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Evaluation of Resonance Parameters for Neutron Interaction with Iron Isotopes for Energies up to 400 keV

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ABSTRACT

This report documents the evaluation of the resolved resonance parameters of iron isotopes 54, 56 and 57 in the neutron energy region below 400 keV. Estimates of the uncertainties in the resonance parameters and correlation between the partial widths Γ_n and Γ_γ are given when significant. Some details about the procedures used to evaluate the resonance parameters, their uncertainties and correlations are reported. This evaluation was performed for the general purpose file of the Evaluated Nuclear Data File (ENDF/B-V MAT 1326).

I. INTRODUCTION

This report documents the evaluation of the resolved resonance parameters of the iron isotopes performed for the general purpose file of ENDF/B-V MAT 1326.

The general purpose iron evaluations for ENDF/B-III and -IV in the resolved resonance region, which went up to 60 keV, were based upon a private communication of Storey (ST070). In 1975 Ribon and LeCoq (RIB75) updated the resolved resonance evaluation of ENDF/B-IV mostly on the basis of new data from Karlsrühe. This evaluation was documented and entered in the ENDF/A system under MAT 449. This evaluation was available to us at the start of the work described in this report, which was done in the period 1976 to 1977. The major motivation behind this work was extensive sets of data from ORELA on the major isotopes ^{56}Fe and ^{54}Fe which became available. These included not only transmission and capture data but also high resolution scattering data on natural iron which allowed the determination of the spin and parity of resonances in ^{56}Fe having reasonably large scattering widths ($g\Gamma_n$). In addition, some new data from Karlsrühe were available.

The isotopic composition of elemental iron is: ^{56}Fe (91.66%), ^{54}Fe (5.82%), ^{57}Fe (2.19%) and ^{58}Fe (0.33%). Most of the emphasis was therefore placed upon the isotopes ^{56}Fe and ^{54}Fe. Since below 20 keV ^{57}Fe contributes an appreciable fraction of the capture in natural iron, it was also looked at more carefully in the low energy region.

Since ^{56}Fe is the most abundant isotope and the data were more complete for this isotope, we analyzed them first. Some of the findings from this analysis were exploited in the evaluation of the data for the isotope ^{54}Fe.

The major purpose of this report is to indicate not only the data sources used but to give some reasonably detailed information on how the numerical values were adopted. It is practically impossible to provide all of the considerations which went into the evaluation process; it is doubtful if these are of interest to many people. Some of the decisions made appear very arbitrary and most of them were largely so. We hope, however, that this document will be useful to some users of the file and in particular to those who may want to update it at a future time. In this evaluation an effort was made to estimate the uncertainties in the resonance parameters including the correlations between the partial widths Γ_n and Γ_γ when these are significant. This type of work has seldom been done before and a special section of the report is devoted to its description.

II. ^{56}Fe EVALUATION

A. Experimental Data Review

The three major data sets available to Ribon and LeCoq were:

1) A transmission measurement by Bowman *et al.* (BOW62). Some 40 resonances were analyzed between 170 and 650 keV. This early work has poor resolution compared to the more recent data.

2) A capture measurement by Hockenbury *et al.* (HOC69). A total of 25 resonances were observed up to 130 keV, but only 12 of them were analyzed for capture areas.

3) A capture measurement by Ernst *et al.* (ERN70). A total of 41 resonances were reported up to 250 keV. This work was subsequently reanalyzed by Fröhner in 1973 and 1974 (FRO74).

Other publications (BIL61, GAR71, ROH66) report only s waves in transmission measurements below 250 keV. Early capture measurements (MAC64 and MOX65) only report four resonances below 50 keV. From a (γ,n) experiment on ^{57}Fe Jackson and Strait (JAC71) assign spin and parity to 15 resonances in ^{56}Fe (a 4% correction for recoil effects was applied to the energy of these resonances given in the Data Review Tables in the Appendix).

Three much more extensive data sets from ORELA were available to us at the start of this analysis:

1) Transmission data up to 500 keV reported by Pandey *et al.* (PAN75). The energy resolution is better than 0.1%. This allows the narrow resonance energies to be determined to about 0.1%, but for the large s-wave resonances their energy determination drops to about 0.3%.

With the exception of energy regions "blanked out" by large s-wave resonances this experiment allowed the observation of resonances having approximately the following scattering widths:

$g\Gamma_n > 1$ eV for $E_n < 100$ keV
$g\Gamma_n > 4$ eV $100 < E_n < 200$ keV
$g\Gamma_n > 10$ eV $200 < E_n < 300$ keV
$g\Gamma_n > 30$ eV $300 < E_n < 400$ keV .

From 24 to 400 keV 79 resonances were observed in this work and values of $g\Gamma_n$ reported for them. Fifteen resonances could be identified as s waves from the interference with the potential scattering.

2) Capture data up to 500 keV, with an energy resolution of 0.1% up to 100 keV and 0.2% above were reported by Allen *et al.* (ALL76). A total of 122 resonances were observed in this work from 10 to 400 keV. All but three of the resonances seen in transmission could be seen in the capture data. (The missing resonances are at 51.55, 55.37 and 182.25 keV.) One resonance at 96.44 keV in the capture data was seen as a doublet in the transmission data.

Up to 100 keV the capture areas reported in this work are in "good agreement" with the results reported earlier by Ernst *et al.* (ERN70) and Fröhner (FRO74). However, above 100 keV many more resonances are clearly seen and resolved in this work.

There are "slight" differences between the various energy scales of all of the above measurements. These differences are not judged to be of any consequence for any of the uses we anticipate for this evaluation. Resonance energies reported in the capture data of Allen *et al.* (ALL76) are systematically 0.1 to 0.3% lower than the energies reported by Pandey *et al.* (PAN75). Because of intercomparison of resonance energies made at ORELA at the time the transmission data were taken, we are inclined to believe that the transmission data energy scale is more likely to be correct. We have, however, no proof that it is so. We adopted the absolute energy scale of the transmission data because most of the resonance energies should be better defined in view of the narrower energy resolution.

3) Elastic scattering angular distributions from natural iron from 20 to 500 keV with an energy resolution of 0.3% by Kinney (KIN76). This

unpublished work was performed using a technique described by Kinney and Perey (KIN77). The experimental data consisted of excitation functions at seven angles from 20 to 500 keV. The data were available to us in the form of computer files of the Legendre coefficients up to L = 5 as a function of energy. Between 80 and 400 keV all the resonances but one at 96.14 keV seen in transmission could be observed as "resonances" in one or more of the Legendre coefficient excitation functions. Although this work had much broader energy resolution than the transmission data (PAN75), due to interference effects in the angular distributions of the various partial waves, some of the resonances could be more clearly seen than in the transmission data. The resonances at 72.98 and 215.6 keV, for example, seen in capture but not in transmission, were clearly seen in the scattering data.

The data were analyzed using an R-function formalism (PER76). The characteristic interference effects in the Legendre coefficients as a function of energy could be clearly reproduced using the resonance energies and the values of $g\Gamma_n$ obtained from the transmission data analysis. The theoretical shapes were very insensitive to values of the scattering radius, boundary conditions and $g\Gamma_n$ but had very large sensitivities to the spin and parity assigned to each resonance. Except where the levels strongly overlap, the assignment of J^π values can be made by inspection of the resonance shapes in the various Legendre coefficients. The results of this analysis have been reported (PER77).

B. The Negative Energy Level

There were no new data in the low energy region since Ribon and LeCoq's evaluation. Therefore, we made use of their analysis for the negative energy level at -2 keV with Γ_n = 180 eV and Γ_γ = 0.64 eV.

