ОБЪЕДИНЕННЫЙ
ИНСТИТУТ
ЯДЕРНЫХ
ИССЛЕДОВАНИЙ

Дубна

E4 - 3051

ЛАБОРАТОРИЯ ТЕОРЕТИЧЕСКОЙ ФИЗИКИ

ВЫЧИСЛИТЕЛЬНЫЙ ЦЕНТР

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NON-ROTATIONAL STATES OF ODD-MASS DEFORMED NUCLEI IN THE REGION $155 \leqslant A \leqslant 181$

1966

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Submitted to Izv. AN USSR

The interaction of quasiparticles with phonons in odd-mass deformed nuclei was considered in ref.[1]. Secular equations were obtained the roots of which are the energies of the ground and excited states. It was shown that the interactions of quasiparticles with phonons lead to the appearance of admixtures in one-particle states and to the formation of collective nonrotational states and complex structure states. In refs.[2,3] the energies of the nonrotational states of odd-mass deformed nuclei in the region $153 \leq A \leq 187$ were calculated, the structure of these states was investigated. The probabilities of electric E2 transitions and the decoupling parameters a were computed. Similar calculations in the actinide region were made in ref.[4]. The interaction of quasiparticles with gamma vibrational phonons was studied in paper[5]. In the cases where these interactions play a predominant role the results obtained in ref.[5] are close to these presented in ref.[2].

The aim of paper[2] was to give a general picture of the excited states for many-odd-A nuclei. Many states with $K_0 - 2$ and $K_0 + 2$ (where K_0 is related to the ground state of an off-mass nucleus) and the values of $B(E2)$ were given. The data on some complex structure states and states close to the one-particle states were presented. It was shown that the account of interactions of quasiparticles with phonons led to an improvement of the description of states close to the one-quasiparticle states as compared with the independent quasiparticle model and to a rather correct description of the collective states and the complex structure states. Ref.[2] contains only a small part of the results obtained.

In the present paper the energies and the structure of the ground and excited states of a number of odd-mass deformed nuclei in the region

$155 \le A \le 181$ are given. The characteristics of each nucleus are presented for all the calculated states with excitation energies up to 1 MeV and for some states - higher than 1 MeV. In some cases the decoupling parameters a and the spectroscopic factors are listed.

The secular equation determining the energies η_j of the ground and excited states of odd-mass defomred nuclei is of the form:

$$\epsilon(\rho) - \eta_j - \frac{1}{4} \sum_{\lambda\mu i} \frac{V^2_{\rho\nu}}{Y^i(\lambda\mu)} \frac{f^{\lambda\mu}(\rho\nu)^2}{\epsilon(\nu) + \omega_i^{\lambda\mu} - \eta_j} = 0, \quad (1)$$

where ρ denotes the average field level with a given $K\pi$ and ν the remaining levels; $\epsilon(\nu) = \sqrt{(E(\nu) - \lambda)^2 + C^2}$ (C is the correlation function, λ is the chemical potential), $U_{\rho\nu} = u_\rho u_\nu - v_\rho v_\nu$, $f^{\lambda\mu}(\rho\nu)$ is the matrix element of the multipole moment operator $(\lambda\mu)$. The summation over $\lambda\mu i$ means that one takes into account the interaction of quasiparticles with quadrupole $\lambda = 2$, $\mu = 0,2$ and octupole $\lambda = 3$, $\mu = 0,1,2$ phonons and the first two roots $i = 1,2$ of the secular equation for the even-even nucleus. The energies of the collective states $\omega_i^{\lambda\mu}$ and the quantities $Y^i(\lambda\mu)$ are calculated in ref./6/. However, in the present paper, in contrast to ref./2/ the multipole-multipole interaction constant is chosen so that to obtain the energies of the vibrational states in even-even nuclei which are close to the experimental ones. This leads to a non essential change of the results of this paper in comparison with the ref./2/, the most striking difference is observed for nuclei Yb^{169}, Yb^{171} since the energies of the gamma vibrational states for these nuclei were overestimated. The energies $E(\gamma)$ and the Nilsson potential wave functions are used in the calculations the one-particle level scheme being the same as in ref./2/.

The wave function for the state with a given $K\pi$ is of the form

$$\psi(K\pi) = \Omega(K\pi)^+ \psi_0, \quad (2)$$

$$\Omega(K\pi)^+ = \frac{1}{\sqrt{2}} C_\rho \sum_\sigma \{ a^+_{\rho\sigma} + \sum_{\lambda\mu i} D^{\lambda\mu i}_{\rho\nu\sigma} a^+_{\nu\sigma} Q_i(\lambda\mu)^+ \}, \quad (3)$$

where $Q_i(\lambda\mu)$ is the phonon operator of multipolarity $(\lambda\mu)$, $a^+_{\nu\sigma}$ is the quasiparticle absorption operator, $\sigma = \pm 1$; ψ_0 is the wave function of the ground state of the even-even nucleus. From the normalization condition we have

$$C_\rho^{-2} = 1 + \frac{1}{4} \sum_{\lambda\psi i} \frac{V^2_{\rho\nu}}{Y^i(\lambda\mu)} \frac{f^{\lambda\mu}(\rho\nu)^2}{(\epsilon(\nu) + \omega_i^{\lambda\mu} - \eta_j)^2} \quad (4)$$

$$D^{\lambda\mu i}_{\rho\nu\sigma} = \frac{1}{2} \frac{V_{\rho\nu}}{\sqrt{Y^i(\lambda\mu)}} \frac{f^{\lambda\mu}(\rho\nu)}{\epsilon(\nu) + \omega_i^{\lambda\mu} - \eta_j} \quad (5)$$

The quantity C_ρ^2 defines the contribution of he onequasiparticle state with a given ρ and the quantity $\frac{1}{2} C_\rho^2 \sum_\sigma (D^{\lambda\mu i}_{\rho\nu\sigma})^2$ defines the contribution of the component with quasiparticle in the state ν and of the phonon $\lambda\mu i$ to the state described by the wave function $\psi(K\pi)$.

Each $K\pi$ and ρ has its own equation of the type (1). Its solutions $\eta_1, \eta_2, \ldots$ are the energies of these states. In each nucleus the least of all the values $\eta_1(K_0\pi)$ is the energy of the ground state and the energies of the excited states are determined by the differences $\eta_j(K\pi) - \eta_1(K_0\pi)$. If in studying the states with given $K\pi$ in the Nilsson level scheme there are several states $\rho_1, \rho_2 \ldots \rho_n$ with identical $K\pi$ for which the quantities $\epsilon(\rho_1), \epsilon(\rho_2) \ldots \epsilon(\rho_4)$ are close to one another then instead of eq. (1) a more complicated secular equation should be solved. The general form of this equation is given in ref./1/ and a particular case $n = 2$ is investigated in ref./2/. It should be noted that the secular equation (1) has no free parameter.

