.
	3748.7	$37/2^-$	283.4	556.0	0.09(4)	0.11(5)		5. The $\lvert g_K-g_R \rvert$ values deduced
	4045.9	$39/2^-$		580.9				in the present work.
	4352.7	$41/2^-$		604.1				
	4673.3	$43/2^-$		627.5				
	5003.1	$45/2^-$		650.3				
	5347.0	$47/2^-$		673.7				
	5701.0	$49/2^-$		697.9				
	(6071.6)	$(51/2^-)$		724.6				
	(6452.3)	$(53/2^-)$		751.3				

$^{165}_{69}Tm_{96}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	1740.8	$17/2^+$					**2001JE09**	1. π: 7/2[523] ν: 5/2[642]⊗5/2[523] 2. Strong signature splitting at higher spins. 3. Assumed Q_0 = 7.2 eb. 4. The $\lvert g_K-g_R \rvert$ values deduced in the present work.
	1857.1	$19/2^+$	116.3					
	1989.3	$21/2^+$	132.2	248.4	0.23(6)	1.44(73)		
	2138.5	$23/2^+$	149.0	281.5	0.32(3)	1.46(30)		
	2304.7	$25/2^+$	166.0	315.5	0.28(2)	0.87(11)		
	2488.3	$27/2^+$	183.5	349.8	0.29(1)	0.80(10)		
	2689.3	$29/2^+$	200.9	384.7	0.28(1)	0.68(8)		
	2907.3	$31/2^+$	217.9	419.1	0.30(1)	0.69(8)		
	3142.2	$33/2^+$	234.7	453.0	0.31(2)	0.70(9)		
	3393.0	$35/2^+$	250.6	485.8	0.29(1)	0.57(7)		
	3658.9	$37/2^+$	265.7	516.8	0.31(2)	0.63(8)		
	3940.3	$39/2^+$	281.2	547.4	0.30(2)	0.58(9)		
	4233.9	$41/2^+$	293.4	575.2	0.31(2)	0.59(9)		
	4543.8	$43/2^+$		603.3				
	4861.6	$45/2^+$		627.7				
	5202.9	$47/2^+$		659.1				
	5525.3	$49/2^+$		663.7				
	(5890.7)	$(51/2^+)$		687.8				
	(6244.8)	$(53/2^+)$		719.6				

$^{165}_{70}Yb_{95}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1734.1	$5/2^+$				**1982RA19**	1. π : 7/2[523]⊗7/2[404] ν: 5/2[523] 2. Decay study. 3. Level energy is adopted from ENSDF.
2	1978.9	$27/2^-$				**1987BE07**	1. For α = −1/2 signature: ν: 3/2[521](α= −1/2) ⊗3/2[651](α= +1/2) ⊗3/2[651](α= −1/2) 2. Nuclear Reaction: ^{130}Te (^{40}Ar, 5n)^{165}Yb E=180 MeV.
	2448.2	$31/2^-$		469.3			
	2954.1	$35/2^-$		505.9			
	3520.2	$39/2^-$		566.1			
	4155.5	$43/2^-$		635.3			
	4861.2	$47/2^-$		705.7			
	5634.4	$51/2^-$		773.2			
	6473.1	$55/2^-$		838.7			
	7377.1	$59/2^-$		904.0			
	8343.7	$63/2^-$		966.6			
	9368.1	$67/2^-$		1024.4			
3	2125.9	$(5/2)^+$				**1982RA19**	1. π : 7/2[523]⊗7/2[404] ν: 5/2[523] 2. Decay study. 3. Level energy is adopted from ENSDF.
4	3325	$(37/2^+)$				**1987BE07**	1. For α = +1/2 signature: ν: 3/2[651](α= +1/2) ⊗3/2[651](α= −1/2) ⊗1/2[660](α= +1/2)
	3858	$(41/2^+)$		(533)			
	4435.3	$45/2^+$		577			
	5170.2	$49/2^+$		734.9			
	5985.3	$53/2^+$		815.1			
	6880.6	$57/2^+$		895.3			
	7845.2	$61/2^+$		964.6			
	8865.6	$65/2^+$		1020.4			
	9923.7	$(69/2^+)$		1058.1			

$^{167}_{70}Yb_{97}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	(3815.4)	(37/2⁻)				**1996SM05**	1. Configuration not known. Most likely a 3 quasineutron configuration. 2. Nuclear Reaction: $^{124}Sn(^{48}Ca, 5n)^{167}Yb$ E=210 MeV. 3. Signature splitting more pronounced at higher spins. 4. Level energies are adopted from ENSDF.
	4116.6	(39/2⁻)	(301.6)				
	4434.5	(41/2⁻)	317.6	(618.6)			
	4764.3	(43/2⁻)	330.0	(648.3)			
	5106.2	(45/2⁻)	341.7	671.3			
	5454.0	(47/2⁻)	347.6	690.3			
	5812.7	(49/2⁻)	358.7	706.8			
	6178.7	(51/2⁻)	366.0	724.0			
	6552.9	(53/2⁻)	374.0	741.0			
	6936.2	(55/2⁻)	383.5	757.0			
	7335.1	(57/2⁻)		782.2			
	7744.0	(59/2⁻)		807.8			
	(8173.9)	(61/2⁻)		(838.7)			
	(8605.0)	(63/2⁻)		(861.0)			

$^{175}_{70}Yb_{105}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration andComments**
1	1497.3	3/2⁺				**1969FU03**	1. Tentatively assigned as a 3qp band: π: 1/2[411]⊗9/2[514] ν: 7/2[514] 2. Decay study. 3. Half-life of bandhead is < 0.1 ns. 4. Level energy is adopted from ENSDF.
2	1793.4	3/2⁺				**1969FU03**	1. Tentatively assigned as a 3qp band: π: 1/2[411]⊗7/2[523] ν: 5/2[523] 2. Level energy is adopted from ENSDF.
3	1891.8	1/2⁺				**1969FU03**	1. Tentatively assigned as a 3qp band: π: 1/2[411]⊗9/2[514] ν: 7/2[514] 2. Level energy is adopted from ENSDF.
4	2114.1	1/2⁺				**1969FU03**	1. Tentatively assigned as a 3qp band: π: 1/2[411]⊗7/2[523] ν: 5/2[523] 2. Level energy is adopted from ENSDF.

$^{159}_{71}Lu_{88}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2357.3+X	$25/2^+$				**1995MA46**	1. π: 7/2[523](α= −1/2)
	2669.1+X	$27/2^+$	311.8				ν: 3/2[651](α= +1/2)
	2801.1+X	$29/2^+$	132.0				⊗3/2[521](α= −1/2)
	3153.5+X	$31/2^+$	352.4	484.4			2. Nuclear Reaction:
	3358.7+X	$33/2^+$	205.2	557.6			^{144}Sm (^{19}F,4n)^{159}Lu
	3749.5+X	$35/2^+$	390.8	596.0			E=105 MeV.
	4002.3+X	$37/2^+$	252.8	643.6			3. Strong signature splitting.
	4379.0+X	$39/2^+$	376.7				4. Level energies are adopted from
	4680.3+X	$41/2^+$	301.3	678.0			ENSDF.
	5498.2+X	$45/2^+$		817.9			5. All level energy are relative to the
							$11/2^-$ state at 0+X; X≤200 keV.

$^{163}_{71}Lu_{92}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1.	2410.8	$21/2^+$				**2004JE03**	1. Competing configurations are:
	2437.0	$23/2^+$					(a) π: 7/2[404] , ν: AB
	2540.8	$25/2^+$	103.8	130.0			(b) π: 5/2[402] , ν: AB
	2681.0	$27/2^+$	140.3	244.0	0.42(10)		(c) π: 1/2[411] , ν: AB
	2861.2	$29/2^+$	180.2	320.4	0.75(18)		Configuration (a) is suggested as most
	3078.3	$31/2^+$	217.2	397.3	0.52(7)		favorable for lower part of the band.
	3323.9	$33/2^+$	245.5	462.7	1.04(44)		A=5/2[642](α= +1/2)
	3572.0	$35/2^+$	248.2	493.7	0.34(9)		B=5/2[642](α= −1/2)
	3892.5	$37/2^+$	320.4	568.6	5.5(22)		2. Nuclear Reaction:
	4150.7	$39/2^+$	258.2	578.7			^{139}La (^{29}Si,5n)^{163}Lu
	4529.3	$41/2^+$	378.8	636.8			E=157 MeV.
	4817.2	$43/2^+$	287.7	666.5			3. Signature splitting more
	5243.1	$45/2^+$		713.8			pronounced at higher spins.
	5559.4	$47/2^+$		742.2			4. Signature Inversion at I= $55/2^+$.
	6005.8	$49/2^+$	446.6	762.7			5. Proposed configuration for top
	6355.8	$51/2^+$	349.7	796.4			part of band is :
	6718.8	$53/2^+$	363.3	713.0			π: 9/2[514] , ν: AEBC
	7133.1	$55/2^+$	414.0	777.3			A=5/2[642](α= +1/2)
	7506.7	$57/2^+$	373.9	787.9			B=5/2[642](α= −1/2)
	7955.8	$59/2^+$	448.8	822.7			C=3/2[651] (α= +1/2)
	8386.9	$61/2^+$		880.2			E=5/2[523] (α= +1/2)
	8855.7	$63/2^+$		899.9			6. Level energies are deduced using
	9330.7	$65/2^+$		943.8			given E_{γ} (E2) energies.
	9816.2	$67/2^+$		960.5			7.The B (M1)/B (E2) values deduced in
	10333.6	$69/2^+$		1002.9			the present work by taking intensities
							from XUNDL and assuming 0.1 keV
							error in gamma-ray energies.

$^{163}_{71}Lu_{92}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	4309.4	$37/2^-$				**2004JE03**	1. π: 9/2[514] , ν: AB
	4579.1	$39/2^-$	269.7				A=5/2[642](α= +1/2)
	4831.4	$41/2^-$	252.2	522.0			B=5/2[642](α= −1/2)
	5116.4	$43/2^-$	285.1	537.3	0.55(38)		2. Signature splitting with
	5419.8	$45/2^-$	303.3	588.4	0.80(37)		signature inversion at the
	5757.1	$47/2^-$	337.4	640.7	0.82(36)		top of the band.
	6108.5	$49/2^-$	351.2	688.7	0.72(31)		3. Level energies are deduced using
	6502.6	$51/2^-$	394.5	745.7	0.81(35)		given E_{γ} (E2) energies.
	6907.7	$53/2^-$	404.7	799.2	0.97(38)		4.The B (M1)/B (E2) values deduced in
	7351.1	$55/2^-$	443.8	848.5			the present work by taking intensities
	7814.2	$57/2^-$	462.7	906.5			from XUNDL and assuming 0.1 keV
	8291.1	$59/2^-$	477.3	940.0			error in gamma-ray energies.
	8790.8	$61/2^-$	499.1	976.4			
	9284.5	$63/2^-$		993.4			
	9805.8	$65/2^-$		1015.0			
	10875.8	$69/2^-$		1071.0			

$^{165}_{71}Lu_{94}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	2544.7+X	$27/2^+$				**2004SC14**	1. π: 9/2[514] , ν: AE
	2764.9+X	$29/2^+$	220.2				A=5/2[642](α= +1/2)
	2968.1+X	$31/2^+$	203.1	423.4			E=5/2[523](α= +1/2)
	3200.6+X	$33/2^+$	244.1	435.7			2. Nuclear Reaction:
	3436.3+X	$35/2^+$	235.6	468.2			$^{139}La(^{30}Si,4n)^{165}Lu$
	3704.9+X	$37/2^+$	268.6				E=152 MeV.
	3980.9+X	$39/2^+$	275.2	544.6	0.14(2)		3. BC crossings suggested
	4269.7+X	$41/2^+$	288.8	564.8	12.1(37)		at higher spins.
	4579.4+X	$43/2^+$	309.1	598.5	0.61(5)		B=5/2[642](α= −1/2)
	4888.2+X	$45/2^+$	309.4	618.5	1.61(4)		C=3/2[651](α= +1/2)
	5220.8+X	$47/2^+$	331.9	641.4	1.22(2)		4. Signature splitting more
	5539.3+X	$49/2^+$	318.6	651.1	1.62(3)		pronounced at higher spins.
	5900.0+X	$51/2^+$	360.1	679.2	1.69(18)		5.The B (M1)/B (E2) values deduced
	6236.0+X	$53/2^+$	336.0	696.7	2.20(5)		in the present work by taking
	6632.9+X	$55/2^+$	395.8	732.9	1.26(4)		intensities from ENSDF and
	6997.4+X	$57/2^+$	365.9	761.4	1.09(26)		assuming 0.1 keV error in gamma-
	7439.8+X	$59/2^+$	442.0	806.9	0.42(3)		ray energies.
	7836.9+X	$61/2^+$	398.6	839.5	2.64(13)		6. Level energies are deduced
	8331.5+X	$63/2^+$	493.2	891.7	0.79(11)		using given E_{γ} (E2) energies; value of
	8754.1+X	$65/2^+$		917.2			X is expected to be about 24 keV, as
	9309.4+X	$67/2^+$		977.9			quoted in ENSDF from systematics.
	9742.0+X	$69/2^+$		987.9			
	10367.8+X	$71/2^+$		1058.4			
	10793.2+X	$73/2^+$		1051.2			
	11497.5+X	$75/2^+$		1129.7			
	11898.6+X	$77/2^+$		1105.4			
	12679.5+X	$79/2^+$		1182.0			
	13040.8+X	$81/2^+$		1142.2			
	14199.3+X	$85/2^+$		1158.5			

$^{171}_{71}Lu_{100}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1240.9	$15/2^-$					**1998BB02**	1. π: 7/2[404]
	1381.7	$17/2^-$	140.8					ν: 7/2[633]⊗1/2[521]
	1541.9	$19/2^-$	160.3	301.0	0.08(1)	0.11(25)		2. Nuclear Reaction:
	1721.1	$21/2^-$	179.4	339.4	0.09(1)	0.08(1)		^{160}Gd (^{19}F,α4n)^{171}Lu
	1919.0	$23/2^-$	197.7	377.1	0.07(1)	0.04(1)		E=103,105 MeV.
	2135.4	$25/2^-$	216.1	414.3	0.09(1)	0.05(1)		3. Signature splitting becomes
	2369.7	$27/2^-$	234.0	450.7	0.12(1)	0.09(1)		strong at higher spins.
	2621.9	$29/2^-$	251.7	486.5	0.13(1)	0.08(1)		4. The B(M1)/B(E2) and
	2891.1	$(31/2^-)$		521.4				$\lvert g_K - g_R \rvert$ values read from
	3177.1	$33/2^-$		555.2				plots.
	3479.0	$(35/2^-)$		587.9				5. Assumed Q_0 = 7.3 eb and
	3796.4	$37/2^-$		619.4				g_R = 0.35.
	4128.1	$(39/2^-)$		649.0				
	4478.4	$(41/2^-)$		682.0				
	4836.0	$(43/2^-)$		707.9				
	5213.9	$(45/2^-)$		735.5				
	5990.7	$(49/2^-)$		776.8				
2	1269.3	$13/2^+$					**1998BB02**	1. π: 1/2[541]
	1352.7	$15/2^+$	84.7					ν: 7/2[633]⊗1/2[521]
	1454.4	$17/2^+$	101.5	185.1	0.32(13)	0.35(25)		2. Mixing with $7/2[404]_{\pi}$
	1576.3	$19/2^+$	121.9	223.7	0.33(4)	0.28(6)		band at I=$27/2^+$.
	1717.8	$21/2^+$	141.7	263.1	0.33(3)	0.18(3)		3. Strong signature splitting.
	1874.7	$23/2^+$	156.9	298.4	0.25(1)	0.1(1)		4. Bandhead is uncertain.
	2043.6	$25/2^+$	169.0	325.8	0.31(1)	0.24(1)		5. The B(M1)/B(E2) and
	2247.2	$27/2^+$	203.5	372.5	0.27(1)	0.11(1)		$\lvert g_K - g_R \rvert$ values read from
	2447.7	$29/2^+$	200.4	404.1	0.29(1)	0.11(1)		plots.
	2695.2	$31/2^+$	247.4	448.0	0.33(1)	0.18(1)		6. Assumed Q_0 = 7.3 eb and
	2925.4	$33/2^+$	230.1	477.7	0.26(1)	0.11(1)		g_R = 0.35.
	3218.3	$35/2^+$	292.3	523.1	0.27(1)	0.13(1)		
	3475.7	$37/2^+$	257.5	550.4	0.28(1)	0.13(1)		
	3813.6	$39/2^+$		595.3				
	4098.3	$41/2^+$		622.5				
	4477.8	$(43/2^+)$		664.2				
	4792.1	$(45/2^+)$		693.9				
	5206.9	$(47/2^+)$		729.2				
	5556.3	$(49/2^+)$		764.1				
	5996.5	$(51/2^+)$		789.6				
	6389.3	$(53/2^+)$		833.0				
	6844.3	$(55/2^+)$		847.8				
	7290.3	$(57/2^+)$		901.1				
	7748.7	$(59/2^+)$		904.4				
	8255.2	$(61/2^+)$		964.9				