C. The 1.15-keV Resonance

In fission reactor applications this resonance is most important since it controls to a large extent the Doppler coefficient of reactivity on stainless steel. Again no new data were available since Ribon and LeCoq's evaluation and we adopted the result of their analysis. In view of the importance of this resonance, we reproduce in Table 1 the data summary of Ribon and LeCoq.

D. The Higher Energy Resonances

All of the available data were compiled on a resonance by resonance basis and these are given in the Appendix. A total of 126 resonances was observed between 2 and 400 keV.

The next step in the analysis consisted in adopting values for the neutron width, $g\Gamma_n$, and the "capture area," $g\Gamma_n\Gamma_\gamma/(\Gamma_n+\Gamma_\gamma)$, for each resonance on the basis of the measurements available. Unfortunately, no specific methodology could be developed to derive the "adopted values" in a consistent fashion on the basis of all the measurements available. The major reason for this difficulty was that we were not able to evaluate on a consistent basis all of the uncertainties in the reported measurements, although all of the papers were consulted. It is very seldom clear from the papers what the uncertainties given correspond to and there is no indication of how to propagate to the parameters the other sources of uncertainties discussed but not included with the parameter tabulations. The lack of a well-accepted methodology for estimating, combining and reporting uncertainties in data is a major obstacle to the performance of credible evaluations in general and in this work in particular. A very subjective approach had to be used to obtain the recommended values and their uncertainties based upon our experience with the types of measurements in general, the specific information in the papers (graphs, discussion, etc.), the method of analysis and our knowledge of the facilities where the data came from. This approach led us to assign more weight to the ORELA measurements since we were more familiar with them, but our perception of the general quality of the data does not necessarily agree with the authors of the data. There are two major drawbacks to what we did: 1) the adopted values are not traceable, in many cases, to the data available, and 2) we very likely failed to take properly into account all of the information available. The adopted values are tabulated in the Appendix following the data for each resonance.

The next step in the analysis was to consider the scattering data of Kinney. From them the spin and parity of 75 responances could be determined. We obtained 15 $s^{1/2}$, 12 $p^{1/2}$, 22 $p^{3/2}$, 18 $d^{3/2}$ and 8 $d^{5/2}$ resonances. For 71 of these resonances we had values of $g\Gamma_n$ and $g\Gamma_n\Gamma_\gamma/(\Gamma_n+\Gamma_\gamma)$ and therefore could extract the values of Γ_n and Γ_γ needed for ENDF/B-V.

Three of the resonances seen in the scattering and capture data were not seen in transmission. The resonance at 46.04 keV is just below the energy where Pandey *et al.* started to see $\ell > 0$ resonances. The two other resonances at 72.98 and 215.6 keV could very well have not been seen because of the large s-wave resonances at 73.98 and 220.5 keV. Since the resonances are seen in scattering, they likely have large scattering widths and we assigned to them a value of $g\Gamma_n$ equal to 10 eV, consistent with the scattering data and not inconsistent with the transmission data. For the resonance at 182.25 keV which was not seen in capture we can assign only a value of Γ_n from the data. Although not consistent with the capture data, since this resonance was not reported, its capture width was set to the average value of Γ_γ for p-wave resonances.

For the remaining 51 resonances not seen in scattering, 45 of them were only seen in the capture data. For these 45 resonances we had only capture areas and an upper limit for the value of $g\Gamma_n$ from the transmission data. For the six resonances below 100 keV seen in both transmission and capture, we can obtain values of $g\Gamma_n$ and $g\Gamma_\gamma$, but the statistical weight g is unknown. A procedure is needed to determine values of J^π, Γ_n and Γ_γ for these 51 resonances which are consistent with the information available.

The often used procedure in ENDF/B evaluations is to adopt an average value of Γ_γ which is then used for all the resonances. Various theoretical considerations regarding level densities and level spacings are then used to assign a value of J^π to the resonances. An estimation of missed levels due to finite energy resolution in the experiments is also performed and extra levels are added to those observed. These considerations are very important when there is a need to describe the cross sections above the resolved resonance energy region in terms of "unresolved resonances" since the average values of the parameters and their distribution laws are required. In the case of iron, however, by extending the resolved resonance energy region up to 400 keV it seems unnecessary, from the point of view of applications, to include an unresolved resonance energy region. It appears adequate to describe the cross sections above 400 keV in terms of average cross sections obtainable directly from the data.

Since there were no compelling reasons to perform an analysis of the distributions of levels and all these resonances must have small values of Γ_n, therefore small self-shielding effects, we developed a simpler procedure. Whatever procedure is used, it must satisfy four basic requirements:

1) $\ell = 2$ resonances should be assigned to resonances having large capture areas because $\overline{\Gamma}_\gamma$ for d-wave resonances is larger than for p-waves and also because they have larger statistical weights,

2) Since no correlations between values of Γ_n and Γ_γ are suspected, the proportion of resonances with various J^π values should be approximately the same as had been found from the scattering data.

3) The average value of Γ_γ for a given ℓ should be the same as for the resonances seen in the scattering data.

4) All of the values of $g\Gamma_n$ should be consistent with the fact that the resonances were not seen in the transmission data.

There is no unique way of satisfying the above desiderata even if we included additional theoretical considerations. In order to satisfy the above requirements, we need to determine the average radiation widths $\overline{\Gamma}_\gamma$ for each ℓ value.

E. Average Radiation Widths

A procedure frequently used to determine average radiation widths is the "maximum likelihood method" (i.e., to take the "sample average"). Since for all the resonances seen in capture and transmission we have $\Gamma_n >> \Gamma_\gamma$ the uncertainties in the values of Γ_γ are entirely determined from the capture areas uncertainties and these were stated to be 10% with few exceptions. Therefore, whether we take "weighted" or "unweighted" averages we would get essentially the same results. For a small sample, as is our case, the maximum likelihood method will only provide a correct estimate if the sample is from a uniform distribution; we know on theoretical ground that this criterion is not met. One of the surprises from our analysis is the fact that we do observe a fairly large dispersion in the values of Γ_γ for resonances having the same ℓ value. As a compromise between what we observed in our small samples and what we thought would occur on theoretical grounds, we decided to eliminate from the averages values far from either side of the mean. This is equivalent to using Bayes theorem with a prior probability density function (pdf) which does not have large "wings," which is consistent with both our current theoretical understanding and past practices in ENDF/B evaluations.

The 15 s-wave resonances between 2 and 400 keV gave an average value of $\overline{\Gamma}_\gamma$ of 1.4 eV with a standard deviation of 0.6 eV. We shall not need this value since we will make the extreme assumption that all s waves were seen in transmission (i.e., there were no small s-wave resonances missed in transmission).

For p-waves we adopted a value of $\overline{\Gamma}_\gamma = 0.54$ eV obtained by averaging 27 values of Γ_γ. We eliminated from the average three resonances for which $\Gamma_\gamma < 0.28$ eV and three for which $\Gamma_\gamma > 1.25$ eV. There seems to be a slight tendency for $p^{1/2}$ resonances to have larger values of Γ_γ than the $p^{3/2}$ resonances. We did not attempt to quantify this likelihood in view of the large standard deviation of 0.16 eV in the average.

For d-wave resonances we adopted a value of $\overline{\Gamma}_\gamma = 0.84$ eV obtained by averaging 23 values of Γ_γ (eliminating from consideration eight values less than 0.45 eV). The standard deviation was 0.25 eV.

For 43 resonances we will use the above values of $\overline{\Gamma}_\gamma$ as the value of Γ_γ and will adopt the standard deviations in $\overline{\Gamma}_\gamma$ as the uncertainties in the values of Γ_γ for the individual resonances.