The results of calculations of the energies and the wave functions for some odd-N and odd-Z nuclei are given in Tables 1-18. In the first column the value of $K\pi$ is given, in the second and the third - the experimental and calculated values of the energies (in kev). The fourth column gives the contribution (in per cent) of the largest components of the wave function obtained from the normalization condition of the wave function. For example, in the $K\pi = ½-$ state of ^{155}Gd $521\downarrow$[x] 42 per cent denotes the contribution of the one-quasiparticle state and $521\uparrow + Q_1(22)$ 37% denotes the contribution of the component quasiparticle in the $521\uparrow$ state plus phonon Q_1 (22).

The experimental data are taken from the review papers/7-10/ and the original papers/11-28//31-35/. Nuclei which are most perspective from the point of view of experimental investigations are chosen for the analysis. The nuclei ^{157}Tb and ^{159}Tb which are analysed in ref./2/ should be added to nuclei of Tables 1-18. Note that the calculated spectra of ^{161}Ho and ^{163}Ho are very similar to the spectrum of ^{165}Ho, therefore the corresponding tables are not given in the present paper.

A very important characteristic of the $K = 1/2$ states is the value of the decoupling parameter a. For a in ref./2/ the following formula is obtained

$$a = C_\rho^2 \{ a^N_{\rho\rho} + \sum_{\nu\nu'} a^N_{\nu\nu'} (D^{201}_{\rho\nu+} D^{201}_{\rho\nu'+} - D^{301}_{\rho\nu+} D^{301}_{\rho\nu'+}) \} \qquad (6)$$

where $a^N_{\nu\nu'}$ is the one-particle decoupling parameter calculated with the average field (Nilsson potential) wave functions. In ref./2/ the decoupling parameters a were analysed for states close to the neutron $521\downarrow$ state. It was shown that the account of the interactions of quasi-particles with phonons essentially improve agreement between theoretical and experimental data. In the present paper one gives the decoupling parameters a for some other $K = 1/2$ states. The calculated and experimental values of the energies and the parameters are placed in Table 19. For the $510\uparrow$ states as the value of $a^N_{\rho\rho}$ one takes the value given in ref./29/ calculated with the wave functions of the one-particle deformed Saxon-Wood potential. As is known, for the $510\uparrow$ states the values of calculated with the Nilsson functions contradict the experimental data. However, the calculations with a^N from ref./29/ in which one takes into account both changes in the deformation (for $A \geq 177$ one takes $\delta = 0.2$) and the interactions of quasiparticles with phonons lead to a good agreement with experiment.

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[x] $Nn_z\Lambda\uparrow$ denotes the Nilsson potential state with $K = \Lambda + \Sigma$ and by $Nn_z\Lambda\downarrow$ the state with $K = \Lambda - \Sigma$.

The cross sections for direct nuclear (dp), (dt) reactions when the targets are the even-even nuclei, are proportional to the spectroscopic factor equal to

$$C_\rho^2 u_\rho^2 \quad \text{for (dp) reaction} \qquad (7)$$

$$C_\rho^2 v_\rho^2 \quad \text{for (dt) reaction} \qquad (7')$$

The effect of the interaction of quasi-particle with phonons on the spectroscopic factors is shown by the example of the $521\uparrow$ state in table 20(similar quantites for the $510\uparrow$ state are given in ref./2/). It is seen that as the level moves away from the Fermi surface its one-quasiparticle component and, consequently, the cross section for the (dt) reaction decrease. This fact is proved experimentally in ref./23/. Notice that the spectroscopic factors for other states and nuclei can be easily obtained using Tables 1-18. The quantity C_ρ^2 occupies the first place in the fourth column and the quantities u_ρ^2 and v_ρ^2 can be calculated using the standart formulas of the superfluid nuclear model.

Now let us briefly discuss the results given in Tables 1-18.

^{155}Cd

The spectrum of this nucleus is very interesting/11/. The interaction of quasiparticles with beta as well as gamma vibrational phonons are important. Two vibrational states are based on the ground state of the nucleus. In the first $K\pi = 1/2-$ state the gamma-vibrational phonon is strongly mixed with one-particle $521\downarrow$ state. The second one, the $K\pi = 3/2-$ state is a rather pure beta-vibrational state. The calculated energy of the beta-vibrational state is somewhat overestimated as compared to the experimental one. The calculations predicted the existence of low-lying levels close to the $530\uparrow$ and $532\downarrow$ ones which are probably some of non-identified levels in the experimental spectrum of ^{155}Gd. The $K\pi = 1/2+$ level close to the $660\uparrow$ one was not experimentally observed. This could be understood from two reasons: the theoretical values of the decoupling parameter a for a given state reaches $a = 6.15$ what lead to a large distortion of the rotational band; in the Nilsson scheme calculations the matrix elements with $\Delta N = 2$ are not taken into account, their account will lead in the given region to the mixing of the 400$\uparrow$ and 660$\uparrow$ states (see ref./30/). The value of log ft obtained in ref./11/ are in satisfactory agreement with theory. Note that the correction due to pairing correlations in log ft for the 400$\uparrow$ and 402$\uparrow$ states reached $R_\beta = 0.05$.

^{163}Er

According to the Nilsson scheme the ground state of this nucleus with $N = 97$ should be the 642$\uparrow$ state. From the experimental data it follows that the ground state of ^{163}Er is the 523$\downarrow$ state and the 642$\uparrow$ state is an excited one with energy 22 KeV. Our calculations give approximately the same energies for these states. In ^{163}Er there is observed a $K_0 - 2$ state with $K\pi = 1/2-$ (K_0 relates to the ground state). It has a complicated structure and contains a large-quasiparticle component and the admixtures of two different gamma-vibrational phonons. The calculated decoupling parameter a is close to the experimental value (see ref./2/). The observed in ref./15/ levels with $K\pi = 3/2+$ (1540 kev) and $K\pi = 1/2+$ (1804 kev) which well populated in the decay of ^{163}Tm (log ft = 5.4 and 5.2) are probably three-quasiparticle states with configuration p523$\uparrow$ $\pm$p411$\downarrow$ -n523$\downarrow$ /36/. However as in the case of ^{165}Er the possibility of mixing of the three-quasiparticle $K\pi = 3/2+$ state with the $K\pi = 3/2+$ (1200 kev) state can not be exluded.

^{163}Dy

The all-round investigation of the spectrum of the nucleus was made in refs./13,14/. The results of calculations are in satisfactory agreement with experimental data. To explain the intensities of the electromagnetic transitions between the states of three lowest rotational bands with negative parity it is necessary to take into account the Coriolis interactions including the second perturbation order. Similar problems arise also in analysing the ^{165}Dy spectrum.