$^{171}_{71}Lu_{100}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
3	1843.9	$21/2^-$				**1998BB02**	1. π: 1/2[541]⊗1/2[411] ⊗7/2[404]
	2047.2	$23/2^-$					
	2268.4	$25/2^-$		424.7			2. B(M1)/B(E2) ratio ~ 0.001 $(\mu_N/eb)^2$.
	2509.1	$27/2^-$		462.0			
	2766.7	$(29/2^-)$		498.3			
	3041.9	$(31/2^-)$		532.7			
	3328.1	$(33/2^-)$		561.5			
	3620.0	$(35/2^-)$		578.1			
	3913.3	$(37/2^-)$		585.2			
	4216.7	$(39/2^-)$		596.7			
4	2624.5	$27/2^{(+)}$				**1998BB02**	1. π: 1/2[541] ν: 7/2[633]⊗1/2[521]
	3096.8	$(31/2^+)$		472.4			
	3640.8	$(35/2^+)$		544.0			
	4255.7	$(39/2^+)$		614.9			

$^{175}_{71}Lu_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1391	$19/2^+$				**1998WH02** 2004GA04	1. π: 7/2[404] ν: 7/2[514]⊗5/2[512] 2. Nuclear Reaction: $^{175}Lu(^{238}U, ^{238}U')^{175}Lu$ E = 1600 MeV. 3. Half-life of bandhead is 984(33) μs.
2	1511	$(9/2^+)$				**1971MI01**	1. Tentative configuration is: π: 7/2[404] ν: 7/2[514]⊗5/2[512] 2. Nuclear Reaction: $^{176}Lu(d,t)^{175}Lu$ E= 12 MeV.
	1644	$(11/2^+)$					
	1799	$(13/2^+)$					
3	1590	$(13/2^+)$				**1971MI01**	1. Tentative configuration is: π: 7/2[404] ν: 7/2[514]⊗1/2[521]
	1785	$(15/2^+)$					
4	1732	$(15/2^+)$				**1971MI01**	1. Tentative configuration is: π: 7/2[404] ν: 7/2[514]⊗1/2[521]

$^{177}_{71}Lu_{106}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration andComments**
1	970	$23/2^-$					**2004DR06**	1. π: 7/2[404]
	1243	$25/2^-$	272.8					ν: 7/2[514]⊗9/2[624]
	1537	$27/2^-$	293.5	566.4	0.090(10)			2. Nuclear Reaction:
	1851	$29/2^-$	314.1	607.8	0.119(12)			^{136}Xe beam at 816 MeV on natural
	2185	$31/2^-$	334.4	648.3	0.111(8)			Lu target and enriched ^{176}Lu and
	2539	$33/2^-$	353.8	688.4	0.099(13)			^{176}Yb targets.
	2912	$35/2^-$	372.8	726.8	0.119(25)			3. Half-life of bandhead is 160.44 d.
	3304	$37/2^-$	392.2	764.6	0.055(35)			4. Assumed Q_0 = 7.32 eb .
2	1049.5	$(9/2^-)$					**1995SH18**	1. Tentative configuration is:
	1187.9	$(11/2^-)$						π: 7/2[404]
	1348.5	$(13/2^-)$						ν: 7/2[514]⊗9/2[624]
								2. Nuclear Reaction:
								^{176}Lu(n,γ) ^{177}Lu
								E= Thermal
3	1230.4	$11/2^+$					**1971MA45**	1. π: 9/2[514]
	1388.0	$13/2^+$					1979BE54	ν: 7/2[514]⊗9/2[624]
	1566.2	$15/2^+$						2. Nuclear Reaction:
								^{176}Lu(n,γ)^{177}Lu
								E= Thermal.
								3. Half-life of bandhead is 60(15) ps.
4.	1241.5	$(7/2^+)$					**1971MA45**	1. Tentative configuration is:
							1979BE54	π: 9/2[514]
								ν: 7/2[514]⊗9/2[624]
								2. Nuclear Reaction:
								^{176}Lu(n,γ)^{177}Lu
								E= Thermal.
								3. Half-life of bandhead is 20 ps.
								4. Level energy is adopted from
								ENSDF.
5	1325	$25/2^+$					**2004DR06**	1. π: 9/2[514]
	1606	$27/2^+$	281.3					ν: 7/2[514]⊗9/2[624]
	1907	$29/2^+$	301.4	582.9	0.200(14)			2. Half-life of bandhead is 62.4(35)
	2229	$31/2^+$	321.4	623.1	0.208(17)			ns.
								3. Assumed Q_0 = 7.32 eb .
								4. Nuclear Reaction:
								^{136}Xe beam at 816 MeV on natural
								Lu target and enriched ^{176}Lu and
								^{176}Yb targets.
6	1336.5	$7/2^+$					**1971MA45**	1. π: 9/2[514]
	1443.3	$9/2^+$						ν: 7/2[514]⊗9/2[624]
	1574.5	$11/2^+$						2. Nuclear Reaction:
								^{176}Lu(n,γ)^{177}Lu
								E= Thermal.

$^{177}_{71}Lu_{106}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	g_K-g_R	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
7	1356.5 1545.2 1749.0	$15/2^+$ $17/2^+$ $19/2^+$	 (205.8)				**1975GE11** 1996PE05	1. π: 7/2[404] ν: 7/2[514]⊗1/2[510] 2. Nuclear Reaction: ^{176}Lu(n,γ)^{177}Lu E= Thermal. 3. Half-life of bandhead is 11.1(1) ns. 4. In 1996PE05, E=1545.5 level has been assigned $7/2[404]_{\pi}\otimes9/2[514]_{\pi}\otimes1/2[541]_{\pi}$ configuration with half-life 0.8(+2-1) ns.
8	1437.9 1670.9 1925.3 2200.1	$(17/2^-)$ $(19/2^-)$ $(21/2^-)$ $(23/2^-)$	 233.4 254.0 274.0	 487.0 530.0			**2002DRZZ**	1. Competing configurations are: (a) π: 9/2[514] ν: 7/2[514]⊗1/2[510] (b) π: 7/2[404] ν: 9/2[624]⊗1/2[510] 2. Nuclear Reaction: ^{176}Yb(^{7}Li,α2n) ^{177}Lu E=37 MeV. 3. Level energies are adopted from ENSDF. 4. Half-life of bandhead is < 13 ns.
9	1453.9 1607.5 1786.3	$13/2^+$ $15/2^+$ $17/2^+$	 (178.9)				**1975GE11**	1. π: 7/2[404] ν: 7/2[514]⊗1/2[521] 2. Nuclear Reaction: ^{176}Lu(n,γ)^{177}Lu E= Thermal
10	1502.6 1677.9 1880.1	$13/2^+$ $15/2^+$ $17/2^+$	 (175.3) (202.2)				**1975GE11** 1996PE05	1. π: 7/2[404] ν: 7/2[514]⊗1/2[510] 2. Nuclear Reaction: ^{176}Lu(n,γ)^{177}Lu E= Thermal. 3. Half-life of bandhead is < 0.2 ns.
11	1617.0 1750.7 1906.5 2084.4	$9/2^+$ $11/2^+$ $13/2^+$ $15/2^+$	 133.8 155.9 177.7	 289.6 333.1			**1971MA45**	1. Tentative configuration is: π: 1/2[411] ν: 7/2[514]⊗1/2[510] 2. Nuclear Reaction: ^{176}Lu(n,γ) ^{177}Lu E = Thermal.
12	1632.8 1812.4	$(15/2^+)$ $(17/2^+)$					**1975GE11**	1. Tentative configuration is: π: 7/2[404] ν: 7/2[514]⊗1/2[521] 2. Nuclear Reaction: ^{176}Lu(n,γ)^{177}Lu E= Thermal. 3. Level energies are adopted from ENSDF.

$^{177}_{71}Lu_{106}$

	E_{level} keV	I^{π}	E_γ (M1) keV	E_γ (E2) KeV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
13	1717.5	$7/2^+$				**1971MA45**	1. Tentative configuration is: π: 1/2[411] ν: 7/2[514]⊗1/2[510] 2. Nuclear Reaction: ^{176}Lu(n,γ) ^{177}Lu E = Thermal.
	1827.7	$9/2^+$	109.8				
	1960.6	$11/2^+$	132.8	242.74			
	2116.6	$13/2^+$	155.9				
14	1728.6	$13/2^+$				**1971MA45**	1. Tentative configuration is: π: 5/2[402] ν: 7/2[514]⊗1/2[510] 2. Nuclear Reaction: ^{176}Lu(n,γ) ^{177}Lu E = Thermal.
	1924.9	$15/2^+$	196.4				
	2154.5	$17/2^+$	229.6	426.1			
15	1882.0	$11/2^+$				**1971MA45**	1. Tentative configuration is: π: 5/2[402] ν: 7/2[514]⊗1/2[510] 2. Nuclear Reaction: ^{176}Lu(n,γ) ^{177}Lu E = Thermal.
	2054.0	$13/2^+$	171.2				
	2247.5	$15/2^+$	194.6				

$^{165}_{72}Hf_{93}$

	E_{level} keV	I^{π}	E_γ (M1) keV	E_γ (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1732.0	$23/2^-$				**1993NE01**	1. ν: 3/2[651]⊗3/2[651] ⊗3/2[521]
	2066.6	$27/2^-$		334.6			2. Nuclear reaction:
	2470.8	$31/2^-$		404.2			^{130}Te (^{40}Ca, 5n) ^{165}Hf
	2959.5	$35/2^-$		488.7			E=195 MeV.
	3559.0	$39/2^-$		599.9			3. CD crossing at $\eta\omega_c$=0.434 MeV suggested.
	4275.6	$43/2^-$		716.6			C=1/2[660](α= +1/2)
	5086.2	$47/2^-$		810.6			D=1/2[660](α= −1/2)
	5929.6	$51/2^-$		843.4			4. Level energies are adopted from XUNDL.
	6779.2	$55/2^-$		849.6			
	7666.4	$59/2^-$		887.2			
	8603.2	$63/2^-$		936.8			
	9584.1	$67/2^-$		980.9			

$^{169}_{72}Hf_{97}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\vert g_K-g_R \vert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1734.0	$(15/2^+)$					**2001SC49**	1. Tentative configuration is:
	1866.9	$(17/2^+)$	132.9					π:5/2[402]⊗1/2[411]
	2012.5	$(19/2^+)$	145.6	278.5	0.08(2)			ν: 5/2[642]
	2191.3	$(21/2^+)$	178.8	324.4	0.30(3)	1.27(18)		2. Nuclear reaction:
	2384.0	$(23/2^+)$	192.7	371.5	0.36(5)			$^{96}Zr(^{76}Ge,3n)^{169}Hf$
	2597.4	$(25/2^+)$	213.5	406.2	0.62(8)	1.50(20)		E=310 MeV.
	2840.3	$(27/2^+)$	242.8	456.3	0.45(2)	3.50(49)		3. BC crossing at $\eta\omega_c$=0.315 MeV
	3107.0	$(29/2^+)$	266.7	509.5	0.51(5)	1.82(27)		is suggested.
	3395.3	$(31/2^+)$	288.3	555.1	0.56(8)	2.00(27)		B=5/2[642](α= −1/2)
	3699.8	$(33/2^+)$	304.5	592.8	0.55(6)			C=3/2[651](α= +1/2)
	4020.0	$(35/2^+)$	320.2	624.6	0.63(9)			4. Level energies are adoped from
	4350.1	$(37/2^+)$	330.2	650.3	0.64(8)			XUNDL .
	4685.0	$(39/2^+)$	334.9	665.1	0.53(13)			5. The B(M1)/B(E2) values read
	5027.0	$(41/2^+)$	342.0	676.9	0.75(18)			from plot.
	5370.9	$(43/2^+)$	343.9	685.9	0.72(19)			6. Assumed Q_0 = 6 eb.
	6097.5	$(47/2^+)$		726.6				7. The $\vert g_K-g_R \vert$ values deduced in the present work assuming 0.1 keV error in gamma-ray energies.
2	1952.9	$(21/2^-)$					**2001SC49**	1. π: 9/2[514]⊗1/2[411]
	2140.8	$(23/2^-)$	187.9					ν: 5/2[642]
	2357.4	$(25/2^-)$	216.6	404.5	0.14(1)			2. Half-life of bandhead is ~10 ps.
	2597.4	$(27/2^-)$	240.0	456.6	0.16(1)	1.80(23)		3. Undergoes BC crossing.
	2856.9	$(29/2^-)$	259.5	499.5	0.41(1)	1.33(16)		B=5/2[642](α= −1/2)
	3134.1	$(31/2^-)$	277.2	536.7	0.31(3)	5.26(72)		C=3/2[651](α= +1/2)
	3424.9	$(33/2^-)$	290.8	568.0	0.42(6)	2.36(36)		4.Small signature splitting with
	3728.6	$(35/2^-)$	303.7	594.5	0.36(6)	3.59(46)		signature inversion at at $I=47/2^-$.
	4041.2	$(37/2^-)$	312.6	616.3	0.40(4)			5. Level energies are adopted from
	4360.8	$(39/2^-)$	319.6	632.2	0.39(5)			XUNDL.
	4687.8	$(41/2^-)$	327.0	646.6	0.41(6)			6. The B(M1)/B(E2) values read
	5020.7	$(43/2^-)$	332.9	659.9	0.42(5)			from plot.
	5361.4	$(45/2^-)$	340.7	673.6	0.42(10)			7. Assumed Q_0 = 6 eb.
	5711.4	$(47/2^-)$	350.0	690.7	0.47(8)			8. The $\vert g_K-g_R \vert$ values deduced in
	6077.2	$(49/2^-)$	365.8	715.8	0.43(11)			the present work assuming 0.1
	6455.1	$(51/2^-)$	377.9	743.7	0.53(14)			keV error in gamma-ray
	6854.0	$(53/2^-)$	398.9	776.8	0.45(14)			energies.