F. J^π Assignments and Level Distributions

For 45 resonances seen only in capture, the assignment of J^π values is arbitrary since we only require $A < g\overline{\Gamma}_\gamma$. We assigned to $g\Gamma_\gamma$ the lowest value of $g\overline{\Gamma}_\gamma$ consistent with the constraint $A < g\Gamma_\gamma$ and also consistent with the limits of $g\Gamma_n$ given on page 3. The assignment of the uncertainties in the values of $g\Gamma_n$ will be discussed in Section VI.

The final results are given in Table 2. The final distribution of ℓ and J values obtained for resonances up to 400 keV is:

15	$s^{1/2}$	resonances	(all determined from scattering)
25	$p^{1/2}$	resonances	(12 determined from scattering)
44	$p^{3/2}$	resonances	(22 determined from scattering)
29	$d^{3/2}$	resonances	(18 determined from scattering)
14	$d^{5/2}$	resonances	(8 determined from scattering).

The distribution in energy of these levels is shown in Figs. 1 and 2.

G. Remarks

The results of this evaluation were previously reported (PER77), but several transcription errors were discovered in the table which was published and these are corrected in Table 2 of this report. Two of the data sets which we have used in this evalution (FRO74) and (ALL76) have been reanalyzed by their authors (FRO77) and (ALL77). However, the results of this work were already incorporated in ENDF/B-V when these corrections were made available to us and will have to be considered in a revision of this evaluation together with new data. Although some of the changes made in the data base we have used are significant for some of the resonances, the overall effects should be minor for most practical applications.

III. ^{54}Fe EVALUATION

A. Experimental Data Review

The most extensive data sets available to Ribon and LeCoq were from Beer *et al.* (BEE75). The transmission data, from 5 to 290 keV, yielded 12 s waves but two of them, at 159.0 and 230.2 keV, have since been identified as non-s waves. Only four $\ell > 0$ resonances below 60 keV could be analyzed. In the capture data seven s-wave resonances were analyzed up to 190 keV and 23 $\ell > 0$ resonances up to 130 keV. Above 130 keV three more $\ell > 0$ resonances could be identified but were not analyzed. These data sets had an energy resolution of about 0.5%.

Four less extensive data sets were also available to Ribon and LeCoq. The transmission data of Bowman *et al.* (BOW62), from 90 to 500 keV, had an energy resolution between 0.5 and 1%. Twelve $\ell = 0$ resonances were analyzed up to 400 keV and eight $\ell > 0$ resonances between 160 and 400 keV. The capture data of Hockenbury *et al.* (HOC69) identified four resonances below 60 keV, only two of which were analyzed. Two other reports (BIL61 and GAR71) deal with s-wave resonances below 180 keV.

Two extensive data sets from ORELA were available to us at the start of this work:

1) Transmission data up to 500 keV by Pandey *et al.* (PAN75). The energy resolution of these data is not better than 0.1%. Below 160 keV this experiment allowed observation of resonances with neutron widths such as:

$g\Gamma_n > 1$ eV $\quad E_n < 25$ keV,
$g\Gamma_n > 5$ eV $\quad 25 < E_n < 80$ keV, and
$g\Gamma_n > 25$ eV $\quad 80 < E_n < 160$ keV.

Not as many small resonances can be seen here as in the ^{56}Fe data. In energy regions "blanked out" by large s waves, $\ell > 0$ resonances having larger values of $g\Gamma_n$ could have been missed. Above 160 keV a general statement about the minimum neutron width required for $\ell > 0$ resonances to be seen is difficult; due to the two large s waves at 174 and at 192 keV the region between 160 and 220 keV is "blanked out" almost completely to observation of $\ell > 0$ resonances. Above 220 keV a neutron width, $g\Gamma_n$, of at least 100 eV is necessary for a resonance to have been observed. Between 7 and 400 keV, 16 s-wave resonances and 35 $\ell > 0$ resonances were analyzed. Two $\ell > 0$ resonances at 173.9 and 213.6 keV could be seen but no estimate provided for $g\Gamma_n$. Above 160 keV the R-matrix fit to the data is very poor.

2) Capture data up to 500 keV by Allen *et al.* (ALL76A). An energy resolution of 0.1% was claimed in this experiment. The energies of most s-wave resonances were taken from the work of Pandey *et al.* (PAN75). Between 3 and 400 keV, 16 s waves and 114 $\ell > 0$ resonances were analyzed. The 53 resonances observed in transmission (PAN75) were also seen in the capture data.

With the exception of six resonances below 70 keV, which had very small capture areas (less than 0.08 eV), the authors assigned values of $g\Gamma_n$ to all the resonances which had been seen in capture only. These values were needed by them to perform self-shielding corrections and are not always consistent with the limits of $g\Gamma_n$ given above. We have shown these assigned values of $g\Gamma_n$ between quotation marks in the tabulation of the Appendix.

The capture areas given by Beer *et al.* (BEE 75) are systematically 10 to 20% larger than in this work by Allen *et al.* (ALL76A).

The resonance energies of these capture data are in better overall agreement with those of Pandey *et al.* (PAN75) than was the case for ^{56}Fe. Below 200 keV the differences are less than 0.1%. The differences above 200 keV are slightly larger, but in view of the difficulties apparent in the transmission analysis we do not think that for this nuclide there is any sufficient justification for adopting the transmission data energy scale as was the case for ^{56}Fe.

As we did for ^{56}Fe, the experimental data were tabulated for each resonance and where experimental data were available we adopted a value for $g\Gamma_n$ and the capture area, $g\Gamma_n\Gamma_\gamma/(\Gamma_n + \Gamma_\gamma)$. Considerations for adopting the numerical values were similar to those explained for ^{56}Fe. The results are tabulated in the Appendix.

B. S-wave Resonances

The s-wave resonances can easily be identified by their interference with the potential scattering in transmission data, provided $g\Gamma_n$ is sufficiently large. From the available transmission data, 16 $\ell = 0$ resonances have been identified for which we can get the required ENDF/B parameters E_n, Γ_n and Γ_γ. We made no attempt at identifying $\ell = 0$ resonances with small values of Γ_n which could have been missed or identified as $\ell > 0$ resonances. The average value of Γ_γ of 2.2 eV, with a standard deviation of 0.8 eV, was obtained using 13 of these s-wave resonances. We ignored in the averaging three resonances for which Γ_γ was larger than 5 eV.

C. $\ell > 0$ Resonances

The major difference with ^{56}Fe is that, for ^{54}Fe, many more resonances have no experimental determination of $g\Gamma_n$ and there are no scattering data to assist in the assignment of J^π values. There is some theoretical justification for believing that ^{54}Fe and ^{56}Fe should have large similarities as far as the radiation widths are concerned. Therefore, we would expect that $\overline{\Gamma}_\gamma$ for d-wave resonances is approximately twice the value for p-wave resonances. The procedure adopted to arrive at a set of recommended values for the resonance parameters, for $\ell > 0$ resonances, was what we may call a "hybrid one," the final results being obtained in a stepwise fashion when information gained at each step could be exploited in the next one. The first step consisted in obtaining values of $g\Gamma_n$ and $g\Gamma_\gamma$ for as many resonances as possible on the basis of the experimental papers. Some criteria were then developed to assign J^π values for all the resonances on the basis of $g\Gamma_\gamma$ values and the capture areas. The next step consisted in extracting values of $\overline{\Gamma}_\gamma$ for p- and d-wave resonances. These average values were then used to assign $g\Gamma_n$ values for the remaining resonances.