To explain the small values of log ft for the transitions to the $K\pi = 1/2+$states (5.6 and 4.9) one should assume the admixture of the three-quasiparticle {p523$\uparrow$ -p 411$\uparrow$-n 523$\downarrow$} state which is the main component of the 523$\downarrow$ + $Q_1(32)$ state. This component noticeable contribute to the second $K\pi = 1/2+$ state (11 per cent) and gives the predominant contribution to the third $K\pi = 1/2+$ state which, however, was not so far observed. It is difficult to account for the decouplong parameter a for the first $K\pi = 1/2+$ band ($a_{th} \approx 2.0$, $a_{exp} \approx 0.52$) and the cross section for the (dp) reaction for the second $K\pi = 1/2+$ state. It should be noted that the mixing of one-particle wave functions of the 660$\uparrow$ and 400$\uparrow$ states as well as the 651$\uparrow$ and 402$\downarrow$ states not taken into account in the Nilsson scheme (and, correspondingly in our calculations) can noticeably influence the $K\pi = 1/2+, 3/2+$ states for nuclei in the given region.

The $K\pi = 3/2-$ (821 kev) state is, according to the calculations, the one-quasiparticle 532$\downarrow$ state and the state with large component 521$\downarrow$+$Q_1(22)$ lies essentially higher (about 1.4 MeV).

^{165}Er

In the spectrum of this nucleus three types of phonons $Q_1(22)$, $Q_1(20)$ and $Q_1(30)$ plays an essential role. In contrast to ^{163}Dy there is no low-lying $K\pi = 1/2+$ states with large admixture of the 523$\downarrow$ + $Q_1(32)$ component. It would be interesting to find the experimental value of the decoupling parameter for the $K\pi = 1/2+$ (508 keV) band, the theoretical value is $a_{th} \approx 2.0$. In the given nucleus there exists the known/20/ three-quasiparticle $K\pi = 3/2+$ state with configuration (p523$\uparrow$ - n523$\downarrow$ + p411$\downarrow$) and energy 1428 keV. We have predicted the existence of a $K\pi = 3/2+$ state of some other nature with energy of about 1.4 MeV. It is quite possible that the observed state is the mixture of these two states.

^{165}Dy ^{167}Er ^{169}Yb

Tables 5-7 give the data on three nuclei with $N = 99$. The spectra of ^{165}Dy and ^{167}Er are alike but the spectrum of ^{169}Yb differs from them. This is due to the energy increase and, correspondingly, to the decrease of "collectivity" of gamma-vibrational states in ^{168}Yb as compared to ^{164}Dy and ^{166}Er. This fact is most clearly revealed in the $K\pi = 3/2+$ states. In the nuclei ^{165}Dy and ^{167}Er the first $K\pi = 3/2+$ state is mainly collective and the second one-single-quasiparticle state. In ^{169}Yb on the contrary, the first $K\pi = 3/2+$ state is close to the one-quasiparticle state and the second to the collective state. Note that a small difference in the energies and the structure of some states as compared with ref./2/ are due to the fact that in the present paper the values of $\omega_i^{\lambda\mu}$ close to the experimental ones were inserted into eqs. (1), (4) (5). If we take for the $510\uparrow$ state the one-particle value of the decoupling parameter a calculated in ref./29/ on the basis of the wave functions of the Saxon-Wood potential we obtain satisfactory agreement between the calculated decoupling parameters a and the experimental values for states containing the one-particle $510\uparrow$ component. In the ^{169}Yb nucleus the $K\pi = 1/2-$ state with energy 1317 keV was observed in ref./23/. The $K\pi = 1/2-$states with energies 1300 and 1350 predicted by us may not be apparently identified with the observed one. These states are excited with small cross sections in (dp) and (dt) reactions and have other values of a . A state with a large one-particle $510\uparrow$ compound is considerably higher ($\approx$ 1.7 MeV).

^{171}Yb ^{173}Yb

The odd-mass isotopes of Ytterbium are experimentally investigated in ref./23/. The calculated energies and other characteristics of the level of these nuclei rather well agree with experiment. It would be interesting to find experimentally the hole $K\pi = 5/2-$ and $5/2+$ levels. Note that for ^{171}Yb and ^{173}Yb the difference of the results of the present calculations as compared to the calculations in ref./2/ is maximum. This is due to the fact that in these nuclei the calculated in ref./6/ energies of the $K\pi = 2+$ states are most strongly different from the experimental one. In ^{172}Yb the first state is close to the two-quasiparticle nn $521\downarrow - 512\uparrow$ state and the second one is collective. Therefore in ^{173}Yb the wave functions of some states contain large components with $Q_1(22)$ and $Q_2(22)$ phonons.

^{175}Yb ^{177}Hf

The levels ^{175}Yb are investigated in ref./23/ and ^{177}Hf in ref./26/ by the (dp) and (dt) reactions. In ref./25/ the $K\pi = 1/2+$ (1454 keV) state was observed in ^{175}Yb for which log ft = 5.3 for the beta decay from

$1/2+411\downarrow$ state of ^{175}Tm. In Table 10 there is $K\pi = 1/2+$ state with energy 1.5 MeV which can not be, however, identified with the experimentally observed 1454 keV energy state. On the other hand, the three-quasiparticle $K\pi = 1/2+$ state with configuration $p411\downarrow - p514\uparrow + n514\downarrow$ must lie, according to ref./37/ at an energy of about 1.6 MeV. For this state the obtained value of log ft = 5.3 is quite reasonable.

In ref./26/ in ^{177}Hf a number of $K\pi = 1/2-, 3/2-$states of energy of about 1.5 MeV was found by the (dp) reaction. These states (due to the factor u_ρ^2) must be particle ones. As a result of calculations some $K\pi = 1/2-, 3/2-$states of energies close to the experimental ones were obtained. The structure of these states is given in Table 11. However, the correspondance of the calculated and experimental states is not unambiguous. At sufficiently high excitation energies states from the $N = 7$ ($770\uparrow, 761\uparrow$) should be observed, which are not included in our calculations.

^{177}Yb ^{179}Hf

In the calculation of all nuclei with $N < 107$ one used the same average level scheme as in ref./2/ and the Nilsson wave functions with deformation $\delta = 0.3$. In the calculation of nuclei with $N \geq 107$ one used the level scheme and the wave functions with $\delta = 0.2$. This is the cause of some changes in the calculated spectrum of the excited states of ^{177}Yb as compared to ^{175}Yb.

In these nuclei the interaction of quasiparticles with phonons is rather weakly revealed. This is due to the fact that in neighboring even-even nuclei the vibrational levels (especially with $K\pi = 2+$) lie rather highly and are weakly "collectivized". Therefore in nuclei with $N = 107$ states with a large contribution of phonons are revealed only at energies higher than 1 MeV.