$^{171}_{72}Hf_{99}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1645.3	$19/2^+$					**1997CU01**	1. π: 7/2[404]⊗5/2[402]
	1794.2	$21/2^+$	149.4					ν: 7/2[633]
	1977.4	$23/2^+$	183					2. Nuclear reactions:
	2189.3	$25/2^+$	212					(a) ^{128}Te (^{48}Ca,5n)^{171}Hf
	2426.1	$27/2^+$	236.9	448.5	0.383(21)	1.97(12)		E=200 MeV.
	2685.6	$29/2^+$	259.4	496.4	0.412(28)	2.04(12)		(b) ^{160}Gd (^{18}O,7n)^{171}Hf
	2966.5	$31/2^+$	280.8	540.6	0.398(21)	1.65(9)		E=106 MeV.
	3266.3	$33/2^+$	299.9	580.6	0.398(21)	2.08(12)		3. Small signature splitting with
	3584.5	$35/2^+$	318.5	617.9	0.426(21)	1.62(10)		signature inversion at $I=37/2^+$.
	3920.4	$37/2^+$	336	654				4. Half-life of bandhead is 6.2(14) ns.
	4262.5	$39/2^+$	342	678				5. Exp. g_K =0.65(5) for g_R =0.25(5).
	4615.5	$41/2^+$	353	695				6. Level energies are adopted from ENSDF.
	4965.5	$43/2^+$	350	703				7. Assumed Q_0 =7.1 eb
								8. The $\lvert g_K-g_R \rvert$ values read from plot.
								9.The B (M1)/B (E2) values are deduced in the present work assuming 0.1 keV error in gamma ray energies.
2	1984.8	$23/2^-$					**1997CU01**	1. π: 7/2[404]⊗9/2[514]
	2161.2	$25/2^-$	177					ν: 7/2[633]
	2371.5	$27/2^-$	211	388				2. Half-life of bandhead is18(2) ns.
	2610.8	$29/2^-$	239.4	449.4	0.440(57)	6.3(15)		3. Exp. g_K = 0.72(5) for g_R =0.25(5).
	2876.2	$31/2^-$	265.6	504.6	0.433(36)	2.37(36)		4. Level energies are adoped from ENSDF.
	3165.4	$33/2^-$	289.3	554.3	0.447(36)	3.86(58)		5. Assumed Q_0 =7.1 eb
	3476.2	$35/2^-$	311	601				6. The $\lvert g_K-g_R \rvert$ values read from plot.
	3807.0	$37/2^-$	331.0	641.4	0.561(64)	4.82(99)		7.The B (M1)/B (E2) values are deduced in the present work assuming 0.1 keV error in gamma-ray energies.
	4156.3	$39/2^-$	349.2	680.6	0.533(64)	3.85(84)		
	4521.8	$41/2^-$	366.4	715.3	0.57(13)	4.4(19)		
	4901.8	$43/2^-$	381	744				
	5292.2	$45/2^-$	390	771				
	5692.0	472^-	400	790				

$^{173}_{72}Hf_{101}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1077.4	$(13/2^+)$				**1991FA06**	1. ν: 1/2[521]⊗5/2[512] ⊗7/2[633]
	1207.6	$(15/2^+)$	130.2				2. Nuclear reaction:
	1354.5	$(17/2^+)$	146.8	(277)			^{160}Gd (^{18}O, 5n)^{173}Hf
	(1521)	$(19/2^+)$	(166)				E= 88 MeV.

$^{173}_{72}Hf_{101}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	1699.7	$19/2^+$					**1991FA06**	1. π: 7/2[404]⊗5/2[402]
	1816.5	$21/2^+$	116.8					ν: 7/2[633]
	2005.7	$23/2^+$	189.2	(306)	0.36(+3-5)			2. Half-life of bandhead is ≤ 4.9 ns.
	2222.3	$25/2^+$	216.6	405.8	0.43(+6-8)	3.9(13)		3. Exp g_K = 0.59(3) for g_R =0.25.
	2464.0	$27/2^+$	241.7	458.4	0.28(5)	1.10(36)		The values of g_K are lower limits since
	2728.4	$29/2^+$	264.4	506.1	0.32(+5-6)	1.27(30)		g_R values may be higher than 0.25.
	3014.1	$31/2^+$	285.7	550.3	0.24(+4-5)	0.59(12)		4. Pure K and Q_0 =7.1 eb assumed.
	3318.9	$33/2^+$	304.8	590.7	0.33(+7-8)	1.08(46)		5. The $\lvert g_K-g_R \rvert$ values read from plot.
	3642.0	$35/2^+$	323.1	628.1	0.37(+5-6)	1.28(66)		6.The B (M1)/B (E2) values are deduced
	3981.4	$37/2^+$	339.6	662.5	0.40(+10-15)	1.34(72)		in the present work assuming 0.1 keV
	4341.5	$39/2^+$	360.0	699.5		5.1(30)		error in gamma-ray energies.
	4715	$41/2^+$		(734)				
3	1981.3	$23/2^-$					**1991FA06**	1. π: 7/2[404]⊗9/2[514]
	2144.6	$25/2^-$	163.3					ν: 7/2[633]
	2353.7	27/2	209.1	372.0	0.34(+4-6)	6.3(26)		2. Half-life of bandhead is 19.5(6) ns.
	2595.7	$29/2^-$	242.0	450.8	0.35(+2-3)	3.73(93)		3. Exp. g_K = 0.62(2) for g_R =0.25.
	2864.9	$31/2^-$	269.2	511.3	0.40(2)	3.59(91)		4. Pure K and Q_0 =7.1 eb assumed.
	3158.7	$33/2^-$	293.8	563.3	0.41(+3-4)	3.2(10)		5. The $\lvert g_K-g_R \rvert$ values read from plot.
	3474.2	$35/2^-$	315.5	609.3	0.33(3)	2.21(81)		6.The B (M1)/B (E2) values are deduced
	3810.5	$37/2^-$	336.3	651.8	0.45(+6-7)	2.7(10)		in the present work assuming 0.1 keV
	4165.5	$39/2^-$	355.0	(691.3)	0.36(+6-8)	2.0(11)		error in gamma-ray energies.

$^{175}_{72}Hf_{103}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1433.3	$19/2^+$					**1980DR06**	1. π:7/2[404]⊗5/2[402]
	1545.3	$21/2^+$	112.0					ν: 7/2[633]
	1735.2	$23/2^+$	189.9	302.2	0.295(+34-10)			2. Nuclear reaction:
	1953.8	$25/2^+$	218.6	408.6	0.317(+7-6)			$^{170}Er(^{9}Be, 4n)^{175}Hf$
	2195.3	$27/2^+$	241.7	460.0	0.383(+12-8)			E=44 MeV.
	2458.5	$29/2^+$	263.2	504.6	0.278(+11-9)			3. Half –life of bandhead is
	2741.6	$31/2^+$	283.3	546.1				1.10(8) μs.
	3044.2	$33/2^+$	302.2	585.9				4. Pure K and Q_0 =7.1 eb assumed.
2	1766.5	$23/2^-$					**1995GJ01**	1. π: 7/2[404]⊗9/2[514]
	1904.6	$25/2^-$	138.1				1980DR06	ν: 7/2[633]
	2114.3	$27/2^-$	209.7	347.9	0.40(1)	9.23(85)	2004SC41	2. Half-life of bandhead is
	2360.2	$29/2^-$	246.0	455.6	0.48(1)	7.64(43)		1.16(11) ns.
	2634.4	$31/2^-$	274.2	520.1	0.44(1)	4.66(20)		3. Pure K and Q_0 =7 eb assumed.
	2933.0	$33/2^-$	298.6	572.8	0.44(1)	3.86(14)		4. Exp. g_K = 0.67(−11) for
	3254.0	$35/2^-$	321	620				g_R = 0.28(5).
	3594.0	$37/2^-$	340	661				5. The B (M1)/B (E2) and $\lvert g_K-g_R \rvert$
	3952.0	$39/2^-$	358	698				values are deduced in the present
								work.

$^{177}_{72}Hf_{105}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1315.0	$23/2^+$					**1998MU14**	1. π:7/2[404]$\otimes$9/2[514]
	1593.0	$25/2^+$	277.3					ν: 7/2[514]
	1888.0	$27/2^+$	295.1	572.3	0.45(40)	12.1(16)		2. Nuclear reaction:
	2199.5	$29/2^+$	311.5	606.3	0.39(22)	4.87(41)		^{176}Yb (^{9}Be, α4n)^{177}Hf
	2525.9	$31/2^+$	326.5	637.8	0.46(28)	5.07(44)		E=70 MeV.
	2865.9	$33/2^+$	340.1	666.2	0.51(38)	5.19(55)		3. Half-life of bandhead is
	3217.9	$35/2^+$	351.9	691.8	0.62(57)	6.66(90)		1.09(5) s.
	3579.6	$37/2^+$	361.7	713.6	0.69(+86-103)	7.5(15)		4. Exp. g_K = 0.68(4) or 0.75(4)
	3949.0	$39/2^+$	369.4	(730.7)	0.62(+93-113)	5.6(14)		for g_R =0.3 or g_R =0.23(2),
								respectively.
								5. Assumed Q_0 =7.2(1) eb.
2	1343.0	$19/2^-$					**1998MU14**	1. π: 7/2[404]$\otimes$5/2[402]
	1582.5	$21/2^-$	240.6					ν: 7/2[514]
	1846.1	$23/2^-$	263.0	503.4	0.51(+9-14)	8.4(40)		2. Half-life of bandhead is
	2124.3	$25/2^-$	278.2	541.0	0.419(39)	3.24(61)		55.9(12) μs.
	2416.8	$27/2^-$	292.6	570.5	0.352(36)	1.71(35)		3. Exp. g_K = 0.64(5) or 0.71(5)
	2724.8	$29/2^-$	308.1	600.5	0.345(36)	1.37(25)		for g_R =0.3 or g_R =0.23(2),
	3047.8	$31/2^-$	323.2	630.5	0.427(+60-70)	1.85(57)		respectively.
								4. Assumed Q_0 =7.2(1) eb.
3	1713.3	$25/2^-$					**1998MU14**	1. π: 7/2[404]$\otimes$9/2[514]
	1968.3	$27/2^-$	254.8					ν: 9/2[624]
	2249.6	$29/2^-$	281.4	536.3	0.34(21)	8.79(77)		2. Half-life of bandhead is < 1ns.
	2555.1	$31/2^-$	305.4	586.7	0.30(17)	3.73(30)		3. Exp. g_K = 0.52(4) or 0.71(5)
	2882.4	$33/2^-$	327.3	632.6	0.26)17)	1.99(19)		for g_R =0.3 or g_R =0.23(2),
	3229.2	$35/2^-$	346.9	674.2	0.25(22)	1.59(20)		respectively.
	3593.6	$37/2^-$	364.6	711.2	0.30(40)	1.90(37)		4. Assumed Q_0 =7.2(1) eb.

$^{179}_{72}Hf_{107}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1106.0	$25/2^-$					**2000MU06**	1. π:7/2[404]$\otimes$9/2[514]
	1393.0	$27/2^-$	287.0					ν: 9/2[624]
	1702.0	$29/2^-$	309.6	597.0	0.10(12)	0.69(22)		2. Nuclear reaction:
	2033.9	$31/2^-$	331.3	640.4	0.46(10)	8.7(38)		^{176}Yb (^{9}Be, α2n)Hf^{177}
	2386.6	$33/2^-$	352.8	683.9	0.24(5)	1.78(66)		E=38, 45 and 55 MeV.
	2760.0	$35/2^-$	373.5	725.8	0.44(27)	4.9(55)		3. Half-life of bandhead is 25.0(3) d.
	(3151)	($37/2^-$)	(392)	(765)				4. Exp. g_K = 0.60 (7) for g_R =0.34(5)
								5.The B (M1)/B (E2) values are deduced in the present work using gamma-ray energies, intensities and their errors from XUNDL.

$^{179}_{72}Hf_{107}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	1310.5	$17/2^+$					**2000MU06**	1. ν: 1/2[510]⊗9/2[624] ⊗7/2[514]
	1521.3	$19/2^+$	210.9					2. Half-life of bandhead is 3(1) ns.
	1754.3	$21/2^+$	232.9	443.2	0.40(11)	4.0(20)		3. Exp. g_K = 0.48(4) for g_R =0.3.
	2008.4	$23/2^+$	254.3	486.4	0.29(7)	1.24(53)		4. The B (M1)/B (E2) values are deduced in the present work using gamma-ray energies, intensities and their errors from XUNDL.
	2282.3	$25/2^+$	273.9					
3	1405.0	$23/2^+$					**2000MU06**	1. π:7/2[404]⊗9/2[514] ν: 7/2[514]
	1713.4	$25/2^+$	308.6					2. Half-life of bandhead is 4(1) ns.
	2044.7	$27/2^+$	331.2	(639.4)				3. Exp. g_K = 0.86(20) for g_R = 0.34(5).
	2397.2	$29/2^+$	352.5	683.5				
	2770.4	$31/2^+$	373.2	725.5				
	(3162)	$(33/2^+)$	(392)	(765)				
4	1404.8+X	$(21/2^+)$					**2000MU06**	1. π:7/2[404]⊗5/2[402] ν: 9/2[624]
	1679.8+X	$(23/2^+)$	275.0					2. Half-life of bandhead is 14(2) ns.
	1974.7+X	$(25/2^+)$	294.9	569.6	0.28(7)	3.5(15)		3. Exp. g_K = 0.54(5) for g_R =0.34(5).
	2287.9+X	$(27/2^+)$	313.2	607.5	0.22(6)	1.29(52)		4. The B (M1)/B (E2) values are deduced in the present work using gamma-ray energies, intensities and their errors from XUNDL. 5. Value of X is expected as small.
5	1688+X	$(19/2^-)$					**2000MU06**	1. π:7/2[404]⊗5/2[402] ν: 7/2[514]
	1972+X	$(21/2^-)$	268					2. Value of X is expected as small.
	(2258+X)	$(23/2^-)$	(287)	(556)				
6	1827+X	$(21/2^+)$					**2000MU06**	1. π:7/2[404]⊗5/2[402] ν: 5/2[512]

$^{181}_{72}Hf_{109}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1040.5	$(17/2^+)$				**2001SH36**	1. π:7/2[404]⊗9/2[514] ν: 1/2[510]
	1239.7	$(19/2^+)$	199.3				2. Half-life of bandhead is ~100 μs. 3. Nuclear Reaction: $^{180}Hf(^{238}U,^{237}U)^{181}Hf$ E=1585 MeV. 4. Level energies are adopted from XUNDL.
2	1381.9	$(19/2^+)$				**2001SH36**	1. π:9/2[514]⊗7/2[404] ν: 3/2[512] 2. Level energy is adopted from XUNDL.

$^{181}_{72}Hf_{109}$

	E$_{level}$ keV	I$^{\pi}$	E$_{\gamma}$ (M1) keV	E$_{\gamma}$ (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
3	1738.9	(25/2$^-$)				**2001SH36**	1. π:9/2[514]⊗7/2[404] ν: 9/2[624] 2. Half-life of bandhead is 1.5(5) ms. 3. Level energy is adopted from XUNDL.