1. Determination of some of the $g\Gamma_n$ and $g\Gamma_\gamma$ values

i. Resonances seen in capture and transmission data

For 35 of the 114 $\ell > 0$ resonances observed in capture we have values of $g\Gamma_n$ based upon transmission data. From the capture areas we can then extract values of $g\Gamma_\gamma$ for these 35 resonances.

ii. Resonances below 210 keV seen in capture data only

Below 210 keV 38 resonances were observed in the capture data but not seen in the transmission data. Allen *et al.* (ALL76A) assumed values of $g\Gamma_n$ for these resonances, no detailed justification being provided for these assignments. We reviewed these assignments for consistency with the fact that they had not been seen in transmission, and they were found to be fully consistent. We therefore adopted these values of $g\Gamma_n$. From the values of $g\Gamma_n$ and the capture areas we extracted values of $g\Gamma_\gamma$. Since for these resonances $g\Gamma_n >> g\Gamma_\gamma$ the values of $g\Gamma_\gamma$ obtained are essentially the capture areas.

There are six resonances, all below 70 keV, which have very small capture areas, from 0.003 to 0.075 eV. For these resonances it is very likely that $g\Gamma_n << g\Gamma_\gamma$ and therefore we could only obtain values for $g\Gamma_n$ which are approximately the capture areas. We adopted Allen *et al.*'s assignment that these resonances were $3/2^+$ resonances, extracted the values of Γ_n and assigned to these resonances as values of Γ_γ the value of $\overline{\Gamma}_\gamma$ found subsequently for d-wave resonances.

iii. Resonances above 210 keV seen in capture data only

Above 210 keV there are 41 resonances seen in capture data but not observed in transmission. To these 41 resonances Allen *et al.* assign a value of $g\Gamma_n$ equal to or larger than 100 eV. We did not agree entirely with these assignments because of their distribution of widths. After considerations of the transmission data we retained the assignment of 100 eV for 14 resonances and adopted half the value assigned by Allen *et al.* to nine others. For these 23 resonances $g\Gamma_n >> g\Gamma_\gamma$ and therefore the $g\Gamma_\gamma$ is approximately given by the capture area.

It is reasonable to assume that a large fraction of the 41 resonances not seen in transmission have values of $g\Gamma_n$ anywhere between 0 and 100 eV. For the 18 remaining resonances the values of $g\Gamma_n$ will be later assigned with this assumption in mind.

2. J^π Assignments

At the completion of step 1 we had estimates of $g\Gamma_\gamma$ for 90 of the 114 $\ell > 0$ resonances. We tried to develop a rule to assign J^π values on the basis of the values of $g\Gamma_\gamma$ only. Our goal was first to obtain approximately a factor of two between $\overline{\Gamma}_\gamma$ of p-wave and d-wave resonances and also approximately the same proportion of resonances having different values of J^π than had been obtained for ^{56}Fe. It is clear, however, from comparing the values of $g\Gamma_\gamma$ for the two isotopes that they tend to be higher for ^{54}Fe. The following procedure satisfies our two conditions approximately:

$g\Gamma_\gamma < 0.75$ eV corresponds to $p^{1/2}$ resonances (g=1)
$0.75 < g\Gamma_\gamma < 1.5$ eV corresponds to $p^{3/2}$ resonances (g=2)
$1.5 < g\Gamma_\gamma < 2.5$ eV corresponds to $d^{3/2}$ resonances (g=2)
$g\Gamma_\gamma > 2.5$ eV corresponds to $d^{5/2}$ resonances (g=3).

The distribution of J^π values which this procedure yielded was 21 $p^{1/2}$ resonances, 30 $p^{3/2}$ resonances, 22 $d^{3/2}$ resonances and 17 $d^{5/2}$ resonances. The "sharp cut-off" criteria we used above is not realistic, but from a practical point of view the outcome would essentially be the same whatever "smooth cut-off" we used unless we took very asymmetric wings to the distribution of widths.

3. Computation of $\overline{\Gamma}_\gamma$

We now attempted to calculate values of $\overline{\Gamma}_\gamma$ for p and d waves to complete the assignment of values of Γ_n, Γ_γ and J^π for the remaining 24 $\ell > 0$ resonances (six below 70 keV for which we need values of Γ_γ and 18 resonances above 210 keV for which we have as yet no estimate of $g\Gamma_n$ or J^π values). Although at this stage we had estimates of J^π and $g\Gamma_\gamma$ values for 90 resonances, we have varying degrees of confidence in the values of $g\Gamma_\gamma$. The strongest justification for the $g\Gamma_\gamma$ values we have is for those assigned in step 1.i. The values of $g\Gamma_\gamma$ obtained at step 1.ii should also be less arbitrary than those at step 1.iii.

We eliminated from consideration in determining the values of $\overline{\Gamma}_\gamma$ three results obtained in step 1.i because of their large values of $g\Gamma_\gamma$ (4.9, 5.2 and 7.2 eV). All $g\Gamma_\gamma$ values obtained in step 1.ii were used in computing $\overline{\Gamma}_\gamma$. However, we found a justification for keeping only six of the 25 $g\Gamma_\gamma$ values obtained in step 1.iii: the resonance at 213.5 keV was seen in transmission but not analyzed; this indicates that its value of $g\Gamma_n$ is much larger than $g\Gamma_\gamma$ which is then approximately the capture area, independent of the value of $g\Gamma_n$. For five resonances between 275 and 400 keV Allen *et al.* had assigned values of $g\Gamma_n$ of 300 eV or more. We suspect that these large values of $g\Gamma_n$ were probably made on the basis of the larger width of the observed peaks in the capture data for these resonances compared to the other ones. This could be because they are unresolved multiplets or because these resonances have larger total widths. We chose this later explanation to argue that for these resonances $g\Gamma_n >> g\Gamma_\gamma$ and therefore the capture area is a measure of $g\Gamma_\gamma$ and is independent of $g\Gamma_n$.

The average value of Γ_γ and its standard deviation for p-wave resonances calculated over 44 resonances was:

$$\overline{\Gamma}_\gamma = 0.52 \pm 0.13 \text{ eV} \quad .$$

For d-wave resonances the result calculated over 26 resonances was:

$$\overline{\Gamma}_\gamma = 1.0 \pm 0.2 \text{ eV} \quad .$$

In the case of ^{56}Fe we had used the standard deviations as an "uncertainty" on the radiation width of resonances for which we used $\overline{\Gamma}_\gamma$. Because of the weak justification for the J^π and $g\Gamma_\gamma$ values used in the case of ^{54}Fe for calculating the values of $\overline{\Gamma}_\gamma$ we decided to assign an uncertainty of 0.17 and 0.3 eV to the radiation widths of resonances for which we will use the above values of $\overline{\Gamma}_\gamma$ as values of Γ_γ.

4. Determination of the Remaining $g\Gamma_n$ and $g\Gamma_\gamma$ Values

As previously mentioned in step 1.ii, for the six resonances below 70 keV which have very small capture areas we used the $3/2^+$ J^π value suggested by Allen *et al.* and therefore took 1.0 ± 0.3 eV as their radiation width.

For the remaining 18 resonances left over from step 1.iii, above 210 keV, we used for values of Γ_γ one of the average values of $\overline{\Gamma}_\gamma$ obtained in step 3. For any resonance we must have $g\Gamma_\gamma$ greater than or equal to the capture area. This eliminated some possible values of $g\overline{\Gamma}_\gamma$ for most of the resonances but only provided a lower limit on $g\overline{\Gamma}_\gamma$ which we could take. We assigned to each resonance the J^π value which was the lowest consistent with the capture area, and determined Γ_n on the basis of consistency with the capture area. The values of $g\Gamma_n$ obtained by this procedure for the

18 resonances fell in the range of 3 to 65 eV with 80% of them in the range 3 to 30 eV. These values of $g\Gamma_n$ are consistent with the transmission data.