^{181}Hf

The levels of this nucleus were investigated by the (dp) reaction in ref./26/. A number of particle excited states with energy up to 2 MeV was obtained. It is difficult to relate the observed and the calculated levels with low spins since the experimental information is still little. In this nucleus the 501↓ state is apparently first revealed and among the observed excited states there are possibly states from the $N = 7$ shell (which are not included in our calculations). In ^{181}Hf the $K\pi = 13/2+$ 606↑ state is also first observed; its energy is in good agreement with the calculated value.

^{155}Eu

This nucleus lies near the boundary of deformed nuclei where the lowest vibrational states are the beta and octupole $K\pi = 0-$ states. As in the case of ^{155}Gd and ^{157}Tb a low-lying comparatively pure beta vibrational state may exist in this nucleus. The results of calculation of the levels of ^{155}Eu satisfactorily agree with the available experimental data[31].

^{165}Ho

As was already mentioned, the calculated characteristics of the states in ^{161}Ho and ^{163}Ho are very close to those for ^{165}Ho. In ^{165}Ho both gamma-vibrational states $K_0 - 2$ and $K_0 + 2$ are known. The energies of these states calculated in the present paper and in ref.[2] are overestimated as compared to the experimental data. Interactions of quasiparticles with phonons in nuclei with an odd number of protons for states with negative parity are less effective as compared to states with positive parity. Therefore the admixture to the collective states of the type quasiparticle in the ground state plus phonon are small.

^{169}Tm

In this nucleus two levels of the type $K_0 - 2$ with $K\pi = 3/2+$ are detected, for one of them the value of $B(E2)$ being large for the other small. The structure of the second $K\pi = 3/2+$ state calculated in ref.[2] corresponds to the first $K\pi = 3/2+$ state detected experimentally and vice versa. After the $K\pi = 2+$ state energy has been corrected in ^{168}Er the situation became somewhat better. For the remaining states satisfactory agreement between theory and experiment is obtained.

^{171}Lu

In this nucleus the interactions of quasiparticle with beta-vibrational phonons play an important role. The energy for the 514↑ state obtained in ref.[35] strongly differs both from the energies of this states in other isotopes and the calculated value. The identification of the $K\pi = 7/2-$ state as the 523↑ one is not sufficiently reliable.

In conclusion it should be noted that the results of calculations given in Tables 1-20 allow to conclude that theory satisfactorily describes all the experimental data on the odd-mass deformed nuclear levels in the region $155 \leq A \leq 181$. Besides, the position of many new levels in the studied nuclei is predicted. The Cariolis interaction was not taken into account which is some cases could play an important role especially in the calculation of the electromagnetic transition probabilities. The largest uncertainties in the calculations are due to a rough description of the behaviour of the average field levels and the wave functions in the one-particle Nilsson model.

The authors express their deep gratitude to L.A.Malov for usefull discussion, A.A.Korneichuk and K.M.Zhelesnova for the help in making numerical calculations.

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Received by Publishing Department
on December 2, 1966.

TABLE I.

$^{155}_{64}\mathrm{Gd}_{91}$

Kπ	Energy (keV)		STRUCTURE
	exper.	calcul.	
3/2 −	0	0	52I↑ 9I%; 52I↓ + Q_1(22) 6%
I/2 +		−50	660↑ 63%; 660↑ + Q_1(20) 30%
5/2 +	I05	85	642↑ 8I%; 642↑ + Q_1(20) I5%
3/2 +	85	I35	65I↑ 9I%; 65I↑ + Q_1(20) 3%; 660↑ + Q_1(22)
II/2 −		I90	505↑ 90%; 505↑ + Q_1(20) 7%;
5/2 −	287	300	523↓ 88%; 52I↓ + Q_1(22) 7%; 523↓ + Q_1(20) 2%
3/2 −		400	532↓ 7I%; 532↓ + Q_1(20) I2%; 530↑ + Q_1(22) I0%
I/2 −		400	530↑ 60%; 530↑ + Q_1(20) I5%; 532↓ + Q_1(22) I3%
I/2 −		550	52I↓ 42%; 52I↑ + Q_1(22) 37%; 523↓ + Q_1(22) I6%
3/2 +	267	590	402↓ 59%; 400↑ + Q_1(22) 24%; 404↓ + Q_1(22) 8%
I/2 +	368	740	400↑ 64%; 402↓ + Q_1(22) 22%; 400↑ + Q_1(20) I0%
3/2 +		850	65I↑ 3%; 65I↑ + Q_1(20) 95%;
3/2 −	592	980	52I↑0,7%; 52I↑ + Q_1(20) 99%
3/2 −		990	532↓ II%; 532↓ + Q_1(20) 88%

TABLE 2.

$^{163}_{68}\mathrm{Er}_{95}$

Kπ	Energy (keV)		STRUCTURE
	exper.	calcul.	
5/2 −	0	0	523↓ 96%
5/2 +	22	−I0	642↑ 97%
3/2 −	I04	75	52I↑ 95%
3/2 +		260	65I↑ 78%; 65I↑ + Q_1(20) I0%; 52I↑ + Q_1(30) 4%
II/2 −		280	505↑ 95%; 505↑ + Q_1(20) 4%
I/2 −	345	480	52I↓ 55%; 523↓ + Q_1(22) 26%; 52I↑ + Q_1(22) I6%
I/2 +		500	660↑ 65%; 660↑ + Q_1(20) I3%; 65I + Q (22) 9%
3/2 −		500	532↓ 79%; 532↓ + Q (20) 6%; 530↑ + Q_1(22) 5%
7/2 +		680	633↑ 95%
5/2 −		930	5I2↑ 48%; 642↑ + Q_1(30) 47%; 5I0↑ + Q_1(22) 3%
7/2 −		980	523↑ I%; 52I↑ + Q_1(22) 98%
I/2 +		I000	660↑ 3%; 640↑ I%; 642↑ + Q_1(22) 85%
I/2 −		I000	52I↑ + Q_1(22) 60%; 523↓ + Q_1(22) 35%
9/2 +		I000	624↑ I%; 642↑ + Q_1(22) 98%
9/2 −		I050	523↓ + Q_1(22) ~I00%
3/2 +		I200	65I↑ 2%; 52I↑ + Q_1(30) 72%; 65I↑ + Q_1(20) 3%
I/2 −		I400	52I↓ 40%; 523↓ + Q_1(22) 35%; 52I↑ + Q_1(22) I3%

TABLE 3.