$^{173}_{73}Ta_{100}$

	E$_{level}$ keV	I$^{\pi}$	E$_{\gamma}$ (M1) keV	E$_{\gamma}$ (E2) keV	$\vert g_K-g_R \vert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1479.7	17/2$^-$					**1995CA27**	1. Competing configurations are: (a) π: 5/2[402] ν: 5/2[512]⊗7/2[633] (b) π: 7/2[404] ν: 7/2[633]⊗1/2[521] The observed lowest state with spin 17/2$^-$ favors configuration (a). 2. Nuclear reaction: ^{160}Gd (^{19}F, 6n)^{173}Ta E=103-105 MeV. 3. Strong signature splitting at high spins. 4. The B(M1)/B(E2) and $\vert g_K-g_R \vert$ values read from plots. 5. Assumed Q_0 = 7.0 eb.
	1633.3	19/2$^-$	153.4					
	1805.6	21/2$^-$	172.4	326.0	0.08(1)	0.34(4)		
	1997.0	23/2$^-$	191.3	363.6	0.04(1)	0.12(1)		
	2205.7	25/2$^-$	208.2	400.3	0.12(1)	0.20(3)		
	2432.6	27/2$^-$	226.3	435.8	0.02(2)	0.07(2)		
	2675.4	29/2$^-$	243.7	469.7	0.08(2)	0.06(2)		
	2934.8	31/2$^-$	260.1	502.1		0.08(3)		
	3208.3	33/2$^-$	273.3	532.9		0.02(4)		
	3496.5	35/2$^-$		561.7				
	3797.8	37/2$^-$	301.2	589.5	0.10(6)	0.12(6)		
	4113.2	(39/2$^-$)		616.7				
	4436.9	(41/2$^-$)		639.1				
	4783.3	(43/2$^-$)		670.1				
	5085.7	(45/2$^-$)		648.9				
	5477.0	(47/2$^-$)		693.8				
	5792.5	(49/2$^-$)		706.8				
	6207.0	(51/2$^-$)		(730)				
2	1635.9	(19/2$^+$)					**1995CA27**	1. π: 1/2[541] ν: 1/2[521]⊗7/2[633] 2. Strong signature splitting with signature inversion at I=57/2$^+$. 3. The B(M1)/B(E2) and $\vert g_K-g_R \vert$ values read from plots. 4. Assumed Q_0 = 7.0 eb.
	1774.0	(21/2$^+$)	138.7					
	1926.7	(23/2$^+$)	152.7	290.1	0.50(2)	0.20(2)		
	2085.1	25/2$^+$						
	2295.5	27/2$^+$	210.4	368.4				
	2479.0	29/2$^+$	183.2	394.1	0.66(2)	0.37(3)		
	2743.4	31/2$^+$	264.6	447.6	0.58(1)	0.28(2)		
	2957.2	33/2$^+$	213.5	478.3	0.60(1)	0.31(2)		
	3266.6	35/2$^+$	309.2	523.4	0.62(2)	0.33(3)		
	3510.6	37/2$^+$	244.0	553.3	0.49(6)	0.15(4)		
	3862.5	39/2$^+$		595.9				
	4137.0	41/2$^+$		626.4				
	4524.5	(43/2$^+$)		662.0				
	4834.0	(45/2$^+$)		697.0				
	5247.1	(47/2$^+$)		722.7				
	5596.5	(49/2$^+$)		762.5				
	6026.3	(51/2$^+$)		779.1				
	6432.2	(53/2$^+$)		835.7				
	6845.1	(55/2$^+$)		818.8				
	7308.2	(57/2$^+$)		876.0				
	7693.1	(59/2$^+$)		848.0				

$^{173}_{73}Ta_{100}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
3	1713.6+X	$(21/2^-)$					**1977AN04**	1. π: 9/2[514] ν: 7/2[514]⊗5/2[512] 2. Nuclear reactions: (a) $^{165}Ho(^{12}C, 4n\gamma)^{173}Ta$ E=60-70 MeV. (b) $^{175}Lu(\alpha, 6n\gamma)^{173}Ta$ E= 73 MeV. 3. Level energy is adopted form ENSDF. It is considered as tentative since not reported by 1995CA27; X=1.4 keV. 4. Half-life of level is ~100 ns.

$^{175}_{73}Ta_{102}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1551.7	$17/2^+$					**1996KO17**	1. Competing configurations are: (a) π: 9/2[514] ν: 7/2[633]⊗1/2[521] (b) π:7/2[404]⊗9/2[514] ⊗1/2[541] 2.Half-life of bandhead is 5.5(8) ns 3. Exp. g_K = 0.72(7) or 0.82(14) for two configurations with g_R=0.34(3) or g_R=0.44(10), respectively. 4. Pure K and Q_0 = 7.8 eb assumed. 5. Nuclear Reaction: $^{170}Er(^{10}B, 5n)^{175}Ta$ E= 64 MeV.
	1650.5	$19/2^+$	98.8					
	1793.2	$21/2^+$	142.7					
	1968.7	$23/2^+$	175.5	318.6	0.32(6)	1.19(48)		
	2172.8	$25/2^+$	204.1	379.8	0.34(7)	1.02(42)		
	2402.2	$27/2^+$	229.4	433.7	0.44(+6-7)	1.42(42)		
	2655.8	$29/2^+$	253.6	482.9	0.37(+6-7)	0.92(32)		
	2930.9	$31/2^+$	275.1	528.2	0.43(+8-10)	1.12(47)		
	3224.6	$33/2^+$	293.7	569.1	0.49(16)	1.34(86)		
2	1565.9	$21/2^-$					**1996KO17**	1. π: 5/2[402]⊗7/2[404] ⊗9/2[514] 2. Half-life of bandhead is 1950(150) ns. 3.Exp g_K =1.02(15) for g_R =0.34(3) 4. Pure K and Q_0 = 7.8 eb assumed.
	1877.1	$23/2^-$	311.2					
	2202.3	$25/2^-$	325.2	635.9	0.74(+9-12)	19.9(58)		
	2536.8	$27/2^-$	334.5	659.5	0.66(+11-16)	9.0(38)		
	2879.3	$29/2^-$	342.5	677.2	0.62(+10-12)	5.9(21)		
	3231.2	$(31/2^-)$	(351.9)	(694.0)				
3	1729.3	$21/2^+$					**1996KO17**	1. π: 9/2[514] ν: 7/2[633]⊗5/2[512] 2. Half-life of bandhead is 0.9(3) ns. 3.Exp. g_K =0.56(6) for g_R =0.34(3). 4. Signature splitting at higher spins. 5. Pure K and Q_0 = 7.8 eb assumed.
	1895.0	$23/2^+$	165.7					
	2086.0	$25/2^+$	191.0	357.1	0.23(3)	1.90(49)		
	2298.4	$27/2^+$	212.4	403.7	0.20(3)	0.78(22)		
	2530.7	$29/2^+$	232.3	444.4	0.21(+5-7)	0.67(40)		
	2782.0	$31/2^+$	251.3	483.3	0.23(+5-6)	0.65(32)		
	3051.5	$33/2^+$	269.5	520.4	0.23(+4-5)	0.57(23)		
	3338.1	$35/2^+$	286.6	555.9	0.26(+6-8)	0.68(37)		
	3640.2	$37/2^+$	302.1	588.8	0.27(8)	0.70(42)		
	3956.5	$39/2^+$	316.3	618.7	0.27(+9-12)	0.65(52)		
	4282.0	$41/2^+$	325.5	641.1				
	4619.4	$(43/2^+)$	337.4	662.9				
	4966.0	$(45/2^+)$	346.0	684.0				

$^{175}_{73}Ta_{102}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K-g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
4	1941.0	(23/2)					**1996KO17**	1. Tentative configuration is:
	2317.3	(27/2)		376.0				π: 1/2[411]⊗ ν^2:$i_{13/2}$
	2768.8	(31/2)		451.1				2. Level energies are adopted from
	3295.8	(35/2)		527.0				ENSDF
	3892.3	(39/2)		596.5				
	4559.3	(43/2)		667.0				
	5297.0	(47/2)		737.7				

$^{177}_{73}Ta_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K-g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1253.3	$3/2^-$					**1972AD12**	1. π: 9/2[514]
								ν: 7/2[514]⊗1/2[521]
								2. Decay study.
								3. Level energy is adopted from
								ENSDF.
2	1355.0	$21/2^-$					**2000DA09**	1.There are four competing
	1625.9	$23/2^-$	271.0					configurations:
	1920.2	$25/2^-$	294.3	565	0.45(+10-16)	9(5)		a. π: 9/2[514]⊗7/2[404]
	2192.7	$27/2^-$	272.6	566.8	0.45(+ 6-7)	4.8(14)		⊗5/2[402]
	2471.0	$29/2^-$	278.4	550.7	0.37(5)	2.5(6)		b. π:9/2[514]
	2755.1	$31/2^-$	284.2	562.2	0.26(5)	1.0(4)		ν: 7/2[514]⊗5/2[512]
	3046.5	$33/2^-$	291.4	575.5	0.34(+ 6-7)	1.5(6)		c. π: 7/2[404]
	3345.8	$35/2^-$	299.4	590.6	0.40(+6-7)	1.8(6)		ν: 7/2[514]⊗7/2[633]
	3653.7	$37/2^-$	308.1	607.0				d. π: 5/2[402]
	3968.7	$(39/2^-)$	(315)	622.9				ν: 7/2[514]⊗9/2[624]
								2. Configuration (a) is for low spin values and others for higher spins.
								3. Backbending at I=$25/2^-$.
								4. Nuclear reaction: ^{170}Er (^{11}B, 4n) ^{177}Ta E= 55 MeV.
								5. Half-life of bandhead is 5.96(21) μs.
								6. Exp. g_K = 0.64(3) for g_R =0.29(3)
								7. Pure K and Q_0 = 7.27 eb assumed.
3	1475.9	(17/2)					**2000DA09**	1. Tentative configuration is:
	1650.9	(19/2)	175.0					π: 9/2[514]
								ν: 1/2[521]⊗7/2[514]
								2. Half-life of bandhead is < 1.4 ns.
4	1512.5	$(1/2^-,3/2^-)$					**1972AD12**	1. π: 9/2[514]
								ν: 7/2[514]⊗1/2[521]
								2. Decay study.
								3. Level energy is adopted from
								ENSDF.

$^{177}_{73}Ta_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K$-$g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
5	1522.9	$17/2^+$					**2000DA09**	1.Competing configurations are:
	1605.4	$19/2^+$	82.5					(a) π: 9/2[514]⊗7/2[404]⊗1/2[541]
	1737.4	$21/2^+$	131.9					(b) π: 9/2[514]
	1904.6	$23/2^+$	167.1	299.3	0.34(4)	1.6(4)		ν: 1/2[521]⊗7/2[633]
	2101.5	$25/2^+$	196.9	364.3	0.36(3)	1.3(2)		Available experimental information
	2324.2	$27/2^+$	222.7	419.5	0.42(4)	1.5(3)		and theoretical calculations favor
	2570.0	$29/2^+$	245.8	468.5	0.42(5)	1.4(3)		configuration (a).
	2839.9	$31/2^+$	269.9	515.7	0.34(6)	0.8(3)		2. Half-life of bandhead is 5.5(14) ns.
	3129.3	$33/2^+$	289.4	559.7	0.46(7)	1.4(4)		3. Exp. g_K = 0.63(4) – 0.75(7) for
	3438.1	$35/2^+$	308.8	598.2				g_R =0.29(3).
	3764.4	$37/2^+$	326.3	634.7				4. Small signature splitting.
								5. Pure K and Q_0 = 7.27 eb assumed.
6	1602.7	$19/2^-$					**2000DA09**	1. Competing configurations are:
	1766.1	$21/2^-$	163.4					(a) π: 7/2[404]
	1949.3	$23/2^-$	183.1	346.6	0.02(+4)	0.01(+10)		ν: 5/2[642]⊗7/2[514]
	2154.1	$25/2^-$	204.7	388.0	0.10(4)	0.2(1)		(b) π: 5/2[402]
	2381.0	$27/2^-$	226.9	431.7	0.08(+4-3)	0.09(7)		ν: 7/2[633]⊗7/2[514]
	2628.5	$29/2^-$	(247.5)	474.4				2. Half-life of bandhead is < 1.4 ns.
	2896.2	$31/2^-$		515.2				3. Exp. g_K = 0.38(4) for g_R =0.29(3).
	3181.0	$33/2^-$		552.5				4. Pure K and Q_0 = 7.27 eb assumed.
	3480.7	$35/2^-$		584.5				
	3779	$(37/2^-)$		(598)				
7	1698.5	$23/2^+$					**2000DA09**	1. π: 9/2[514]
	1834.6	$25/2^+$	136.1					ν: 7/2[633]⊗7/2[514]
	2037.1	$27/2^+$	202.5	338.6	0.31(+5-6)	5.3(19)		2. Half-life of bandhead is <1.0 ns.
	2271.2	$29/2^+$	234.1	436.6	0.33(+4-5)	3.3(9)		3. Exp. g_K = 0.58(4) for g_R =0.29(3).
	2530.0	$31/2^+$	258.8	492.9	0.30(3)	2.0(4)		4. Pure K and Q_0 = 7.27 eb assumed.
	2810.3	$33/2^+$	280.3	539.1	0.28(+4-5)	1.5(5)		
	3109.6	$35/2^+$	299.3	579.6	0.26(3)	1.1(3)		
	3426.1	$37/2^+$	316.6	615.8	0.33(+4-5)	1.6(5)		
	3757.8	$39/2^+$	331.7	648.2				
	4103.2	$41/2^+$		677.1				
	4459.4	$43/2^+$		701.6				
	4825	$(45/2^+)$		(722)				
	5195	$(47/2^+)$		(736)				
8	1874.9	$25/2^-$					**2000DA09**	1. Competing configurations are:
	2116.9	$27/2^-$	242.1					(a) π: 7/2[404]
	2380.7	$29/2^-$	263.9	505.8	0.18(+5-6)	0.5(3)		ν: 7/2[633]⊗7/2[514]
	2666.3	$31/2^-$	285.6	549.3	0.17(7)	0.5(4)		(b) π: 7/2[404]
	2971.5	$33/2^-$	305.2	590.8	0.17(6)	0.4(3)		N: 7/2[514]⊗9/2[624]
	3294.7	$35/2^-$	323.4	628.3				(c) π: 5/2[402]
	3633.5	$37/2^-$		662.0				N: 7/2[514]⊗9/2[624]
	3987.9	$39/2^-$		693.2				Available exp. information favor
	4352.8	$41/2^-$		719.3				configuration (a) tentatively.
	4727.9	$43/2^-$		740.0				2. Pure K and Q_0 = 7.27 eb assumed.
9	2098.2	$25/2^+$					**2000DA09**	1. π: 9/2[514]
	2324.4	$27/2^+$	226.2					ν: 7/2[514]⊗9/2[624]
	2570.0	$29/2^+$	245.6	(472)	0.11(4)	0.5(3)		2. Half-life of bandhead is
	2831.0	$31/2^+$	(261)					< 2.8 ns.
								3. Exp. g_K = 0.40(5) for g_R =0.29(3).
								4. Pure K and Q_0 = 7.27 eb assumed.