5. Level Distribution

The final level distribution obtained for the 114 $\ell > 0$ resonances is: 23 $p^{1/2}$ resonances, 35 $p^{3/2}$ resonances, 37 $d^{3/2}$ resonances and 19 $d^{5/2}$ resonances. This distribution of levels among the different J^{π} values is very similar to the one obtained for ^{56}Fe.

As a check on the results which our overall procedure yielded, we compared the cumulative number of levels of each J^{π} value with the theoretical estimates given by Ribon and LeCoq. The results are shown on Figs. 3 and 4. We find the agreement with the predictions of Ribon and LeCoq quite remarkable in view of the fact that we did not exploit, although strictly speaking we should have, the theoretical information considered by them.

D. Final Results

Table 3 summarizes the conclusions arrived at in our analysis for the resonances of ^{54}Fe. Below 50 keV we provide an estimated uncertainty on the resonance parameters including the correlation coefficient when substantially different from zero. Above 50 keV we indicate the uncertainties in the value of Γ_n only when the values of $g\Gamma_n$ were obtained from the transmission data.

E. Remarks

The data of Allen *et al.* (ALL75A) which we have extensively used were reanalyzed to improve the estimates of the capture areas for s waves (ALL77). The evaluation had been incorporated in ENDF/B-V when this reanalysis became available to us.

IV. ^{57}Fe EVALUATION

A. Experimental Data Review

For this iron isotope very little new data were reported since the evaluation of Ribon and LeCoq. The major change in the data base is that we had available some data which had been only available to Ribon and LeCoq in preliminary form and one set of data was reanalyzed. For completeness we will give a review of the complete data base available to us and indicate in what way it differs from what Ribon and LeCoq used.

Four early publications (MIL59, MOX65, GOO66 and MAC64) reported on five or fewer resonances below 50 keV. Two other publications (BIL61, GAR71) deal only with the s-wave resonance at 6.2 keV. The value of Γ_n reported by Garg *et al.* (GAR71) for the 6.2-keV resonance, based on transmission data from natural iron, is a factor of 5 larger than other determinations and was ignored. The capture data of Hockenbury *et al.* (HOC69) gives value of Γ_q for three s-wave resonances and capture areas for eight $\ell > 0$ resonances.

The most extensive data sets come from KFK:

The transmission data of Rohr and Müller (ROH69) were initially analyzed for the large resonances only. From the graphs in the publication Ribon and LeCoq estimated values of $g\Gamma_n$ for 19 $\ell > 0$ resonances which could be seen clearly up to 120 keV. These data were subsequently analyzed by Beer and Spencer (BEE75) and their values of $g\Gamma_n$ differ substantially from those estimated by Ribon and LeCoq for the 11 $\ell > 0$ resonances they reported upon.

Preliminary results from a capture measurement by Spencer and Beer (SPE73) were available to Ribon and LeCoq. The data were published in final form (BEE75) with capture areas extracted for seven $\ell > 0$ resonances up to 110 keV.

The data base considered is tabulated in the Appendix on a resonance-by-resonance basis.

B. S-wave Resonances

Because ^{57}Fe has a spin of 1/2, $\ell = 0$ resonances can have a J value of 0 or 1. The assignment of the J value was based upon the value of the peak cross section of the resonances.

We have an experimental determination of the value of $g\Gamma_n$ for all of the s-wave resonances but capture areas for only nine of them. We assigned the average value of Γ_γ of 1.5 ± 0.5 eV obtained from seven of the measured capture areas (ignoring two resonances having small capture areas, 0.55 and 0.5) to the $\ell = 0$ resonances for which we had no capture data.

C. $\ell > 0$ Resonances

Twenty-nine resonances with $\ell > 0$ have been identified up to 120 keV. To all of them an $\ell = 1$ value has been arbitrarily assigned. For $\ell = 1$ resonances we can have values of J equal to 0, 1 or 2 with corresponding g values of 1/4, 3/4 and 5/4.

Only nine of the reported 29 $\ell > 0$ resonances have both measurements of $g\Gamma_n$ and the capture area. We can therefore only extract values of $g\Gamma_\gamma$ for these resonances. Assuming that Γ_γ is independent of J, we used the following criteria to determine the statistical weight of these resonances:

$g = 5/4$ when $g\Gamma_\gamma$ is larger than 0.55 eV,

$g = 1/4$ when $g\Gamma_\gamma$ is smaller than 0.2 eV, and

$g = 3/4$ for intermediate values of $g\Gamma_\gamma$.

The average value of Γ_γ and its standard deviation for the nine resonances is 0.57 ± 0.14 eV. For the remaining 21 $\ell > 0$ resonances the spins were left the same as assigned by Ribon and LeCoq and the above average value of Γ_γ was used.

D. Final Results

The recommended values of the resonance parameters are given in Table 4.

V. ^{58}Fe EVALUATION

^{58}Fe is a very minor isotope in natural iron and plays an insignificant role in the applications for which the general purpose file is used. However, the capture in ^{58}Fe sometimes plays an important role in activation measurements. It has been the tradition in previous versions of ENDF/B to incorporate, for consistency purposes, the special dosimetry evaluation of the isotope ^{58}Fe into the general purpose file. This tradition was maintained in ENDF/B-V and the ^{58}Fe isotope evaluation was provided by Mann (MAN77).

VI. COVARIANCE FILES

In ENDF/B-V the resonance parameter data (E, Γ_n, Γ_γ and ℓ, J for each resonance) are entered in a "file" identified as MF=2. There is also the possibility of entering information concerning the "uncertainties" in the resonance parameter data in two different "files," MF=32 and MF=33, called covariance files. The covariance file MF=32 is used to represent the components of the uncertainties affecting only the parameters of each resonance (i.e., excluding uncertainties which are common to several resonances). This latter information is entered in the covariance file MF=33.

For MAT 1326 in File MF=33 we have indicated a systematic uncertainty of 10% (based on the ORELA data) in the capture cross section, fully correlated over the complete energy range of the "resolved resonance energy region," 155 eV to 400 keV. This uncertainty applies to the sum of the capture cross sections of all the isotopes, weighted by their natural abundances, and is independent of self-shielding and Doppler effects.

We shall now describe the information in File MF=32 and how it was generated.

A. Resonance Energies

There is no provision in ENDF/B-V for representing a "systematic uncertainty" in the resonance energies (i.e., we cannot give the covariances of the energies of the resonances. The standard deviations of the resonance energies in Tables 2, 3 and 4 were used to generate the data in File MF=32.

B. Partial Widths Γ_n and Γ_γ

As mentioned above, in File MF=32 we indicate only the components of the uncertainty which are independent for each resonance. These components may, however, affect both the numerical values of Γ_n and Γ_γ for a resonance in a systematic fashion. We need to communicate the extent to which we know independently the values of Γ_n and Γ_γ, specify their variances and how well we know jointly their values, and specify their covariance.

We shall now indicate how the covariance matrices of Γ_n and Γ_γ were generated.

The two basic sources of data for estimating $g\Gamma_n$ and $g\Gamma_\gamma$ were the transmission data which were analyzed to obtain the estimates of $g\Gamma_n$ and the capture area data, A. The basic relation which was used to extract information from the capture areas was:

$$\frac{1}{A} = \frac{1}{g\Gamma_n} + \frac{1}{g\Gamma_\gamma} \quad . \tag{1}$$

We need to consider the several different ways in which the relation was exploited to generate values of $g\Gamma_\gamma$ and/or $g\Gamma_n$.