$^{163}_{66}\mathrm{Dy}_{97}$

Kπ	Energy (keV)		S T R U C T U R E
	exper.	calcul.	
5/2 -	0	0	523↓ 96%
5/2 +	25I	90	642↑ 94%; 642↑ + $Q_1(20)$ 2%; 660↑ + $Q_1(22)$ I,5%
7/2 +		290	633↑ 97%
3/2 -	422	3I0	52I↑ 92%; 65I↑ + $Q_1(30)$ 2%; 52I↑ + $Q_1(22)$ 2%
I/2 -	35I	340	52I↓ 73%; 523↓ + $Q_1(22)$ 23%; 52I↑ + $Q_1(22)$ 3%
3/2 +	859	460	65I↑ 75%; 65I↑ + $Q_1(20)$ I4%; 52I↑ + $Q_1(30)$ 6%
II/2 -		620	505↑ 94%
5/2 -		660	5I2↑ 88%; 5I0↑ + $Q_1(22)$ 6%; 642↑ + $Q_1(30)$ 2%
I/2 +	738	680	660↑ 33%; 642↑ + $Q_1(22)$ 50%; 660↑ + $Q_1(20)$ 6%
9/2 -		780	523↓ + $Q_1(22)$ ~ I00%
9/2 +		900	642↑ + $Q_1(22)$ ~ I00%
I/2 -		940	52I↓ 9%; 523↓ + $Q_1(22)$ 60%; 52I↑ + $Q_1(22)$ 26%
3/2 -	82I	950	532↓ 73%; 532↓ + $Q_1(20)$ I0%; 65I↑ + $Q_1(30)$ 7%
I/2 +	(884)	I060	660↑ 22%; 642↑ + $Q_1(22)$ 43%; 523↓ + $Q_1(32)$ II%
I/2 -	(I056)	I070	52I↓ I4%; 52I↑ + $Q_1(22)$ 70%; 523↓ + $Q_1(22)$ I5%
I/2 +	(884)	II00	660↑ I,5%; 523↓ + $Q_1(32)$ 70%; 642↑ + $Q_1(22)$ 5%
3/2 -		I300	52I↑ + $Q_1(20)$ ~ I00%

TABLE 4.

$^{165}_{68}\mathrm{Er}_{97}$

Kπ	Energy (keV)		S T R U C T U R E
	exper.	calcul.	
5/2 -	0	0	523↓ 96%
5/2 +	47	90	642↑ 94%; 642↑ + $Q_1(20)$ 2%; 660↑ + $Q_1(22)$ 2%
7/2 +		290	633↑ 97%
3/2 -	243	300	52I↑ 93%; 65I↑ + $Q_1(30)$ 3%; 52I↓ + $Q_1(22)$ I%
I/2 -	297	320	52I↓ 7I%; 523↓ + $Q_1(22)$ 24%; 52I↑ + $Q_1(22)$ 3%
3/2 +	855	460	65I↑ 72%; 65I↑ + $Q_1(20)$ I3%; 52I↑ + $Q_1(30)$ 7%
II/2 -		550	505↑ 86%; 505↑ + $Q_1(20)$ I4%
I/2 +	508	640	660↑ 3I%; 642↑ + $Q_1(22)$ 55%; 660↑ + $Q_1(20)$ 6%
5/2 -	608	670	5I2↑ 86%; 5I0↑ + $Q_1(22)$ 7%; 642↑ + $Q_1(30)$ 3%
9/2 -		800	523↓ + $Q_1(22)$ ~ I00%
9/2 +		900	642↑ + $Q_1(22)$ ~ I00%
I/2 -		9I0	52I↓ 9%; 523↓ + $Q_1(22)$ 52%; 52I↑ + $Q_1(22)$ 36%
3/2 -		950	532↓ 7I%; 65I↑ + $Q_1(30)$ I0%; 532↓ + $Q_1(20)$ 9%
7/2 -		980	52I↑ + $Q_1(22)$ ~ I00%
I/2 +		I020	660↑ 26%; 642↑ + $Q_1(22)$ 44%; 65I↑ + $Q_1(22)$ 20%
I/2 -		I050	52I↓ I7%; 52I↑ + $Q_1(22)$ 60%; 523↓ + $Q_1(22)$ I9%
I/2 -		I300	5I0↑ 32%; 5I2↑ + $Q_1(22)$ 62%
3/2 +		I400	65I↑ 3%; 52I↑ + $Q_1(30)$ 90%; 65I↑ + $Q_1(20)$ 4%

TABLE 5.

$^{165}_{66}\mathrm{Dy}_{99}$

Kπ	Energy (keV)		S T R U C T U R E
	exper.	calcul.	
7/2 +	0	0	633↑ 98%
I/2 -	I08	I50	52I↓ 98%
5/2 -	I84	250	5I2↑ 90%; 5I0↑ + $Q_1(22)$ 8%
5/2 -	533	550	523↓ 96%
5/2 +		590	642↑ 89%; 523↓ + $Q_1(30)$ 4%; 642↑ + $Q_1(20)$ 2%
I/2 -	570	700	5I0↑ 3I%; 5I2↑ + $Q_1(22)$ 64%; 5I2↓ + $Q_1(22)$ 3%
3/2 +	539	750	65I↑ 6%; 633↑ + $Q_1(22)$ 93%
3/2 -	574	820	52I↑ 8I%; 52I↓ + $Q_1(22)$ II%; 65I↑ + $Q_1(30)$ 4%
II/2 +		850	633↑ + $Q_1(22)$ ~ I00%
I/2 +		950	660↑ II%; 642↑ + $Q_1(22)$ 85%
I/2 -		I020	523↓ + $Q_1(22)$ ~ I00%
5/2 -		I030	523↓ 2%; 52I↓ + $Q_1(22)$ 98%
3/2 -	II03	I050	52I↑ 9%; 52I↓ + $Q_1(22)$ 89%
9/2 +		I060	624↑ I%; 642↑ + $Q_1(22)$ 98%
7/2 -		II00	5I4↓ 82%; 5I2↓ + $Q_1(22)$ 8%
3/2 +	II67	II50	65I↑ 67%; 52I↑ + $Q_1(30)$ I3%; 633↑ + $Q_1(22)$ 7%
I/2 +		I250	523↓ + $Q_1(32)$ I00%

TABLE 6.

$^{167}_{68}\mathrm{Er}_{99}$

Kπ	Energy (keV)		S T R U C T U R E
	exper.	calcul.	
7/2 +	0	0	633↑ 98%
I/2 -	208	I50	52I↓ 98%
5/2 -	348	280	5I2↑ 90%; 5I0↑ + $Q_1(22)$ 8%
5/2 -	585	550	523↓ 96%
5/2 +		590	642↑ 89%; 642↑ + $Q_1(20)$ 4%; 523↓ + $Q_1(30)$ 3%
3/2 +	532	800	65I↑ 6%; 633↑ + $Q_1(22)$ 90%
I/2 -		8I0	5I0↑ 30%; 5I2↑ + $Q_1(22)$ 65%; 5I2↓ + $Q_1(22)$ 3%
3/2 -	745	820	52I↑ 8I%; 52I↓ + $Q_1(22)$ I2%; 65I↑ + $Q_1(30)$ 4%
II/2 +		830	633↑ + $Q_1(22)$ 98%
I/2 +		950	660↑ II%; 642↑ + $Q_1(22)$ 88%
5/2 -		I000	523↓ 2%; 52I↓ + $Q_1(22)$ 98%
I/2 -		I020	523↓ + $Q_1(22)$ ~ I00%
3/2 -		I050	52I↑ II%; 52I↓ + $Q_1(22)$ 82%
3/2 +		II50	65I↑ 69%; 52I↑ + $Q_1(30)$ 8%; 633↑ + $Q_1(22)$ 7%
7/2 -		II50	5I4↓ 85%; 5I2↓ + $Q_1(22)$ 8%; 633↑ + $Q_1(30)$ 6%

TABLE 7.