$^{179}_{73}Ta_{106}$

	E_{level} keV	I^{π}	E_{γ}(M1) keV	E_{γ}(E2) keV	$\lvert g_K - g_R \rvert$	B(M1)/B(E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1251.5	$21/2^-$					**1997KO13**	1. Mixing of following three
	1541.4	$23/2^-$	289.9					configurations suggested:
	1847.6	$25/2^-$	306.2	595.9	0.43(+6-8)	8.0(26)		(a) π: 9/2[514]⊗5/2[402]⊗7/2[404]
	2161.6	$27/2^-$	314.0	619.9	0.33(4)	2.59(68)		(b) π: 5/2[402]
	2512.4	$29/2^-$	350.8	664.6	0.39(+7-8)	2.8(11)		ν: 7/2[514]⊗9/2[624]
	2861.7	$31/2^-$	349.3	701.9				(c) π: 9/2[514]
	3225.3	$(33/2^-)$	(363.6)	(714.0)				ν: 5/2[512]⊗7/2[514]
								2. Signature splitting with double back-bending at I= $25/2^-$ and I= $29/2^-$.
								3. Half-life of bandhead is 320(20) ns.
								4. Exp. g_K = 0.66(2) for g_R =0.30.
								5. Nuclear reaction: $^{176}Yb(^{7}Li, 4n)^{179}Ta$ E= 30-60 MeV.
								6. Pure K and Q_0 = 7.22(9) eb assumed.
2	1317.8	$25/2^+$					**1997KO13**	1. π: 9/2[514]
	1591.6	$27/2^+$	273.8					ν: 7/2[514]⊗9/2[624]
	1885.3	$29/2^+$	293.7	567.4	0.23(2)	3.82(81)		2. Half-life of bandhead is 11(2) ms.
	2198.8	$31/2^+$	313.5	606.4	0.22(4)	1.93(66)		3. Exp. g_K = 0.53(5) for g_R =0.30.
	2531.3	$33/2^+$	332.5	645.6	0.23(4)	1.57(49)		4. Pure K and Q_0 = 7.22(9) eb
	2882.6	$35/2^+$	351.3	683.5				assumed.
	3252.1	$37/2^+$	369.5	720.0				
	3638.7	$39/2^+$	386.6	756.1				
	4042.4	$(41/2^+)$	(403.7)	790.3				
3	1327.0	$23/2^-$					**1997KO13**	1. π: 7/2[404]
	1601.3	$25/2^-$	274.3				1982BA21	ν: 7/2[514]⊗9/2[624]
	1898.4	$27/2^-$	297.1	571.5	0.07(+6-3)	0.28(29)		2. Half-life of bandhead is 1.6(4) μs.
	2217.9	$29/2^-$	319.5	616.8	0.10(3)	0.34(17)		3. Exp. g_K = 0.39(11) for g_R =0.30.
	2560.0	$31/2^-$	342.1	661.2				4. Pure K and Q_0 = 7.22(9) eb
	2920.5	$(33/2^-)$	360.5	(702.0)				assumed.
4	1627.6	$(19/2^+,21/2^-)$					**1997KO13**	1. There are two possible
	1832.3	$(21/2^+,23/2^-)$	204.7					configurations:
	2058.2	$(23/2^+,25/2^-)$	225.9	429.6	0.38(+8-14)	6.1(39)		(a) π: 9/2[514]
	2304.3	$(25/2^+,27/2^-)$	246.1	472.2	0.23(+6-7)	1.32(75)		ν: 1/2[521]⊗9/2[624]
								(b) π: 5/2[402]
								ν: 9/2[624]⊗7/2[514]
								2. Half-life of bandhead is ≤ 1 ns.
								3. For g_R =0.30, exp g_K = 0.56(13) and 0.60(14) for K=$21/2^-$ and $19/2^+$ respectively.
								4. Pure K and Q_0 = 7.22(9) eb assumed.

$^{181}_{73}Ta_{108}$

	E_{level} keV	I^π	E_γ (M1) keV	E_γ (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1402.4	$15/2^-$				**1998SA60**	1. π: 7/2[404] ν: 1/2[510]⊗9/2[624] 2. Nuclear reaction: ^{176}Yb (^{11}B, α2n)^{179}Ta E = 57, 52 MeV. 3. The B(M1)/B(E2) values read from plot. 4. Level energies are adopted from XUNDL.
	1583.0	$17/2^-$	181				
	1786.8	$19/2^-$	204	384	2.8(11)		
	2013.9	$21/2^-$	227	431	0.58(14)		
	2261.8	$23/2^-$	249	475	0.36(14)		
	2532.9	$25/2^-$		519			
2	1402.4+X	$(19/2^+)$				**1998SA60**	1. π: 9/2[514] ν: 1/2[510]⊗9/2[624] 2. Half-life of bandhead is 140(36) ns. 3. The B(M1)/B(E2) values read from plot. 4. Level energies are adopted from XUNDL.
	1615.4+X	$(21/2^+)$	213				
	1851.9+X	$(23/2^+)$	236	450	1.64(35)		
	2111.7+X	$(25/2^+)$	260	496	1.14(14)		
	2392.3+X	$(27/2^+)$	281	540	0.71(14)		
3	1485	$21/2^-$				**1998WH02**	1. π:9/2[514]⊗7/2[404] ⊗5/2[402] 2. Nuclear reaction: ^{181}Ta (^{238}U,^{238}U')^{181}Ta E=1600 MeV 3. Half-life of bandhead is 25(2) μs.
4	2230	$29/2^-$				**1998WH02**	1. π: 9/2[514] ν:11/2[615]⊗9/2[624] 2. Half-life of band head is 210(20) μs.

$^{185}_{73}Ta_{112}$

	E_{level} keV	I^π	E_γ (M1) keV	E_γ (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1258+X	$21/2^-$				**1999WH03**	1. π: 5/2[402]⊗7/2[404] ⊗9/2[514] 2. Nuclear reaction: ^{186}W(^{238}U,X)^{185}Ta E=1600 MeV. 3. Half-life of bandhead is > 1 ms. 4. Value of X<100 keV.

$^{165}_{74}W_{91}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1948.9+X	$23/2^-$				**1992SI12**	1. For α = +1/2 signature:
	2302.7+X	$27/2^-$		353.8			ν: 3/2[521](α= +1/2)
	2511.2+X	$(29/2^-)$					⊗3/2[651](α= +1/2)
	2602.3+X	$31/2^-$		299.6			⊗3/2[651](α= −1/2)
	2860.3+X	$(33/2^-)$		349.1			For α = −1/2 signature:
	3057.3+X	$35/2^-$		455.0			ν: 3/2[521](α= −1/2)
	3341.8+X	$(37/2^-)$		481.5			⊗3/2[651](α= +1/2)
	3633.6+X	$39/2^-$		576.3			⊗3/2[651](α= −1/2)
	3924.5+X	$(41/2^-)$		582.7			2. Nuclear reaction:
	4290.1+X	$43/2^-$		656.5			$^{106}Pd(^{63}Cu, p3n)^{165}W$
	4601.3+X	$(45/2^-)$		676.8			E=285 MeV.
	5003.7+X	$47/2^-$		713.6			3. Signature splitting with
	5342.4+X	$(49/2^-)$		741.1			Signature inversion at
	5774.3+X	$51/2^-$		770.6			$I=39/2^-$.
	6136.5+X	$(53/2^-)$		794.1			4. Level energies are relative to
	6598.4+X	$(55/2^-)$		824.1			$13/2^+$ state at 0+X, where X is
	(7470.4+X)	$(59/2^-)$		(872)			unknown.

$^{167}_{74}W_{93}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1782.4+X	$23/2^-$				**1992TH06**	1. For α = +1/2 signature:
	2093.4+X	$(25/2^-)$					ν: 3/2[521](α= +1/2)
	2104.5+X	$27/2^-$		322.1			⊗3/2[651](α= +1/2)
	2427.9+X	$(29/2^-)$	323.4	334.5			⊗3/2[651](α= −1/2)
	2479.0+X	$31/2^-$		374.5			For α = −1/2 signature:
	2821.6+X	$(33/2^-)$	342.6	393.7			ν: 3/2[521](α= −1/2)
	2937.0+X	$35/2^-$		458.0			⊗3/2[651](α= +1/2)
	3313.3+X	$(37/2^-)$	376.3	491.7			⊗3/2[651](α= −1/2)
	3509.4+X	$39/2^-$		572.4			2. Nuclear reaction:
	3907.7+X	$(41/2^-)$		594.4			$^{142}Nd(^{30}Si, 5n)^{167}W$
	4197.2+X	$43/2^-$		687.8			E=165 MeV.
	4602.0+X	$(45/2^-)$		694.3			3.Strong signature splitting with
	4984.3+X	$47/2^-$		787.1			signature inversion at $I= 49/2^-$.
	5385.2+X	$(49/2^-)$		783.2			4. Level energies are adopted
	5849+X	$51/2^-$		864.9			from ENSDF. Values are
	6241.8+X	$(53/2^-)$		856.6			relative to $5/2^-$ state at 0+X,
	6765+X	$(55/2^-$		915.4			where X is expected to be
	7153+X	$(57/2^-)$		911.3			small.
	8660+X	$(59/2^-)$		930.0			
	8108+X	$(61/2^-)$		955.2			

$^{177}_{74}W_{103}$

	E$_{level}$ keV	I$^{\pi}$	E$_{\gamma}$ (M1) keV	E$_{\gamma}$ (E2) keV	|g$_K$-g$_R$|	B (M1)/B (E2) (μ_N/eb)^2	Reference	**Configuration and Comments**
1	1645.5	19/2$^+$					**1997SH36**	1. ν: 5/2[512]⊗7/2[514] ⊗7/2[633]
	1789.9	21/2$^+$	144.3					
	1977.4	23/2$^+$	187.5	331.8	0.116(7)	0.47(4)		2. Nuclear reaction: ^{164}Dy (^{18}O, 5n)^{177}W E=83 MeV.
	2194.9	25/2$^+$	217.5	404.9	0.109(7)	0.25(2)		
	2436.3	27/2$^+$	241.4	458.9	0.102(7)	0.17(2)		
	2697.8	29/2$^+$	261.7	502.8	0.136(7)	0.25(2)		3. Mean exp. g_K = 0.18(2) for g_R =0.30(5).
	2974.6	31/2$^+$	(276.0)	538.3	0.163(7)	0.30(1)		
	3270.7	33/2$^+$	296.0	573.0	0.150(14)	0.22(2)		4. Strong signature splitting at higher spins.
	3568.7	35/2$^+$		594.1				
	3889.2	37/2$^+$		618.5				5. Level energies are adopted from ENSDF. 6. Assumed Q_0 = 6.8 eb . 7. Half-life of band-head is ≤ 1 ns. 8. The B (M1)/B (E2) values are deduced in the present work.
2	2148.8	21/2$^+$					**1997SH36**	1. Competing configurations are:
	2330.1	23/2$^+$	181.6					(a) π: 9/2[514]⊗7/2[404] ν: 5/2[512]
	2557.9	25/2$^+$	227.9	409.5	0.218(14)	9.0(52)		
	2821.6	27/2$^+$	263.6	491.5	0.558(27)	13.8(28)		(b) π: 9/2[514]⊗5/2[402] ν: 7/2[514]
	3109.6	29/2$^+$	288.0	551.7	0.650(41)	14.6(88)		
	3419.9	31/2$^+$	310.3	598.3		2.8(21)		Configuration (a) dominates at bandhead spin region and mixing of both at high spins suggested.
	3745.1	33/2$^+$	325.2	635.5		5.2(42)		2. Mean exp. g_K = 0.71(20) for g_R = 0.30(5). 3. Level energies are adopted from ENSDF. 4. Assumed Q_0 = 6.8 eb . 5. The B (M1)/B (E2) values are deduced in the present work taking gamma ray energies, intensities and their error from ENSDF.

$^{179}_{74}W_{105}$

	E$_{level}$ keV	I$^{\pi}$	E$_{\gamma}$ (M1) keV	E$_{\gamma}$ (E2) keV	B (M1)/B (E2) (μ_N/eb)^2	Reference	**Configuration and Comments**
1	720.2	(3/2)$^+$				**1975ME20**	1. Tentative configuration is:
	773.7	(5/2)$^+$	53.5				π: 9/2[514]⊗5/2[402]
	1680.3	(7/2)$^+$					ν: 7/2[514] 2. Decay study. 3. Level energies are adopted from ENSDF.
2	1216.0	17/2$^+$				**1991WA26**	1. ν: 7/2[514]⊗9/2[624]⊗1/2[521] 2. Nuclear reaction: ^{170}Er (^{13}C, 4n)^{179}W E=67 MeV.

$^{179}_{74}W_{105}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
3	1631.8	$21/2^+$					**1994WA05**	1. Competing configurations are: (a) ν: 9/2[624]⊗7/2[514]⊗5/2[512] (b) π: 7/2[404]⊗5/2[402] ν: 9/2[624] Configuration (a) favored by g_K value but there may be mixing among these two configurations.
	1873.2	$23/2^+$	241.4					2. Nuclear reaction: $^{170}Er\ (^{13}C, 4n)^{179}W$ E=67 MeV.
	2137.9	$25/2^+$	264.6	506.1	0.16(1)	1.27(10)		3. Half-life of bandhead is 390(30) ns.
	2424.3	$27/2^+$	286.4	551.2	0.19(1)	1.06(9)		4. Exp. g_K = 0.13(5) for g_R =0.30(5).
	2730.8	$29/2^+$	306.5	592.9	0.20(4)	0.85(31)		5. Assumed Q_0 = 6.5 eb .
	3054.9	$31/2^+$	324.1	630.7	0.19(4)	0.63(24)		6. The B (M1)/B (E2) and $\lvert g_K - g_R \rvert$ values are deduced in the present work assuming 0.1 keV error in gamma ray energies.
	3391.3	$33/2^+$	(336)	660.5	0.16(6)	0.42(23)		
	3746.4	$35/2^+$		691.5				
4	1832.1	$23/2^-$					**1994WA05**	1. ν: 9/2[624]⊗7/2[514]⊗7/2[633]
	2037.7	$25/2^-$	205.6					2. Signature splitting with signature inversion at I=$39/2^-$.
	2261.2	$27/2^-$	223.4	429.1	0.06(1)	0.22(5)		3. Half-life of bandhead is <0.5 ns.
	2504.4	$29/2^-$	243.3	466.9	0.04(4)	0.06(11)		4. Exp g_K = 0.24(5) for g_R =0.30(5).
	2738.9	$31/2^-$	(234)	477.4				5. It is explained as a tilted rotational band.
	3031.6	$33/2^-$		527.1				6. The B (M1)/B (E2) and $\lvert g_K - g_R \rvert$ values are deduced in the present work assuming 0.1 keV error in gamma ray energies.
	3326.5	$35/2^-$		587.6				
	3637.5	$37/2^-$		605.9				
	3963.9	$39/2^-$		637.4				
	4304.7	$41/2^-$		667.2				
	4666.8	$43/2^-$		702.9				
	5036.4	$45/2^-$		731.7				
	5436.9	$47/2^-$		770.1				
	5833.3	$49/2^-$		796.9				
	6269	$(51/2^-)$		(832)				
	6708	$(53/2^-)$		(875)				
5	2011.9	$(23/2)^+$					**1994WA05**	1. π: 9/2[514]⊗7/2[404] ν: 7/2[514]
	2291.5	$(25/2)^+$	279.6					2. Half-life of bandhead is < 1.0 ns.
	2586.1	$(27/2)^+$	294.5	574.3	0.41(7)	11.7(41)		3. Exp. g_K = 0.7(1) for g_R =0.30(5).
	2893.5	$(29/2)^+$	307.4	602.1	0.37(6)	5.2(17)		4. Assumed Q_0 = 6.5 eb .
	3210.3	$(31/2)^+$	316.7	624.3	0.38(3)	3.98(57)		5. The B (M1)/B (E2) and $\lvert g_K - g_R \rvert$ values are deduced in the present work assuming 0.1 keV error in gamma ray energies.
	3534.7	$(33/2)^+$	324.4	(641)				