CASE 1. Resonances seen in capture and transmission data. We had both experimental determinations of $g\Gamma_n$ and A. In this case we had estimated uncertainties in both $g\Gamma_n$ and A.

i. If $A \ll g\Gamma_n$, then the capture area is essentially a direct measurement of Γ_γ. The relation (1) simplifies then to:

$$A \approx g\Gamma_\gamma \quad , \tag{2}$$

the relative uncertainty in Γ_γ is the same as in the capture area and the covariance of Γ_n and Γ_γ is almost zero.

ii. If A and $g\Gamma_n$ are comparable in magnitude. The data are consistent if $g\Gamma_n > A$, and we may extract using (1) a value for $g\Gamma_\gamma$ which is positive. In this case, however, we have a large negative covariance of Γ_n and Γ_γ.

To simplify the notation let us write:

$$x \equiv g\Gamma_n \qquad \text{and} \qquad y \equiv g\Gamma_\gamma \quad . \tag{3}$$

Then from relation (1) we have:

$$\frac{1}{y} = \frac{1}{A} - \frac{1}{x} \quad , \tag{4}$$

from which we can extract a nominal value for y (i.e., $g\Gamma_\gamma$). In order to estimate the uncertainty in y let us differentiate (4) and we get:

$$\frac{dy}{y^2} = \frac{dA}{A^2} - \frac{dx}{x^2} \quad . \tag{5}$$

Let us square (5); we obtain:

$$\frac{dy^2}{y^4} = \frac{dA^2}{A^4} + \frac{dx^2}{x^4} - \frac{2\, dAdx}{A^2x^2} \quad . \tag{6}$$

We now take the expectation value of (6) over the joint pdf of A and x and assuming that the transmission data and capture data are independent we get:

$$<dy^2> \;=\; y^4\left(\frac{<dA^2>}{A^4} + \frac{<dx^2>}{x^4}\right) \quad . \tag{7}$$

For relation (7) we know all the terms in the righthand side to calculate the variance of y.

In order to get the covariance of y and x, <dxdy>, we multiply (5) by dx and again take the expectation value over the joint pdf of A and x and we obtain:

$$<dxdy> \;=\; -\frac{y^2}{x^2}<dx^2> \quad . \tag{8}$$

CASE 2. Resonances seen in capture data only. We only had the capture area A and an upper estimate for the value of $g\Gamma_n$. The problem is now completely undetermined if we consider the relation (1) as the only basis for estimating both $g\Gamma_n$ and $g\Gamma_\gamma$. We then exploited information obtained in case 1 and theoretical considerations. We compared the value of A with the different values of $g\overline{\Gamma}_\gamma$ obtained for the several values of g and decided to take the lowest value of $g\overline{\Gamma}_\gamma$ consistent with the constraint $g\overline{\Gamma}_\gamma < A$. We also decided to take the variance in $g\overline{\Gamma}_\gamma$ as the variance for $g\Gamma_\gamma$ for these resonances. It is then possible to use relation (1) to extract the value of $g\Gamma_n$. We now consider the assignment of the variance of $g\Gamma_n$, <dx²>, and the covariance of $g\Gamma_n$ and $g\Gamma_\gamma$, <dxdy>.

Relation (6) can be rewritten:

$$\frac{dx^2}{x^4} \;=\; \frac{dA^2}{A^4} + \frac{dy^2}{y^4} - \frac{2\,dAdy}{A^2y^2} \quad , \tag{9}$$

but when we take the expectation value of (9) over the joint pdf of A and y we can no longer drop the term <dAdy> since the value of y was to some extent dependent upon the value of A.

If we multiply the relation (5) by dy, we obtain:

$$\frac{dAdy}{A^2} \;=\; \frac{dy^2}{y^2} + \frac{dydx}{x^2} \quad . \tag{10}$$

We now substitute the value of dAdy obtained in (10) into (9) and take the expectation values:

$$\frac{<dx^2>}{x^4} \;=\; \frac{<dA^2>}{A^4} - \frac{<dy^2>}{y^4} - \frac{2\,<dydx>}{x^2y^2} \quad . \tag{11}$$

Relation (11) has two unknown constants $\langle dx^2 \rangle$ and $\langle dydx \rangle$, but these are not independent since the covariance $\langle dydx \rangle$ must satisfy a constraint. It is convenient to rewrite (11) by introducing the correlation coefficient C defined as:

$$\langle dxdy \rangle \equiv C\sqrt{\langle dx^2 \rangle \langle dy^2 \rangle} \quad , \tag{12}$$

and to introduce the notation:

$$x'^2 \equiv \frac{\langle dx^2 \rangle}{x^2} \; ; \quad y'^2 \equiv \frac{\langle dy^2 \rangle}{y^2} \; ; \quad A'^2 \equiv \frac{\langle dA^2 \rangle}{A^2} \quad . \tag{13}$$

The quantities x', y' and A' are the relative standard deviations of x, y and A. With these notations (11) now reads:

$$\left(\frac{x'}{x}\right)^2 + 2\,C\,\frac{y'}{y}\,\frac{x'}{x} + \left(\frac{y'}{y}\right)^2 - \left(\frac{A'}{A}\right)^2 = 0 \quad . \tag{14}$$

The relation (14) was the basic equation used for obtaining x' and from it $\langle dx^2 \rangle$ once a decision had been made concerning the correlation coefficient C. In the case 1 we had uniquely obtained some correlation coefficients. It was observed that if we plotted them against $\frac{g\Gamma_\gamma}{A}$ they lay almost on a straight line. Due to the symmetry of the relation (14) in $g\Gamma_n$ and $g\Gamma_\gamma$ it was decided to use the line determined above as the basis for assigning the correlation coefficient C as a function of $\frac{g\Gamma_n}{A}$. Then equation (14) was solved for the largest of the roots x' verifying that the final result was consistent with the fact that the resonance had not been observed in transmission.

For several resonances where we had very small capture areas, $A \ll 1$ eV, the capture area is a measure of $g\Gamma_n$ and the correlation coefficients were set to zero. The assignment of the g value is then completely arbitrary.

There is a provision in ENDF/B-V for communicating the uncertainty in the g value. Due to the organization of the formats this can only be done by assigning a variance in the value of J, the total angular momentum of the resonance. We can also provide covariances of J and of Γ_n and of Γ_γ. In principle this information is needed to properly estimate the uncertainty in the Doppler coefficient and the self-shielding effects. In this evaluation ^{56}Fe is the main isotope and we did have scattering data to assign the J^π values of the larger resonances. Therefore, the decision was made to assume in file MF=32 that the J^{π} values of all the resonances were perfectly well known.

VII. CONCLUSION

We believe that the description of the iron cross sections below 400 keV in ENDF/B-V is a considerable improvement over the one in ENDF/B-IV, and over its revision by Ribon and Lecoq, due to the more extensive and presumably more accurate data base used.

In ENDF/B-V the multi-level Breit-Wigner formalism (GAR75, DES78) is to be used with the resonance parameters given in this report. A correction term based on measured total cross sections must be applied due to the deficiencies of the multi-level formalism. The correction term placed in File MF=3 was based on the ENDF/B-IV evaluated total cross sections. The effective scattering radius in ENDF/B-V is 5.0 fermi.

As pointed out earlier, some of the data relied upon in this work were corrected by their authors in significant ways very shortly after this work was completed and therefore were not as accurate as we thought at the time of the evaluation.

A major weakness of this work, which we believe is common to most if not all works of this type today, is the fact that very little of the evaluation work per se was performed in any formal way. It is not fully clear what are the specific assumptions under which the values of the parameters we recommend in ENDF/B-V are justified. In our opinion we have not been able to exploit in a rational fashion all the information which we think was obtained in the experiments. We perceive that such a goal could in principle be achieved, but that in practice it may only be approached. In only very minor ways were we able to partially "correct" or modify the data we used in this evaluation in the light of information we had which was not available to or used by the authors who reported the data originally. We think that more attention will have to be devoted to this aspect of evaluation work and to its implications upon the way experimental results should be reported. This would be necessary to achieve maximum usefulness of the data and to substantially improve the credibility of the recommendations made.