I69
Yb
70 99

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
7/2 +	0	0	633↑ 97%
I/2 −	24	I50	52I↓ 96%
5/2 −	I92	240	5I2↑ 88%; 5I0↑ + Q_1(22) 8%; 5I2↑ + Q_1(20) 2%
5/2 +	584	420	642↑ 76%; 642↑ + Q_1(20) I8%; 660↑ + Q_1(22) 2%
5/2 −	570	560	523↓ 95%
3/2 +		740	65I↑ 59%; 65I↑ + Q_1(20) 2I%; 633↑ + Q_1(22) II%
3/2 −	657	850	52I↑ 87%; 52I↑ + Q_1(20) 4%; 52I↓ + Q_1(22) 4%
I/2 −	805	900	5I0↑ 37%; 5I2↑ + Q_1(22) 58%
I/2 +		930	660↑ 35%; 642↑ + Q_1(22) 42%; 660↑ + Q_1(20) I0%
II/2 +		II00	633↑ + Q_1(22) ~ I00%
3/2 +		II00	65I↑ 6%; 633↑ + Q_1(22) 85%; 65I↑ + Q_1(20) 3%
7/2 −		II00	5I4↓ 85%; 5I2↓ + Q_1(22) 9%; 633↑ + Q_1(30) 4%
3/2 −		I200	52I↑ 3%; 52I↓ + Q_1(22) 90%
I/2 −		I300	523↓ + Q_1(22) ~ I00%
I/2 −		I350	52I↓I,5%; 52I↓ + Q_1(20) 90%; 52I↑ + Q_1(22) 8%
5/2 −		I350	523↓ 3%; 523↓ + Q_1(20) 95%

TABLE 8.

I7I
Yb
70 I0I

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
I/2 −	0	0	52I↓ 95%; 52I↑ + Q_1(22) 2%; 523↓ + Q_1(22) 2%
5/2 −	I22	20	5I2↑ 9I%; 5I0↑ + Q_1(22) 7%;
7/2 +	I00	200	633↑ 98%;
I/2 −	945	800	5I0↑ 42%; 5I2↑ + Q_1(22) 5I%; 5I2↓ + Q_1(22) 5%
5/2 +		850	642↑ 74%; 642↑ + Q_1(20) I8%
5/2 −		870	523↓ 59%; 52I↓ + Q_1(22) 38%
3/2 −	902	930	52I↑ 34%; 52I↓ + Q_1(22) 62%
3/2 +		I000	65I↑ 22%; 633↑ + Q_1(22) 68%
7/2 −	~838	I050	5I4↓ 84%; 5I2↓ + Q_1(22) I0%; 5I4↓ + Q_1(20) 4%
3/2 −		II00	5I2↓ 53%; 5I4↓ + Q_1(22) 32%; 5I0↑ + Q_1(22) I3%
II/2 +		II50	633↑ + Q_1(22) ~ I00%
9/2 +		I400	624↑ 97%

TABLE 9.

I73
Yb
70 I03

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
5/2 −	0	0	5I2↑ 96%
I/2 −	398	270	52I↓ 94%; 52I↑ + Q_1(22) 2%; 523↓ + Q_1(22) 2%
7/2 −		450	5I4↓ 95%
7/2 +	350	620	633↑ 97%
I/2 −	I03I	850	5I0↑ 62%; 5I2↑ + Q_2(22) 22%; 5I2↑ + Q_1(22) 8%
9/2 +		I000	624↑ 99%
3/2 −	I340	II00	5I2↓ 66%; 5I4↓ + Q_2(22) I7%; 5I0↑ + Q_2(22) 8%
5/2 −		I200	523↓ 38%; 52I↓ + Q_2(22) 24%; 5I2↑ + Q_1(20) 20%
5/2 −		I300	523↓ II%; 5I2↑ + Q_1(20) 80%; 52I↓ + Q_1(22) 8%
3/2 −	I224	I320	52I↑ 28%; 52I↓ + Q_2(22) 35%; 52I↓ + Q_1(22) 34%
I/2 −		I340	52I↓ + Q_1(20) ~ I00%

TABLE I0.

I75
Yb
70 I05

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
7/2 −	0	0	5I4↓ 97%
5/2 −	633	230	5I2↑ 98%
9/2 +	260	420	624↑ 99%
I/2 −	5II	660	5I0↑ 89%; 5I2↓ + Q_1(22) 7%
3/2 −	809	780	5I2↓ 75%; 5I4↓ + Q_1(22) I5%; 5I0↑ + Q_1(22) 9%
I/2 −	9I3	800	52I↓ 93%; 523↓ + Q_1(22) 2%; 52I↑ + Q_1(22) 2%
7/2 +	995	II00	633↑ 94%; 633↑ + Q_1(20) 3%
7/2 −		I200	503↑ 87%; 503↑ + Q_1(20) 6%; 50I↑ + Q_1(22) 6%
I/2 +		I500	65I↓ 80%; 65I↓ + Q_1(20) I6%
5/2 −		I650	523↓ 34%; 52I↓ + Q_1(22) 64%
3/2 −	I6I6	I700	52I↑ 20%; 52I↓ + Q_1(22) 80%
I/2 −		I750	5I0↑ 2%; 5I2↑ + Q_1(22) 98%
I/2 −		I800	52I↓ 2%; 5I0↑ + Q_1(20) 96%
3/2 −		I800	5I2↓ II%; 5I4↓ + Q_1(22) 85%

TABLE II.