$^{179}_{74}W_{105}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
6	2088.4	(23/2)				**1994WA05**	1. Tentative configuration is: π: 9/2[514]⊗5/2[402] ν: 9/2[624]
	2299.6	(25/2)	211.2				
	2546.7	(27/2)	247.1				
	2822.0	(29/2)	275.3	(523)			2. Half-life of bandhead is < 0.5 ns.
	3121.0	(31/2)	299.0	(574)			
	3439	(33/2)	318.0	(617)			3. Exp. g_K < 0.08 or > 0.52 for g_R = 0.30(5).
	(3779)	(35/2)	(340)	(658)			

$^{183}_{74}W_{109}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1745.7	$19/2^-$					**1999SA60**	1. ν: 9/2[624]⊗11/2[615] ⊗1/2[510] Admixture of K=$19/2^-$ and K=$21/2^-$ suggested.
	1988.9	$21/2^-$	243.0					
	2252.4	$23/2^-$	263.5	507.2	0.34(1)	3.83(33)		
	2535.2	$25/2^-$	282.8	546.5	0.33(1)	2.00(12)		
	2836.8	$27/2^-$	301.6	584.3	0.35(1)	1.83(16)		2. Nuclear reaction: $^{176}Yb(^{14}C, \alpha 3n)^{183}W$ E=68 MeV.
	3155.9	$29/2^-$	318.9	620.8	0.38(1)	1.62(8)		3. Half-life of bandhead is 12.7(20) ns. 4. The B(M1)/B(E2) and $\lvert g_K-g_R \rvert$ values read from plots. 5. Assumed Q_0 = 7.0 eb.
2	1900.3	$(19/2^+)$					**1999SA60**	1. ν: 7/2[514]⊗11/2[615] ⊗1/2[510]
	2154.2	$(21/2^+)$	253.8					
	2429.8	$(23/2^+)$	275.6					2. Half-life of bandhead is < 3.0 ns.
	2723.4	$(25/2^+)$	293.5	569.3		0.88(23)		3. For g_R = 0.25, exp. g_K for I= $25/2^+$ is 0.04(3).
3	2049.9	$23/2^-$					**1999SA60**	1 ν: 9/2[624]⊗11/2[615] ⊗3/2[512]
	2339.7	$25/2^-$	289.7					
	2648.5	$27/2^-$	308.8	598.9	0.24(1)	3.87(29)		2. Half-life of bandhead is < 1.5 ns.
	2976.7	$29/2^-$	328.1	637.7	0.36(1)	4.24(49)		3. The B(M1)/B(E2) and $\lvert g_K-g_R \rvert$ values read from plots. 4. Assumed. Q_0 = 7.0 eb and g_R = 0.25.
4	2101.1	$23/2^{(+)}$					**1999SA60**	1.Tentative configuration is: π: 5/2[402]⊗7/2[404] ν: 11/2[615]
5	2268.9	$25/2^{(-)}$					**1999SA60**	1. π: 5/2[402]⊗9/2[514] ν: 11/2[615]
	2590.4	$27/2^{(-)}$	321.5					
	2931.7	$29/2^{(-)}$	341.3	662.8		36.4(44)		2. Half-life of bandhead is < 3.0 ns.
	3291.6	$31/2^{(-)}$	359.9					3. For g_R = 0.25, exp. g_K value at I =$29/2^-$ is 0.95(4).

$^{169}_{75}Re_{94}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1.	1922.6	(23/2)				**2004ZH05**	1.Tentative configuration assignment based on alignment is: π: 9/2[514] ν: 3/2[651](α= +1/2) ⊗3/2[521](α= +1/2) 2. Nuclear Reaction: $^{144}Sm(^{28}Si, 1p2n\gamma)^{169}Re$ E=140, 145, 150 MeV. 3. Energy variation with spin is not smooth. 4. Signature splitting at higher spins. 5. Level energies are adopted from XUNDL
	2078.2	(25/2)	155.6				
	2274.0	(27/2)	195.8	351.3	2.05(40)		
	2512.9	(29/2)	239.0	434.6	2.91(60)		
	2786.4	(31/2)	273.5	512.3	3.44(70)		
	3081.4	(33/2)	295.0	568.6	4.34(85)		
	3408.8	(35/2)	327.5	622.3			
	3723.1	(37/2)	314.3	641.8			
	4050.4	(39/2)	327.5	641.6			
	4337.4		287.0				

$^{175}_{75}Re_{100}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1793.9	(19/2)					**1992KI06**	1. Competing configurations are: (a) π: 9/2[514] ν: 5/2[512]⊗7/2[633] (b) π: 5/2[402] ν: 5/2[512]⊗7/2[633] 2. Half-life of bandhead is 28 ns. 3. Nuclear Reaction: $^{161}Dy(^{19}F, 5n)^{175}Re$ E = 88-112 MeV. 4. Assumed Q_0 = 7 eb.
	1943.5	(21/2)	149.5					
	2120.5	(23/2)	177.0	326.9	0.27(6)	2.6(9)		
	2322.9	(25/2)	202.4	379.4	0.17(3)	0.54(19)		
	2549.2	(27/2)	226.2	428.8	0.13(3)	0.26(10)		
	2797.4	(29/2)	248.2	474.5	0.16(5)	0.31(17)		
	3066.2	(31/2)	268.7	516.9	0.23(3)	0.57(15)		
	3353.5	(33/2)	287.3	556.2	0.20(4)	0.39(17)		
	3658.2	(35/2)	304.7	592.0	0.28(5)	0.74(27)		
	3978.3	(37/2)	320.2	624.8	0.39(11)	1.3(6)		
	4310.2	(39/2)	332.0	651.9	0.42(7)	1.4(5)		
	4672.2	(41/2)		693.9				

$^{177}_{75}Re_{102}$

	E_{level} KeV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1442.3+X	$15/2^+$					**1995BA67**	1. Competing configurations are: (a) π: 9/2[514]⊗5/2[402] ⊗1/2[541] (b) $9/2[514]_{\pi}+3^-$ Octupole 2. Exp. $g_K \sim 0.8$ for $g_R = 0.35$. 3. Half-life of bandhead is ≤ 0.4 ns. 4. Nuclear Reactions: (a) $^{130}Te\ (^{51}V, 4n)^{177}Re$ E=225 MeV. (b) $^{163}Dy\ (^{19}F, 5n)\ ^{177}Re$ E=105 MeV. 5. Level energy is relative to the energy of the $9/2^-$, 9/2[514] level at 0+X, where X<40 keV.
2	1567.1+X	$17/2^+$					**1995BA67**	1. Competing configurations are: (a) π: 9/2[514]⊗7/2[404]⊗ 1/2[541] (b) π: 9/2[514] ν: 1/2[521]⊗7/2[633] 2. Small signature splitting. 3. Average exp. $g_K = 0.8$ for $g_R = 0.35$. 4. Assumed $Q_0 = 6.7$ eb . 5. The B (M1)/B (E2) and $\lvert g_K-g_R \rvert$ values are deduced in the present work assuming 0.1 keV error in gamma ray energies. 6. Level energies are relative to the energy of the $9/2^-$, 9/2[514] level at 0+X, where X<40 keV.
	1676.1+X	$19/2^+$	109.0					
	1817.7+X	$21/2^+$	141.5					
	1988.6+X	$23/2^+$	170.8	313.2				
	2184.6+X	$25/2^+$	196.1	366.8	0.43(4)	2.17(47)		
	2406.1+X	$27/2^+$	221.5	417.6	0.47(6)	2.20(54)		
	2648.3+X	$29/2^+$	242.1	463.6	0.51(5)	2.30(51)		
	2913.4+X	$31/2^+$	265.1	507.3	0.4(4)	1.59(31)		
	3198.2+X	$33/2^+$	284.8	549.7	0.70(13)	3.7(14)		
3	1586.8+X	$(17/2^-)$					**1995BA67**	1. π: 9/2[514] ν: 1/2[521]⊗5/2[512] 2. Exp. $g_K = 0.87$. 3. Level energies are relative to the energy of the $9/2^-$, 9/2[514] level at 0+X, where X<40 keV.
	1829.4+X	$(19/2^-)$	242.5					
	2074.5+X	$(21/2^-)$	245.1					
	2331.2+X	$(23/2^-)$	256.4					
	2603.7+X	$(25/2^-)$	272.2	529.2				
4	1825.2+X	$21/2^+$					**1995BA67**	1. π: 9/2[514] ν: 5/2[512]⊗7/2[633] 2. Signature splitting at high spins. 3. Half-life of bandhead is ≤ 0.5 ns. 4. Average exp. $g_K = 0.48$. 5. Assumed $Q_0 = 6.7$ eb . 6. The B (M1)/B (E2) and $\lvert g_K-g_R \rvert$ values are deduced in the present work assuming 0.1 keV error in gamma ray energies. 7. Level energies are relative to the energy of the $9/2^-$, 9/2[514] level at 0+X, where X<40 keV.
	1975.9+X	$23/2^+$	150.7					
	2156.0+X	$25/2^+$	180.2					
	2367.1+X	$27/2^+$	211.3	391.0	0.18(1)	1.07(17)		
	2604.6+X	$29/2^+$	237.7	448.4	0.17(2)	0.78(16)		
	2865.0+X	$31/2^+$	260.2	498.0	0.12(1)	0.29(5)		
	3144.9+X	$33/2^+$	279.8	540.4	0.13(2)	0.31(6)		
	3439.9+X	$(35/2^+)$		574.9				
	3747.3+X	$(37/2^+)$		602.8				
	4066.6+X	$(39/2^+)$		626.7				
	4391.5+X	$(41/2^+)$		644.3				
	4736.6+X	$(43/2^+)$		670.0				
	5073.3+X	$(45/2^+)$		681.8				

$^{177}_{75}Re_{102}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K-g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
5	1959.9+X	$23/2^+$					**1995BA67**	1. π: 9/2[514] ν: 7/2[514]⊗7/2[633] 2. Assumed Q_0 = 6.7 eb . 3. The B (M1)/B (E2) and $\|g_K-g_R\|$ values are deduced in the present work assuming 0.1 keV error in gamma ray energies. 4. Half-life of bandhead is ≤ 0.5 ns. 5. Average exp. g_K = 0.59. 6. Level energies are relative to the energy of the $9/2^-$, 9/2[514] level at 0+X, where X<40 keV.
	2092.3+X	$25/2^+$	132.4					
	2273.7+X	$27/2^+$	181.3					
	2489.7+X	$29/2^+$	216.1	397.1	0.44(4)	7.0(14)		
	2734.0+X	$31/2^+$	244.4	460.3	0.34(1)	3.10(29)		
	3002.7+X	$33/2^+$	268.7	513.0	0.24(1)	1.20(9)		
	3291.8+X	$35/2^+$	289.0	557.8	0.26(1)	1.28(11)		
	3599.4+X	$37/2^+$	307.6	596.8	0.27(1)	1.27(11)		
	3922.5+X	$39/2^+$	323.2	630.7	0.21(1)	0.72(9)		
	4258.9+X	$41/2^+$	336.6	659.3	0.25(1)	0.92(12)		
	4607.3+X	$43/2^+$	348.2	684.6	0.18(2)	0.48(11)		
	4964.0+X	$45/2^+$	357.1	705.4	0.26(2)	0.91(18)		
	5332.5+X	$47/2^+$	368.9	724.6	0.35(4)	1.57(36)		
	5709.8+X	$(49/2^+)$		745.7				

$^{179}_{75}Re_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K-g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1297.6	$15/2^-$					**2002TH12**	1. Tentative configuration is: π: 9/2[514] ν: 7/2[514]⊗1/2[521] 2. Level energies are adopted from XUNDL. 3. Nuclear Reactions: (a) ^{165}Ho (^{18}O, 4n)^{179}Re E=82 MeV (b) ^{173}Yb (^{11}B, 5n) ^{179}Re E=73 MeV.
	1544.1	$(17/2^-)$	246.1					
2	1771.8	$(19/2^-)$					**2002TH12**	1. π: 5/2[402] ν:7/2[514]⊗7/2[633] 2. Level energy is adopted from XUNDL.
3	1771.8+X	$(23/2^+)$					**2002TH12**	1. π: 9/2[514] ν: 7/2[514]⊗7/2[633] 2. Half-life of bandhead is 408(12) ns. 3. Level energies are adopted from XUNDL; X≤140 keV.
	1902.4+X	$(25/2^+)$	130.2					
	2097.1+X	$(27/2^+)$	194.7					
	2326.0+X	$(29/2^+)$	228.9					
	2581.1+X	$(31/2^+)$	255.1					
4	1813.7	$(17/2^+)$					**2002TH12**	1. π: 5/2[402] ν:7/2[514]⊗5/2[512] 2. Small signature splitting. 3. Level energies are adopted from XUNDL. 4. Assumed Q_0 = 6.8 eb . 5. The B (M1)/B (E2) values are deduced in the present work.
	1988.3	$(19/2^+)$	174.5					
	2182.6	$(21/2^+)$	194.3	368.9		0.06(2)		
	2396.5	$(23/2^+)$	214.0	408.1	0.177(3)	0.48(12)		
	2627.5	$(25/2^+)$	231.0	444.8	0.184(14)	0.40(5)		
	2876.9	$(27/2^+)$	249.5	480.6	0.23(5)	0.50(19)		
	3130.8	$(29/2^+)$	254.1	503.0	0.170(14)	0.25(3)		

$^{179}_{75}Re_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K-g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
5	1826.4	$(19/2^+)$					**2002TH12**	1. π: 9/2[514]
	1978.0	$(21/2^+)$	151.6					ν:9/2[624]⊗1/2[521]
	2186.6	$(23/2^+)$	208.6					2. Bandhead is isomeric but
	2416.4	$(25/2^+)$	229.9					half-life is not known.
	2693.4	$(27/2^+)$	277.0	506.9				3. Level energies are adopted
	3252.4	$(31/2^+)$		559.0				from XUNDL.