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Table 1. ^{56}Fe: The 1.15-keV Resonance

Reference	E eV	Γ eV	$g\Gamma_n$ eV	Γ_γ eV	ℓ	J	Method
ISAKOV *et al.* [IS60]	1180 ± 80	$\geq$0.85	$\geq$0.05	$\geq$0.80	0		σ_c, Pb spectrometer $\sigma_o = 165 \pm 12$, $\sigma_o\Gamma_\gamma = 74 \pm 7$
RUSSEL *et al.* [RU63]	1154 ± 6	0.80 ± 0.30	0.064 ± 0.010	0.736			σ_c, time of flight
MOORE *et al.* [MO63]	1200 ± 30	0.73 ± 0.080	0.056 ± 0.006	0.673 ± 0.074	0	1/2	σ_c, self indication - time of flight $\sigma_o = 165 \pm 12$, $\sigma_o\Gamma_\gamma = 110 \pm 12$
MOXON *et al.* [MO63a]	1148 ± 10	0.725 ± 0.20	0.052 ± 0.005	0.673 ± 0.20			σ_c, time of flight $g\Gamma_n\Gamma_\gamma/\Gamma = 0.0476 \pm 0.0004$ eV
MITZEL et PLENDL [MI64]	1200	0.665	0.435	0.618			Pb spectrometer $\sigma_o\Gamma = 89$
HUYNH *et al.* [HU65]	1150			0.60 ± 0.10			
BLOCK *et al.* [BL64]	1148 ± 3	0.58 ± 0.08	0.068 ± 0.006	0.53 ± 0.08	1		Transmission, time of flight
MURADYAN [MU65]	1200				0		ℓ determination
HOCKENBURY *et al.* [HO69]	1150		$0.086 {+0.021 \atop -0.014}$				Capture, time of flight
JULIEN *et al.* [JU69]	1151	0.630 ± 0.06	0.062 ± 0.004	0.57 ± 0.06	1,2	(1/2)	
ALIX *et al.* [AL69]	1150 ± 5	0.740 ± 0.090	0.059 ± 0.006	(0.680 ± 0.090)	1	$1/2^-$	Transmission, time of flight
CHRIEN *et al.* [CH70]	(1167)					$1/2^-$	Capture γ spectrum
Recommended	1149 ± 3	0.665 ± 0.040	0.060 ± 0.003	0.605 ± 0.040	1	$1/2^-$	

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Table 2. ^{56}Fe Resonance Parameter Evaluation.

E (keV)	ΔE	Γ_n (eV)	$\Delta\Gamma_n$	$\Gamma_\gamma^{(1)}$ (eV)	$\Delta\Gamma_\gamma$	2JΠ	C	A (eV)	ΔA %	Notes
-2.0	.5	180.	50.	.64	.07	1+				
1.149	.002	.060	.004	.60	.06	1-	.6	.055	7	
2.35	.05	.00020	.00006	.84		3+		.0004	30	
12.45	.04	.0023	.0003	.54		1-		.0023	10	
17.75	.05	.019	.002	.54		1-		.019	10	
20.17	.05	.0047	.0005	.84		3+		.0094	10	
22.79	.05	.27	.06	.54		1-	-.7	.18	10	
27.67	.03	1520.	30.	1.4	.1	1+				(2)
34.20	.05	.79	.3	.54		3-	-.9	.64	8	
36.70	.05	.11	.01	.84		5+		.28	8	
38.40	.05	.32	.08	.54		3-	-.7	.40	10	
46.04	.05	10.	3.	.53	.05	1-		.50	10	(2)
52.12	.02	12.	1.	.42	.04	3-		.81	10	(2)
53.54	.02	1.0	.4	.67	.17	1-	-.8	.40	10	
55.37	.02	1.9	.3	.12	.05	1-		.11	40	
59.20	.02	4.0	.5	.49	.05	3-		.87	10	(2)
63.44	.02	.80	.16	.55	.13	3-	-.7	.65	10	
72.98	.05	10.	5.	.75	.08	1-		.70	10	(2)
73.98	.05	535.	10.	.73	.07	1+		.73	10	(2)
77.04	.02	3.6	.5	.33	.03	1-		.30	10	
80.80	.02	7.0	.7	.74	.08	5+		2.04	10	(2)
83.65	.08	1250.	50.	1.28	.13	1+		1.28	10	(2)
90.29	.03	14.	1.	.46	.05	3-		.89	10	(2)
92.65	.03	1.6	.3	.65	.11	3+	-.6	.93	10	(2)
92.78	.05	.52	.15	.54		3-	-.8	.53	10	
96.14	.03	.67	.4	1.1	.9	5+	-.9	1.26	10	
96.29	.03	1.3	1.2	.4	.3	1-	-.5	.3	50	
96.57	.03	2.5	.3	.4	.2	3-		.7	50	(2)
102.63	.03	21.0	1.0	.36	.04	3-		.71	10	(2)
103.0	.1	.76	.24	.84		3+	-.8	.8	10	
105.87	.05	2.8	.3	1.07	.17	3+	-.6	1.55	10	(2)
112.64	.05	5.5	.5	.65	.07	3+		1.17	10	(2)
120.9	.1	.026	.005	.54		1-		.026	20	
122.5	.1	.090	.011	.54		3-		.15	10	
122.7	.1	46.	2.	.27	.03	3-		.54	10	(2)
124.1	.05	7.5	1.	.68	.07	1-		.63	10	(2)
125.09	.05	10.	1.	.65	.07	3+		1.27	10	(2)
129.8	.2	500.	50.	1.0	.2	1+		1.0	20	(2)
130.2	.2	1.5	1.	.84		3+	-.9	1.04	10	
140.4	.2	2700.	100.	2.2	.2	1+		2.19	10	(2)
141.3	.2	.57	.17	.84		3+	-.8	.68	10	
142.4	.2	.56	.17	.54		3-	-.8	.55	10	
143.6	.2	.04	.03	.54		1-		.04	75	
149.8	.2	.20	.03	.54		3-	-.6	.29	10	
153.9	.2	.42	.09	.84		3+	-.7	.56	10	
161.64	.05	6.5	1.	.62	.06	3+		1.14	10	(2)
169.0	.2	1000.	100.	1.1	.1	1+		1.1	10	(2)
169.3	.1	6.	3.	1.2	.15	3+	-.4	2.0	10	(2)
173.1	.2	.58	.17	.54		3-	-.8	.56	10	
173.6	.1	42.	1.	.18	.02	3-		.36	10	(2)

Table 2. ^{56}Fe Resonance Parameter Evaluation (cont.)