$^{I77}_{72}\mathrm{Hf}_{I05}$

Kπ	Energy (keV)		STRUCTURE
	exper.	calcul.	
7/2 -	0	0	5I4↓ 96%
5/2 -	504	230	5I2↑ 97%
9/2 +	324	440	624↑99,5%
I/2 -	739	600	5I0↑ 80%; 5I2↓ + $Q_1(22)$ 9%; 5I2↑ + $Q_1(22)$ 5%
I/2 -	560	720	52I↓ 90%; 523↓ + $Q_1(22)$ 4%; 52I↑ + $Q_1(22)$ 4%
3/2 -	9I9	750	5I2↓ 68%; 5I4↓ + $Q_1(22)$ 20%; 5I0↑ + $Q_1(22)$ II%
7/2 +	750	II00	633↑ 9I%; 633↑ + $Q_1(20)$ 5%
7/2 -	I058	II00	503↑ 82%; 50I↑ + $Q_1(22)$ 8%; 503↑ + $Q_1(20)$ 5%
I/2 +		I350	65I↓ 76%; 65I↓ + $Q_1(20)$ I4%; 65I↓ + $Q_2(20)$ 7%
5/2 -		I450	523↓ 28%; 52I↓ + $Q_1(22)$ 68%
3/2 -		I500	52I↑ I9%; 52I↓ + $Q_1(22)$ 80%
I/2 -	I634	I550	5I0↑ 4%; 5I2↑ + $Q_1(22)$ 95%
I/2 -		I650	52I↓ I%; 52I↓ + $Q_1(20)$ 99%
3/2 -		I660	5I2↓ II%; 5I4↓ + $Q_1(22)$ 75%; 5I0↑ + $Q_1(22)$ I2%
3/2 -	I434	I700	50I↑ 26%; 503↑ + $Q_1(22)$ 40%; 50I↓ + $Q_1(22)$ I5%
3/2 -	I502	I750	50I↑ 30%; 503↑ + $Q_1(22)$ 35%; 50I↓ + $Q_1(22)$ I0%

TABLE I2.

$^{I77}_{70}\mathrm{Yb}_{I07}$ (δ = 0,2)

Kπ	Energy (keV)		STRUCTURE
	exper.	calcul.	
9/2 +	0	0	624↑ 98%
I/2 -	335	220	5I0↑ 9I%; 5I2↓ + $Q_1(22)$ 7%
7/2 -	III	300	5I4↓ 98%
3/2 -	708	5I0	5I2↓ 8I%; 5I0↑ + $Q_1(22)$ I4%; 5I4↓ + $Q_1(22)$ 2%
5/2 -	(6I9)	600	5I2↑ 94%
I/2 -	(998)	700	52I↓ 89%; 52I↑ + $Q_1(22)$ 3%; 523↓ + $Q_1(22)$ 3%
9/2 -		750	505↓ 9I%; 503↓ + $Q_1(22)$ 3%; 505↓ + $Q_1(20)$ 2%
7/2 +		850	633↑ 92%; 65I↑ + $Q_1(22)$ 2%; 5I2↑ + $Q_1(3I)$ I%
7/2 -	I222	I000	503↑ 90%; 50I↑ + $Q_1(22)$ 6%
3/2 -	I365	II00	50I↑ 89%; 50I↓ + $Q_1(22)$ 4%; 50I↑ + $Q_1(20)$ 3%
5/2 +		II00	642↑ 74%; 624↑ + $Q_1(22)$ I4%; 642↑ + $Q_1(20)$ 3%
3/2 -		I350	52I↑ 47%; 52I↓ + $Q_1(22)$ 4I%; 633↑ + $Q_1(32)$ 4%
I/2 +		I700	65I↓ 3I%; 5I0↑ + $Q_1(3I)$ 57%

TABLE I3.

$^{I79}_{72}\mathrm{Hf}_{I07}$ (δ = 0,2)

Kπ	Energy (keV)		STRUCTURE
	exper.	calcul.	
9/2 +	0	0	624↑ 99%
I/2 -	376	290	5I0↑ 94%; 5I2↓ + $Q_1(22)$ 5%
7/2 -	2I5	300	5I4↓ 98%
3/2 -	522	600	5I2↓ 87%; 5I0↑ + $Q_1(22)$ 9%; 5I4↓ + $Q_1(22)$ 2%
5/2 -		620	5I2↑ 96%
I/2 -		720	52I↓ 93%; 523↓ + $Q_1(22)$ 3%; 52I↑ + $Q_1(22)$ 3%
9/2 -		860	505↓ 95%
7/2 +		900	633↑ 94%
7/2 -		I000	503↑ 94%; 50I↑ + $Q_1(22)$ 5%
3/2 -		I200	50I↑ 94%; 50I↓ + $Q_1(22)$ 3%
5/2 +		I200	642↑ 83%; 624↑ + $Q_1(22)$ 6%; 5I2↑ + $Q_1(30)$ 3%
3/2 -		I500	52I↑ 55%; 52I↓ + $Q_1(22)$ 30%

TABLE I4.

$^{I8I}_{72}\mathrm{Hf}_{I09}$ (δ = 0,2)

	Energy (keV)		STRUCTURE
	exper.	calcul.	
I/2 -	0	0	5I0↑ 94%; 5I2↓ + $Q_1(22)$ 3%
3/2 -	255	290	5I2↓ 9I%; 5I0↑ + $Q_1(22)$ 6%
9/2 +	68	370	624↑ 97%
9/2 -		460	505↓ 93%; 503↓ + $Q_1(22)$ 2%; 505↓ + $Q_1(20)$ 2%
7/2 -	670	6I0	503↑ 92%; 50I↑ + $Q_1(22)$ 3%; 503↑ + $Q_1(20)$ 3%
3/2 -	I063	800	50I↑ 90%; 503↑ + $Q_1(22)$ 7%; 50I↓ + $Q_1(22)$ 2%
7/2 -		820	5I4↓ 97%
5/2 -		I050	5I2↑ 86%; 5I0↑ + $Q_1(22)$ 5%
II/2 +		II00	6I5↑ 94%; 6I5↑ + $Q_1(20)$ 2%
I/2 -		I200	52I↓ 90%; 523↓ + $Q_1(22)$ 3%; 52I↑ + $Q_1(22)$ 3%
7/2 +		I350	633↑ 89%; 633↑ + $Q_1(20)$ 4%
I/2 +		I350	65I↓ 8I%; 65I↓ + $Q_1(20)$ 7%
5/2 -		I600	5I2↑ 4%; 5I0↑ + $Q_1(22)$ 90%
5/2 -	I637	I650	503↓ 36%; 505↓ + $Q_1(22)$ 62%
3/2 -		I700	5I2↓ 6%; 5I0↑ + $Q_1(22)$ 92%
3/2 -		I800	52I↑ 49%; 52I↓ + $Q_1(22)$ 37%; 5I4↓ + $Q_1(22)$ 4%
I/2 -		I850	50I↓ 32%; 50I↓ + $Q_1(22)$ 58%
I3/2 +	I729	I900	606↑ 88%; 624↑ + $Q_1(22)$ 8%

TABLE I5.