$^{181}_{75}Re_{106}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\|g_K-g_R\|$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1656.4	$21/2^-$					**2000PE18**	1. π: 5/2[402]
	1883.3	$23/2^-$	226.7		1.05(7)			ν: 9/2[624]⊗7/2[514]
	2136.6	$25/2^-$	253.3	479.9	0.16(7)	1.20(40)		2. Half-life of bandhead is
	2411.9	$27/2^-$	275.4	528.6	0.21(7)	1.11(33)		250(10) ns.
	2713.0	$29/2^-$	301.3	576.6	0.14(7)	0.37(14)		3. Exp. $g_K = 0.47(4)$ for $g_R = 0.3$.
	3031.2	$31/2^-$	318.4	619.4	0.182(7)	0.52(16)		4. It crosses 9/2[514](gsb) at I=
	3371.1	$33/2^-$	340.6	657.7	0.203(14)	0.56(17)		$23/2^-$ and at I =$35/2^-$.
	3711.2	$35/2^-$	340.6	679.9	0.182(7)	0.43(13)		5. The I= $23/2^-$ band has a chance
								degeneracy with the I=$23/2^-$
								level of 9/2[514] band.
								6. Signature splitting.
								7. Nuclear reaction:
								^{176}Yb (^{11}B, 6n) ^{181}Re
								E=77 MeV.
								8. Assumed Q_0 = 7 eb .
								9. The B (M1)/B (E2) values are
								deduced in the present work
								assuming 0.1 keV error in
								gamma ray energies.
2	1693.4	$17/2^+$					**2000PE18**	1. Tentative configuration is:
	1809.0	$19/2^+$	115.6					π: 1/2[541]
								ν: 9/2[624]⊗7/2[514]

$^{181}_{75}Re_{106}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
3	1857.7	$21/2^+$					**2000PE18**	1. π: 5/2[402]
	1986.8	$23/2^+$	129.2				1997PE15	ν: 9/2[624]⊗7/2[633]
	2156.5	$25/2^+$	169.8	297.8	0.182(35)			2. Exp. g_K =0.41(9) for g_R = 0.3.
	2354.3	$27/2^+$	197.5	367.4		0.30(8)		3. It is a tilted rotational band
	2574.2	$29/2^+$	(220.3)	417.7		0.29(8)		from TAC with :
	2815.5	$31/2^+$	(241.6)	461.3	0.042(70)	0.29(8)		ε_2=0.225, ε_4 =0.046
	3074.2	$33/2^+$	(258.9)	499.9	0.07(49)	0.30(12)		Δp =0.87 MeV and
	3348.0	$35/2^+$		532.6	0.21(35)			Δn = 0.67 MeV.
	3642.6	$37/2^+$		568.4				4. It cross 5/2[402] at I = $25/2^+$.
	3963.0	$39/2^+$		615.0				5. Strong signature splitting at
	4288.5	$41/2^+$		645.9				higher spins.
	4653.9	$43/2^+$		690.9				6. The B(M1)/B(E2) values read
	5010.0	$45/2^+$		721.5				from plot given in 1997PE15.
	5421.6	$47/2^+$		767.6				7. Assumed Q_0 = 7 eb.
	5803.4	$49/2^+$		793.7				
	6256.1	$51/2^+$		834.4				
	6655.9	$53/2^+$		852.4				
4	1881.0	$25/2^+$					**2000PE18**	1. π: 9/2[514]
	2135.9	$27/2^+$	255.4					ν: 9/2[624]⊗7/2[514]
	2412.9	$29/2^+$	277.0	532.2	0.203(7)	2.96(89)		2. Exp. g_K =0.49(5) for g_R = 0.3.
	2710.7	$31/2^+$	297.9	574.8	0.175(7)	1.25(40)		3.Half-life of bandhead is 12(2) μs.
	3028.1	$33/2^+$	317.6	615.1	0.154(7)	0.73(24)		4. Strong signature splitting at
	3370.7	$35/2^+$	342.5	659.8	0.224(7)	1.23(36)		higher spins.
	3724.3	$37/2^+$	353.6	696.2	0.133(14)	0.36(13)		5. Assumed Q_0 = 7 eb.
								6. The B (M1)/B (E2) values are deduced in the present work assuming 0.1 keV error in gamma ray energies.
5	2225.1	$25/2^-$					**2000PE18**	1. π: 9/2[514]
	2427.1	$27/2^-$	202.0				1997PE15	ν: 9/2[624]⊗7/2[633]
	2632.9	$29/2^-$	205.8	407.7	0.231(56)	4.5(18)		2. Exp. g_K =0.54(5) for g_R = 0.3.
	2854.8	$31/2^-$	221.8	427.7	0.266(28)	3.34(51)		3. It cross 9/2[514] at I =$27/2^-$.
	3093.2	$33/2^-$	238.4	460.3	0.231(35)	1.82(51)		4. It is explained as a tilted
	3348.9	$35/2^-$	255.7	494.1	0.217(35)	1.47(34)		rotational band from TAC
	3623.8	$37/2^-$	274.8	530.6	0.224(42)	1.43(43)		calculations.
	3914.9	$39/2^-$	291.0	565.8	0.287(42)	1.87(51)		5. Strong Signature splitting at
	4228.9	$41/2^-$	314.1	605.1	0.238(42)	1.34(34)		higher spins.
	4552.7	$43/2^-$	323.9	637.8	0.252(42)	1.34(30)		6. The B(M1)/B(E2) values read
	4910.2	$45/2^-$	357.5	681.2	0.301(63)	1.71(55)		from a plot shown in 1997PE15.
	5260.2	$47/2^-$	350.2	707.4				7. Assumed Q_0 = 7 eb.
	5667.1	$49/2^-$	406	756.0				
	6032.5	$51/2^-$	366	772.5				
	6458.1	$53/2^-$		791				
	6861.7	$55/2^-$		829.6				

$^{183}_{75}Re_{108}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1628.3	$15/2^-$					**2000PU01**	1. π: 5/2[402]
	1819.4	$17/2^-$	191.1					ν: 9/2[624]⊗1/2[510]
	2019.8	$19/2^-$	200.4	391.5	0.324(78)	2.15(79)		2. Nuclear Reaction:
	2238.2	$21/2^-$	218.4	418.8	0.298(65)	1.08(30)		$^{176}Yb(^{11}B, 4n)^{183}Re$
	2476.4	$23/2^-$	238.3	456.5	0.408(78)	1.50(38)		E= 49-61 MeV.
	2734.0	$25/2^-$	257.6	495.8	0.408(97)	1.29(40)		3. Level energies are adopted
	3012.1	$27/2^-$	277.9	536.3	0.47(10)	1.51(45)		from XUNDL.
								4. Assumed Q_0 = 6.47 eb.
								5. The B (M1)/B (E2) values are
								deduced in the present work.
2	1763.4	$17/2^-$					**2000PU01**	1. π: 5/2[402]
	1936.6	$19/2^-$	173.1					ν: 9/2[624]⊗3/2[512]
	2137.8	$21/2^-$	201.2	374.3	0.219(32)	1.41(21)		2. It crosses 9/2[514] in spin
	2365.1	$23/2^-$	227.4	428.6	0.226(32)	0.86(13)		range I =$25/2^-$ to I=$27/2^-$.
	2616.4	$25/2^-$	251.3	478.5	0.180(19)	0.41(5)		3. Level energies are adopted
	2888.7	$27/2^-$	272.4	523.6	0.232(32)	0.59(10)		from XUNDL.
	3183.2	$29/2^-$	294.6	566.7	0.206(39)	0.40(9)		4. Assumed Q_0 = 6.45 eb.
	3499.2	$31/2^-$	316.1	610.5		0.06(7)		5. The B (M1)/B (E2) values are
	3833.4	$33/2^-$		650.2				deduced in the present work .
3	1906.7	$25/2^+$					**2000PU01**	1. π: 5/2[402]
	2211.8	$27/2^+$	305.1				1998HA51	ν: 9/2[624]⊗11/2[615]
	2537.9	$29/2^+$	326.1	631.1	<0.019	0.12(8)		2. Half-life of bandhead is 1 ms.
	2883.8	$31/2^+$	345.9	672.0	<0.045			3. It is explained as a tilted
	3247.7	$33/2^+$	364.0	710.0	<0.051	0.0(4)		rotational band.
	3628.1	$35/2^+$	380.6	744.5	0.058(45)	0.12(4)		4. Level energies are adopted
	4022.3	$37/2^+$	394.4	774.6	0.064(45)	0.08(3)		from XUNDL.
	4428.5	$39/2^+$	406.0	800.4	0.077(45)	0.12(3)		5. The B(M1)/B(E2) values read
	4842.9	$41/2^+$	414.4	820.6	0.083(58)	0.12(3)		from plot shown in 1998HA51.
	5266.0	$43/2^+$	423.1	837.5	0.128(6)	0.21(3)		6. Assumed Q_0 = 6.39 eb.
	5691.1	$45/2^+$		848.2		0.47(4)		
	6131.0	$47/2^+$		865.0				
	6569.2	$49/2^+$		878.1				
4	1927.5	$15/2^+$					**2000PU01**	1. π: 5/2[402]⊗9/2[514]
								⊗1/2[541]
								2. Level energy is adopted
								from XUNDL.

$^{183}_{75}Re_{108}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
5	1937+X	(21/2)					**2000PU01**	1. π: 5/2[402]
	2186.7+X	(23/2)	249.7					ν: 9/2[624]⊗7/2[503]
	2464.4+X	(25/2)	277.7	527.4	0.07(2)	0.15(5)		2. Half-life of bandhead is
	2765.9+X	(27/2)	301.6	579.1	0.03(4)	0.04(7)		10(4) ns.
	3086.6+X	(29/2)	320.7	622.2	0.08(1)	0.15(6)		3. Level energies are adopted
	3419.7+X	(31/2)	333.4	653.7	0.03(11)	0.02(10)		from XUNDL; X<75 keV.
	3756.2+X	(33/2)		669.6				4. Assumed Q_0 = 6.02 eb.
								5. The B (M1)/B (E2) and
								$\lvert g_K-g_R \rvert$ values are deduced
								in the present work.
6	2030.0	$(11/2^+)$					**1983BR24**	1. Tentative configuration is:
								π: 9/2[514]
								ν: 9/2[624]⊗7/2[514]
								2. Decay study.
7	2036.9	$(19/2^+)$					**2000PU01**	1. π: 9/2[514]
	2232.0	$(21/2^+)$	195.1					ν: 9/2[624]⊗1/2[510]
	2454.7	$(23/2^+)$	222.5	417.9	0.281(45)	3.15(60)		2. Level energies are adopted
	2702.1	$(25/2^+)$	247.4	470.3	0.383(58)	3.43(67)		from XUNDL.
	2971.8	$(27/2^+)$	269.7	517.0	0.320(38)	1.81(28)		3. Assumed Q_0 = 6.39 eb.
	3261.9	$(29/2^+)$	290.1	560.0	0.236(58)	0.83(24)		4. The B (M1)/B (E2) values
	3571.0	$(31/2^+)$	309.3	599.0	0.358(38)	1.63(21)		are deduced in the present
	3898.2	$(33/2^+)$	327.1	636.3	0.262(64)	0.80(23)		work.
	4238.8	$(35/2^+)$	340.7	667.8	0.198(89)	0.41(23)		
	4595.8	$(37/2^+)$		697.6				
	4966.1	$(39/2^+)$		727.3				
8	2737.3	$29/2^-$					**2000PU01**	1. π: 9/2[514]
	3048.1	$31/2^-$	310.9				1998HA51	ν:9/2[624]⊗11/2[615]
	3374.4	$33/2^-$	326.4	637.1		0.50(4)		2. Half-life of bandhead is
	3712.6	$35/2^-$	338.3	664.5		0.12(2)		6.0(5) ns.
	4058.2	$37/2^-$	345.6	683.7	0.042(30)	0.08(2)		3. Strong Signature splitting
	4401.1	$39/2^-$	342.8	688.5	0.066(30)	0.21(2)		at higher spins.
	4749.1	$41/2^-$	348.0	690.9	0.078(30)	0.34(2)		4. Alignment and B (M1)/B (E2)
	5075.8	$43/2^-$	326.9	674.7	0.127(60)	0.49(4)		plots suggest that, at low
	5453.7	$45/2^-$	377.9	704.6	0.175(24)	0.71(8)		spin it is high-K band, at
	5769.2	$47/2^-$	315.4	693.4	0.103(66)	1.25(10)		intermediate spin it is tilted
	6177.6	$49/2^-$	408.4	723.9	0.36(18)			band and at higher spins
								it is aligned band.
								5. Level energies are adopted
								from XUNDL.
								6. The B(M1)/B(E2) read from
								plot shown in 1998HA51.
								7. Assumed Q_0 = 6.03 eb.
9	3207.5	(31/2)					**2000PU01**	1. π: 11/2[505]
	3589.2	(33/2)	381.6					ν: 9/2[624]⊗11/2[615]
	3986.3	(35/2)	397.2	778.8				2. Level energies are adopted
								from XUNDL.

$^{187}_{75}Re_{112}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1474.2	$19/2^-$				**2003SH13**	1. π: 5/2[402] ν:3/2[512]⊗11/2[615] 2. Nuclear Reaction: $^{187}Re(^{82}Se,^{82}Se')\,^{187}Re$ E=500 MeV.
2	1681.6	$(19/2^+, 21/2^+)$				**2003SH13**	1. π: 9/2[514] ν:1/2[510]⊗11/2[615] 2.Half-life of bandhead is 114(23) ns. 3. K= $19/2^+$ is proposed as bandhead.

$^{167}_{76}Os_{91}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	1712.5	$(21/2^-)$				**2001JO11**	1. For α = +1/2 signature:
	1894.4	$(23/2^-)$					ν: 3/2[521](α= +1/2)
	2192.3	$(25/2^-)$		479.8			⊗3/2[651](α= +1/2)
	2382.0	$(27/2^-)$		487.6			⊗3/2[651](α= −1/2)
							For α = −1/2 signature:
							ν: 3/2[521](α= −1/2)
							⊗3/2[651](α= +1/2)
							⊗3/2[651](α= −1/2)
							2. Nuclear reaction:
							$^{112}Sn\,(^{58}Ni, n2p)^{167}Os$
							E=266 MeV.
							3. Level energies are adopted from XUNDL.

$^{171}_{76}Os_{95}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
1	2337.2	$(25/2^-)$				**1999BA13**	1. For α = +1/2 signature:
	2413.6	$(27/2^-)$					ν: 3/2[521](α= +1/2)
	2520.9	$(29/2^-)$		183.4			⊗3/2[651](α= +1/2)
	2676.0	$(31/2^-)$		262.4			⊗3/2[651](α= −1/2)
	2893.8	$(33/2^-)$		372.9			For α = −1/2 signature:
	3115.3	$(35/2^-)$		439.3			ν: 3/2[521](α= −1/2)
	3415.8	$(37/2^-)$		522.0			⊗3/2[651](α= +1/2)
	3725.9	$(39/2^-)$		610.6			⊗3/2[651](α= −1/2)
	4054.7	$(41/2^-)$		639.0			2. Nuclear reaction:
	4459.1	$(43/2^-)$		733.2			$^{116}Sn\,(^{58}Ni, n2p)^{171}Os$
	4766.7	$(45/2^-)$		712.0			E=267 MeV.
	5219.1	$(47/2^-)$		760.0			3. CD crossing near $\eta\omega_c$=
	5503.2	$(49/2^-)$		736.5			0.37 MeV is suggested.
	6260.2	$(53/2^-)$		757.0			C=1/2[660](α= +1/2)
							D=1/2[660](α= −1/2)
							4. Signature splitting with signature inversion at I= $39/2^-$.
							5. Level energies are adopted from XUNDL.

$^{181}_{76}Os_{105}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K - g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1745.1	$21/2^+$					**2003CU03** 1995KU14	1. Tentative configuration is: ν: 7/2[514]⊗9/2[624] ⊗5/2[512] 2. Nuclear reaction: ^{150}Nd (^{36}S, 5n)^{181}Os E=160 MeV. 3. Half-life of bandhead is 7(2) ns.
2.	1876.7	$23/2^-$					**2003CU03**	1. ν: 7/2[514]⊗9/2[624] ⊗7/2[633]
	2080.7	$25/2^-$	204.0				1995KU14	2. At low frequency (< 0.35 MeV),
	2295.3	$27/2^-$	214.6	418.0	0.220(15)	1.28(18)		it is explained as a tilted
	2524.4	$29/2^-$	229.1	442.4	0.258(23)	0.78(21)		rotational band.
	2770.4	$31/2^-$	246	475.2	0.175(23)	0.54(13)		3. Strong signature splitting at
	3042.4	$33/2^-$	272	518.0	0.160(23)	0.46(18)		higher spins.
	3337.9	$35/2^-$	296	567.5				4. The B(M1)/B(E2) and $\lvert g_K - g_R \rvert$
	3657.1	$37/2^-$	322	614.7				values read from plots shown
	3977.2	$39/2^-$		639.3				in 1995KU14 and 2003CU03,
	4338.0	$41/2^-$		680.9				respectively.
	4688.1	$43/2^-$		710.9				5. Assumed Q_0 = 7.6 eb .
	5063.1	$45/2^-$		725.1				
	5430.0	$47/2^-$		741.9				
	5810.8	$49/2^-$		747.7				
	6194.0	$51/2^-$		764.0				
	6576.8	$53/2^-$		766				
	6998.6	$55/2^-$		804.6				
	7365.0	$57/2^-$		788.2				
	7845.6	$59/2^-$		847				
	8166.0	$(61/2^-)$		(801)				
	8719.6	$63/2^-$		874				
	9615.6	$67/2^-$		896				
	10547.6	$71/2^-$		932				

$^{181}_{76}Os_{105}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
3	1928.2	$21/2^-$					**2003CU03**	1. ν: 1/2[521]⊗9/2[624]⊗7/2[633]
	2019.2	$23/2^-$	91.0			0.22(9)	1995KU14	2. Strong signature splitting at higher spins.
	2142.8	$25/2^-$	123.6	213.0		0.11(3)		
	2303.0	$27/2^-$	160.2	284.0	0.046	0.09(4)		3. The B(M1)/B(E2) and $\lvert g_K-g_R \rvert$ values read from plots shown in 1995KU14 and 2003CU03 respectively.
	2493.0	$29/2^-$	190.0	349.8	0.068	0.10(4)		
	2715.2	$31/2^-$	222.2	412.4	0.137			
	2961.6	$33/2^-$	246.4	467.9	0.129(15)			
	3236.6	$35/2^-$	275	521.4	0.274(23)			4. Assumed Q_0 = 7.6 eb .
	3527.4	$37/2^-$	290.8	565.7	0.175(23)			
	3843.7	$39/2^-$	316.3	607.3	0.289(23)			
	4166.1	$41/2^-$	322.4	640.7				
	4512.3	$43/2^-$	346.2	669.4				
	4844.4	$45/2^-$		678.3				
	5212.1	$47/2^-$		699.8				
	5542.4	$49/2^-$		698.0				
	5931.5	$51/2^-$		719.4				
	6264.7	$53/2^-$		722.3				
	6679.1	$55/2^-$		747.6				
	7000.2	$57/2^-$		(735.5)				
	7456.5	$59/2^-$		777.4				
	7751.1	$61/2^-$		(750.9)				
	8262.3	$(63/2^-)$		(805.8)				
	9091.5	$(67/2^-)$		(829.2)				

$^{183}_{76}Os_{107}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1560.1	$15/2^-$					**2001SH41**	1. π: 5/2[402]⊗1/2[541] ν: 9/2[624]
	1583.1	$17/2^-$	(23.2)					
	1665.0	$19/2^-$						2. Nuclear reaction: ^{170}Er (^{18}O, 5n) ^{183}Os E=85 MeV.
	1779.1	$21/2^-$	114.2	195.5	0.041(6)	0.01(1)		
	1925.5	$23/2^-$	146.3	260.6	0.058(6)	0.05(1)		
	2101.3	$25/2^-$	175.6	322.3	0.023(6)	0.01(1)		3. Half-life of bandhead is <3 ns.
	2305.1	$27/2^-$	203.7	379.6	0.052(6)	0.02(1)		
	2536.4	$29/2^-$	231.1	435.1	0.070(6)	0.04(1)		4. Signature splitting with signature inversion at I=43/2⁻.
	2792.6	$31/2^-$	256.3	487.6	0.070(6)	0.04(1)		
	3075.0	$33/2^-$	282.3	538.6	0.104(12)	0.08(1)		5. Average exp. g_K value is 0.36(5) for g_R =0.30(5).
	3377.4	$35/2^-$	302.5	584.8	0.128(12)	0.12(1)		
	3707.5	$37/2^-$	330.2	632.5	0.104(12)	0.07(1)		6. Assumed Q_0 = 5.8 eb .
	4031.3	$39/2^-$		653.7				7. The B (M1)/B (E2) values are deduced in the present work.
	4422.7	$41/2^-$		715.1				
	4814.0	$43/2^-$		782.7				
	5192.8	$45/2^-$		770.1				
	5617.9	$(47/2^-)$		803.9				
	5977.8	$(49/2^-)$		785				
	6460.9	$(51/2^-)$		843.0				

$^{183}_{76}Os_{107}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
2	2209.4	$23/2^+$					**2001SH41**	1. ν: 7/2[503]⊗7/2[514] ⊗9/2[624]
	2470.4	$25/2^+$	260.9					2. Half-life of bandhead is <3 ns.
	2753.9	$27/2^+$	283.7	544.5	0.180(6)			3. Average exp. g_K value is 0.45(5)/ 0.15(5) for g_R =0.30(5).
	3045.7	$29/2^+$	291.9	575.2	0.122(6)			4. Assumed Q_0 = 7.6 eb

$^{185}_{76}Os_{109}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1591.2	$19/2^+$					**2004SH08**	1. ν: 1/2[521]⊗7/2[503] ⊗11/2[615]
	1844.4	$21/2^+$	252.9					2. Nuclear reaction: ^{176}Yb (^{13}C,4n) ^{185}Os E=65 MeV.
	2108.0	$23/2^+$	263.4	516.8	0.19(1)	1.89(10)		3. Half-life of bandhead is <5 ns .
	2386.7	$25/2^+$	278.8	542.5	0.15(1)	0.64(4)		4. Signature splitting more pronounced at higher spins.
	2678.9	$27/2^+$	292.5	570.8	0.08(1)	0.13(3)		5. Assumed Q_0 = 5.7 eb.
	2987.4	$29/2^+$		600.7				6. The B (M1)/B (E2) values are deduced in the present work.
	3309.2	$(31/2^+)$		630.3				
	3663.4	$(33/2^+)$		676.0				
	4010.9	$(35/2^+)$		701.8				
2	1987.1	$23/2^-$					**2004SH08**	1. ν: 3/2[512]⊗9/2[624] ⊗11/2[615]
	2264.3	$25/2^-$	277.1					2. Half-life of bandhead is 5.5(10) ns.
	2551.7	$27/2^-$	287.5	565.0	0.17(1)	2.54(13)		3. Strong signature splitting.
	2848.4	$29/2^-$	296.4	584.5	0.15(1)	1.13(5)		4. Assumed Q_0 = 5.7 eb.
	3139.8	$31/2^-$	291.3	588.2	0.06(1)	0.15(1)		5.The B (M1)/B (E2) values are deduced in the present work.
	3460.9	$33/2^-$	321.0	612.6	0.01(2)	0.01(1)		
	3703.0	$35/2^-$	241.9	563.0	0.04(1)	0.03(2)		
	4101.1	$(37/2^-)$	(398)	640.1				
	4304.6	$(39/2^-)$		601.6				
	4792.6	$(41/2^-)$		691.6				
	4976.6	$(43/2^-)$		672.0				
	5541.9	$(45/2^-)$		749.3				
	5713.6	$(47/2^-)$		736.9				
	6338.6	$(49/2^-)$		796.7				
	6506.6	$(51/2^-)$		793.1				
	7358.6	$(55/2^-)$		852.0				

$^{171}_{77}Ir_{94}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	0+ Y	$(23/2^-)$				**1999BA84**	1. π: $h_{11/2}$
	98.0+Y	$(25/2^-)$	98.0				ν: 3/2[651](α= +1/2)
	223.0+Y	$(27/2^-)$	125.0				⊗3/2[521](α= +1/2)
	424.2+Y	$(29/2^-)$	201.2				2. Nuclear reaction:
	671.0+Y	$(31/2^-)$	246.8				$^{116}Sn(^{58}Ni, p2n)^{171}Ir$
	955.8+Y	$(33/2^-)$	284.8				E=260, 267 MeV.
	1275.2+Y	$(35/2^-)$	319.5				3. Level energies are adopted
	1631.0+Y	$(37/2^-)$	355.5				from ENSDF; Y> 1.1 MeV.
2	2326.7+X	$(23/2^-)$				**1999BA84**	1. π: $h_{11/2}$, ν: $i^2_{13/2}$
	2381.5+X	$(25/2^-)$					2. Level energies are adopted
	2496.8+X	$(27/2^-)$	115.3				from ENSDF. Values are
	2677.9+X	$(29/2^-)$	181.1				relative to the energy of the
	2945.6+X	$(31/2^-)$	267.7				$11/2^-$ state at 0+X, where
	3284.2+X	$(33/2^-)$	338.6				X=180(30) from systematics.
	3671.7+X	$(35/2^-)$	347.5				

$^{181}_{77}Ir_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	1807.0	$19/2^+$					**1993DR02**	1. π: 1/2[541]
	1882.1	$21/2^+$	75.5					ν: 7/2[514]⊗7/2[633]
	1989.8	$23/2^+$	107.8	183				2. Nuclear reactions:
	2129.5	$25/2^+$	139.6	247.2	0.19(4)	1.0(5)		(a) $^{169}Tm(^{16}O, 4n)^{181}Ir$
	2298.5	$27/2^+$	169.0	309	0.22(3)	1.0(3)		(b) $^{169}Tm(^{17}O, 5n)^{181}Ir$
	2498.2	$29/2^+$	199.7	368.9	0.21(2)	0.75(14)		E=77-105 MeV.
	2720.6	$31/2^+$	222.4	422.1	0.14(2)	0.29(7)		3. Small signature splitting is
	2969.0	$33/2^+$	248.4	470.6	0.21(2)	0.57(11)		present.
	3239.1	$35/2^+$	270.1	518.9	0.21(2)	0.53(9)		4. Pure K and Q_0 = 6 eb
	3528.3	$37/2^+$	288.9	559.6				assumed.
	3837.3	$39/2^+$	309.0	597.9				
	4161.7	$41/2^+$		633.4				
	4494.5	$43/2^+$		657.2				
	4840	$45/2^+$		678				
	(5205)	$(47/2^+)$		(710)				
	5564	$(49/2^+)$		(724)				
	(6332)	$(53/2^+)$		(768)				

$^{181}_{77}Ir_{104}$

	E_{level} keV	I^{π}	E_{γ} (M1) keV	E_{γ} (E2) keV	$\lvert g_K-g_R \rvert$	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	Configuration and Comments
2	1837.6	$21/2^+$					**1993DR02**	1. Authors discuss different scenarios about configuration assignment but none agree with the observed behavior; thus the structure remains uncertain.
	2123.7	$25/2^+$		286.1				
	2494.4	$29/2^+$		371.0				
	2981.7	$33/2^+$		487.3				
	3534.5	$37/2^+$		552.8				
	4133.9	$41/2^+$		599.4				
	4777.2	$45/2^+$		643.3				
	5474	$49/2^+$		697				
	(6234)	$(53/2^+)$		(759)				
3	1956	$(17/2^+)$					**1993DR02**	1. Two possible configurations are: (a) π: 1/2[541] ν: 7/2[514]⊗5/2[512] (b) π: 5/2[541] ν: 7/2[514]⊗7/2[633]
4	1961	$19/2^-$					**1993DR02**	1. π: 5/2[402] ν: 7/2[514]⊗7/2[633]
5	1979.0	$21/2^-$					**1993DR02**	1 π: 9/2[514] ν: 5/2[512]⊗7/2[514]
	2174.6	$23/2^-$	195.6					2. Backbending at $I=33/2^-$.
	2381.4	$25/2^-$	206.8	402.7	0.16(2)	1.6(5)		3. Pure K and $Q_0 = 6$ eb assumed.
	2601.9	$27/2^-$	220.5	427.4	0.19(2)	1.2(2)		
	2836.4	$29/2^-$	234.5	454.9	0.18(2)	0.8(2)		
	3083.6	$31/2^-$	247.2	481.8	0.12(2)	0.30(8)		
	(3340.3)	$(33/2^-)$	(256.7)	(503.6)	0.14(2)	0.34(9)		
	(3600.1)	$(35/2^-)$	(259.8)	(516.6)	0.15(2)	0.40(8)		
	(3877.4)	$(37/2^-)$	(277.3)	(536.5)	0.22(4)	0.8(3)		
	(4174.0)	$(39/2^-)$	(296.6)	(573.9)	0.31(14)	1.4(4)		
	(4443.2)	$(41/2^-)$		(565.8)				
6	2033.9	$23/2^+$					**1993DR02**	1 π: 9/2[514] ν: 7/2[633]⊗7/2[514]
	2191.2	$25/2^+$	157.3					2. Half-life of bandhead is 29 ns.
	2381.5	$27/2^+$	190.3	347.7	0.132(18)	1.4(4)		3. Small signature splitting at higher spins.
	2596.6	$29/2^+$	215.1	405.5	0.20(1)	1.70(18)		4. Pure K and $Q_0 = 6$ eb assumed.
	2832.8	$31/2^+$	236.2	451.5	0.19(1)	1.14(14)		
	3087.2	$33/2^+$	254.4	490.8	0.15(1)	0.60(6)		
	3356.7	$35/2^+$	269.5	523.9	0.162(12)	0.62(9)		
	3640.0	$37/2^+$	283.3	552.8	0.216(14)	1.00(13)		
	3935.2	$39/2^+$	295.4	578.5	0.17(2)	0.56(11)		
	4242.7	$41/2^+$	307.8	603.1	0.114(16)	0.24(7)		
	4562.3	$43/2^+$	319.6	627.6	0.12(2)	0.25(8)		
	4895.7	$45/2^+$		653.1				
	5242.3	$47/2^+$		680.0				
	5602.1	$(49/2^+)$		706.4				
	(5974)	$(51/2^+)$		(732.9)				
	(6360)	$(53/2^+)$		(758)				

$^{185}_{78}Pt_{107}$

	E_{level} keV	I^π	E_γ (M1) keV	E_γ (E2) keV	B (M1)/B (E2) $(\mu_N/eb)^2$	Reference	**Configuration and Comments**
1	3131.4	$(33/2^-)$				**1989PI09**	1. π: 1/2[541]⊗1/2[660]
	3294.3	$(35/2^-)$	162.9				ν: 9/2[624]
	3511.4	$(37/2^-)$	217.1	380.0			2. Nuclear reaction:
	3725.0	$(39/2^-)$	213.6	430.7	1.12(8)		$^{173}Yb(^{16}O,4n)^{185}Pt$
	3990.7	$(41/2^-)$	265.7	479.3			E=90 MeV.
	4263.2	$(43/2^-)$	272.5	538.2			3. Strong signature splitting.
	4564.6	$(45/2^-)$	301.4	573.9			
	4902.2	$(47/2^-)$		639.0			

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