$^{I55}_{63}\mathrm{Eu}_{92}$

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
5/2 +	0	0	4I3↓ 96%
3/2 +	246	60	4II↑ 92%; 4II↓ + Q$_1$(22) 7%
5/2 −	I04	I60	532↑ 98%
7/2 −		540	523↑ 98%
I/2 +	765	600	4II↓ 67%; 4II↑ + Q$_1$(22) I9%; 4I3↓ + Q$_1$(22) I4%
9/2 +		700	404↑ 84%; 404↑ + Q$_1$(20) I4%
3/2 −	II00	I000	54I↑ 7I%; 54I↑ + Q$_1$(20) I9%; 4II↑ + Q$_1$(30) 4%
5/2 +		II00	4I3↓ + Q$_1$(20) ~I00%
5/2 −		II50	532↑ + Q$_1$(20) 99%
5/2 +		I200	532↑ + Q$_1$(30) 99%
3/2 +	I275	I250	422↓ 74%; 420↑ + Q$_1$(22) I0%; 54I↑ + Q$_1$(30) 7%
I/2 +		I500	420↑ 65%; 422↓ + Q$_1$(22) I5%; 420↑ + Q$_1$(20) 6%
I/2 +		I650	4II↓ I%; 4I3↓ + Q$_1$(22) 73%; 4II↑ + Q$_1$(22) 25%

TABLE I6.

$^{I65}_{67}\mathrm{Ho}_{98}$

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
7/2 −	0	0	523↑ 99%
3/2 +	362	I60	4II↑ 95%
I/2 +	423	220	4II↓ 95%
5/2 +	(995)	590	4I3↓ 98%
7/2 +	7I6	670	404↓ 94%; 402↓ + Q$_1$(22) 4%
3/2 −	5I4	840	52I↑ 3%; 523↑ + Q$_1$(22) 92%
7/2 +		850	4I3↑ 3%; 4II↑ + Q$_1$(22) 95%
5/2 −		850	532↑ 95%; 4I3↓ + Q$_1$(30) 2%
II/2 −	687	900	523↑ + Q$_1$(22) 99%
I/2 +		I000	4II↓ 3%; 4II↑ + Q$_1$(22) 95%
9/2 −		II00	5I4↑ 99%
5/2 +		II50	402↑ 2%; 4II↓ + Q$_1$(22) 97%
9/2 +		II50	404↑ I%; 4I3↓ + Q$_1$(22) 98%
3/2 −		I500	54I↑ I4%; 4II↑ + Q$_1$(30) 85%
5/2 +		I500	402↑ 83%; 400↑ + Q$_1$(22) 6%; 5I4↑ + Q$_1$(32) 5%

TABLE I7.

$^{I69}_{69}\mathrm{Tm}_{I00}$

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
I/2 +	0	0	4II↓ 96%
7/2 +	3I6	270	404↓ 92%; 404↓ + Q$_1$(20) 4%; 402↓ + Q$_1$(22) 3%
7/2 −	379	360	523↑ 98%
3/2 +	570	580	4II↑ 83%; 4II↓ + Q$_1$(22) I2%; 4I3↑ + Q$_1$(22) 2%
9/2 −		650	5I4↑ 98%
5/2 +		850	402↑ 87%; 400↑ + Q$_1$(22) 5%; 402↑ + Q$_1$(20) 4%
5/2 +	II89	900	4I3↓ 36%; 4II↓ + Q$_1$(22) 60%
3/2 +		950	402↓ 3I%; 404↓ + Q$_1$(22) 64%
I/2 −		I000	54I↓ 80%; 54I↓ + Q$_1$(20) I2%; 4II↓ + Q$_1$(30) 5%
3/2 −		I050	523↑ + Q$_1$(22) ~ I00 %
3/2 +		II00	4II↑ I3%; 4II↓ + Q$_1$(22) 85%
7/2 +		I200	4I3↑ 6%; 4II↑ + Q$_1$(22) 90%
5/2 +		I250	4I3↓ 62%; 4II↓ + Q$_1$(22) 35%
5/2 −		I300	532↑ 87%; 532↑ + Q$_1$(20) 9%; 4I2↑ + Q$_1$(30) 2%

TABLE I8.

$^{I7I}_{7I}\mathrm{Lu}_{I00}$

K_π	Energy (keV)		STRUCTURE
	exper.	calcul.	
7/2 +	0	0	404↓ 93%; 404↓ + Q$_1$(20) 3%; 402↓ + Q$_1$(22) 3%
I/2 −	7I	I60	54I↓ 8I%; 54I↓ + Q$_1$(20) I4%
I/2 +	382	200	4II↓ 88%; 4II↑ + Q$_1$(22) 6%; 4I3↓ + Q$_1$(22) 4%
9/2 −	(662)	270	5I4↑ 97%
5/2 +	296	3I0	402↑ 88%; 402↑ + Q$_1$(20) 6%; 400↑ + Q$_1$(22) 5%
3/2 +	843	750	4II↑ 58%; 4II↓ + Q$_1$(22) 39%;
7/2 −	(470)	850	523↑ 98%
5/2 +		I000	4I3↓ 37%; 4II↓ + Q$_1$(22) 6I%
3/2 +		I050	402↓ 25%; 404↓ + Q$_1$(22) 72%
3/2 −		I200	532↓ 8I%
I/2 +		I350	400↑ 28%; 402↑ + Q$_1$(22) 4I%;4II↓ + Q$_1$(20) 25%
I/2 +		I370	400↑ 5%; 4II↓ + Q$_1$(20) 65%; 402↑ + Q$_1$(22) I5%
II/2 +		I400	404↓ + Q$_1$(22) ~ I00%
7/2 +		I500	404↓ 3%; 404↓ + Q$_1$(20) 97%

TABLE I9.

Decoupling parameter a for some K= I/2 states.

Nuclei	Energy (keV)		Parameter a		ρ	C_ρ^2 (%)
	experim.	calculation	experim.	calcul.		
^{I55}Gd	(556)	550	(0,4I)	0,36	52I↓	42
	368	740	0,24	0,30	400↑	64
^{I65}Dy	570	700	0,05	0,05	5I0↑	3I
^{I67}Er		8I0		0,05	5I0↑	30
^{I69}Yb	805	790	0,08	0,06	5I0↑	37
^{I7I}Yb	945	630	0,032	0,08	5I0↑	42
^{I73}Yb	I03I	850	0,20	0,I2	5I0↑	62
^{I75}Yb	260	420	0,20	0,I8	5I0↑	89
^{I77}Hf	739	600	0,I8	0,I6	5I0↑	80
^{I77}Yb	332	220	0,22	0,23	5I0↑	9I
^{I79}Hf	376	290	0,I65	0,23	5I0↑	94
^{I8I}Hf	0	0	0,I2	0,20	5I0↑	94
^{I7I}Lu	7I	I65	3,8	2,8	54I↓	8I
	392	I90	−0,7I	−0,70	4II↓	88

TABLE 20.

Spectroscopic factors in reaction (d,t) for 3/2 – [52I] states.

Nuclei	Energy (keV)		$S = C_\rho^2 u_\rho^2$
	experiment	calculation	
^{I69}Yb	657	850	0,82
^{I7I}Yb	902	930	0,33
^{I73}Yb	I224	I320	0,27
^{I75}Yb	I6I6	I700	0,20