E	ΔE	Γ_n	$\Delta\Gamma_n$	$\Gamma_\gamma^{(1)}$	$\Delta\Gamma_\gamma$	2JΠ	C	A	ΔA	Notes
(keV)		(eV)		(eV)				(eV)	%	
179.6	.1	13.	3.	.55	.05	1-		.53	10	(2)
181.02	.1	17.	2.	1.1	.1	5+		3.21	10	(2)
182.25	.1	3.0	1.5	.54		3-				(2)
187.0	.1	2.5	1.5	.33	.04	3+		.60	10	(2)
187.6	.2	3600.	100.	3.0	.3	1+		2.98	10	(2)
189.9	.1	15.	7.	.53	.05	3+		1.04	10	(2)
192.9	.1	20.	10.	.57	.06	3+		1.13	10	(2)
195.6	.1	66.	8.	.70	.07	1-		.69	10	(2)
201.4	.1	24.	2.	1.0	.1	3+		1.95	10	(2)
205.7	.2	1.14	.35	.84		5+	-.8	1.45	10	
207.8	.1	22.	2.	1.26	.13	1-		1.19	10	(2)
208.8	.2	.18	.03	.54		3-	-.5	.27	10	
209.8	.2	.25	.04	.84		3+	-.5	.39	10	
210.5	.1	9.	1.	.72	.07	3+		1.33	10	(2)
215.6	.2	10.	5.	.42	.07	1-		.40	15	(2)
220.5	.5	1150.	50.	2.16	.2	1+		2.16	10	(2)
221.6	.1	8.	3.	.34	.04	3-		.64	10	(2)
222.6	.2	.34	.05	.54		1-	-.7	.21	10	
223.5	.2	.9	.3	.84		5+	-.8	1.32	10	
225.6	.1	28.	2.	.51	.05	3-		1.00	10	(2)
231.0	.1	7.5	.5	.33	.03	3-		.62	10	(2)
232.3	.1	20.	1.	1.4	.2	3+		2.67	10	(2)
234.7	.1	20.	1.	.87	.09	5+		2.51	10	(2)
241.4	.1	10.	1.	1.47	.15	5+		3.84	10	(2)
243.2	.2	.08	.01	.54		3-		.14	10	
245.0	.5	600.	20.	.80	.08	1+		.80	10	(2)
252.2	.3	.15	.02	.54		3-	-.5	.24	10	
253.3	.2	28.	2.	.52	.05	5+		1.53	10	(2)
255.9	.2	6.	1.	.60	.06	3-		1.08	10	(2)
259.6	.2	29.	2.5	.55	.06	1-		.54	10	(2)
263.4	.2	140.	5.	.68	.07	1-		.68	10	(2)
264.2	.3	.17	.025	.54		3-	-.5	.26	10	
266.8	.2	55.	2.	.33	.03	5+		1.0	10	(2)
267.5	.3	.44	.09	.84		3+	-.7	.58	10	
269.5	.2	144.	5.	.30	.03	1-		.30	10	(2)
274.7	.3	.32	.07	.54		1-	-.7	.20	10	
276.1	.2	85.	40.	.16	.02	3-		.32	10	(2)
276.6	1.0	4000.	300.	1.0	.1	1+		1.01	10	(2)
280.8	.2	8.	3.	.95	.1	3+		1.69	10	(2)
282.6	.3	.42	.13	.54		3-	-.8	.47	10	
283.7	.2	12.	1.	.82	.08	3+		1.54	10	(2)
285.2	.2	15.	1.	.95	.1	3+		1.79	10	(2)
288.4	.2	12.	2.	.67	.07	3+		1.26	10	(2)
290.1	.2	13.	2.	.70	.07	3-		1.32	10	(2)
292.9	.2	130.	40.	.60	.06	1-		.60	10	(2)
295.6	.3	.34	.07	.54		3-	-.7	.42	10	
299.6	.2	23.	2.	.75	.08	3+		1.46	10	(2)
302.5	.3	.21	.04	.54		3-	-.7	.30	10	
304.2	.2	19.	2.	.33	.03	3-		.65	10	(2)
306.2	.3	.68	.24	.54		1-	-.8	.30	10	

Table 2. ^{56}Fe Resonance Parameter Evaluation (cont.)

E (keV)	ΔE	Γ_n (eV)	$\Delta\Gamma_n$	$\Gamma_\gamma^{(1)}$ (eV)	$\Delta\Gamma_\gamma$	2Jπ	C	A (eV)	ΔA %	Notes
306.7	.3	.32	.08	.54		3-	-.8	.40	10	
310.7	.2	38.	5.	.43	.04	3+		.85	10	(2)
314.5	.2	28.	5.	.89	.09	5+		2.60	10	(2)
317.0	1.0	6500.	1000.	1.7	.6	1+		1.70	35	(2)
321.5	.3	2.5	1.5	.84		3+	-.9	1.26	10	
323.7	.3	.28	.06	.54		3-	-.8	.37	10	
331.2	.3	320.	50.	1.27	.13	1+		1.27	10	(2)
334.1	.3	1.7	.7	.84		5+	-.9	1.68	10	
340.4	.2	125.	5.	1.35	.14	3-		2.68	10	(2)
344.3	.2	47.	4.	.57	.06	3-		1.12	10	(2)
348.4	.2	120.	8.	.59	.06	3-		1.18	10	(2)
349.8	.2	27.	4.	.49	.05	5+		1.45	10	(2)
353.5	.2	20.	4.	.76	.08	3-		1.42	10	(2)
355.2	.3	.36	.1	.54		3-	-.8	.43	10	
356.5	.3	1.17	.6	.54		3-	-.9	.74	10	
356.9	1.5	3600.	300.	1.10	.21	1+		1.10	20	(2)
362.0	1.5	6700.	500.	1.30	.32	1+		1.30	25	(2)
362.4	.4	45.	5.	.56	.06	3-		1.10	10	(2)
366.2	.5	7.	4.	1.0		5+	-.95	2.63	20	(3)
370.6	.5	.50	.15	.54		3-	-.8	.52	10	
373.2	.5	4.	3.	1.0		3+	-.9	1.56	12	(3)
377.0	.5	3.	3.	.54		3-	-.95	.92	10	
378.9	.4	25.	3.	.67	.07	3-		1.31	10	(2)
380.9	1.5	10800.	2000.	1.6	.6	1+		1.60	40	(2)
386.5	.5	46.	5.	4.6	.5	1-		4.22	10	(2)
388.3	.7	5.	5.	1.0		3+	-.95	1.66	10	(3)
393.1	.5	34.	4.	.51	.05	3-		.98	10	(2)
398.8	.7	4.	4.	.54		3-	-.95	.95	10	

Notes:

(1) When Γ_γ is set equal to the average value of Γ_γ ($\overline{\Gamma}_\gamma$ = 0.54 eV for p-waves and 0.84 eV for d-waves) the uncertainty is not quoted (see text).

(2) Spin and parity were assigned from an R-function analysis of the elastic angular distribution.

(3) An arbitrary value of $\Gamma_\gamma \equiv 1.0$ eV (instead of the average value of 0.84 eV) was assigned in order to obtain a small value of Γ_n since this resonance was not observed in transmission.

Table 3. ^{54}Fe Resonance Parameters Evaluation.

E	ΔE	Γ_n	$\Delta\Gamma_n^{(1)}$	Γ_γ	$\Delta\Gamma_\gamma$	2JΠ	C	A	ΔA	Notes
(keV)		(eV)		(eV)				(eV)	%	
3.097	.003	.0015	.0002	1.0		3+		.003	10	(2)
7.64	.10	1020.	20.	2.1	.4	1+		2.1	20	
9.48	.01	.60	.15	.50	.15	3-	-.8	.55	10	
11.18	.01	7.7	.8	.76	.08	1-		.69	10	
14.46	.01	.70	.25	.55	.15	3-	-.8	.62	10	
19.26	.02	.024	.002	1.0		3+		.047	10	(2)
23.01	.02	.35	.1	.44	.13	3-	-.8	.39	10	
28.19	.03	.50	.15	.26	.05	1-	-.7	.17	10	
30.64	.03	3.8	.5	.55	.05	3-		.96	10	
34.21	.03	.007	.001	1.0		3+		.015	13	(2)
35.21	.04	.50	.15	.54	.18	1-	-.8	.26	10	
38.39	.04	.47	.14	.89	.33	5+	-.9	.92	10	
39.10	.04	8.5	1.	.43	.04	3-		.82	10	
41.15	.04	.014	.002	1.0		3+		.028	10	(2)
50.09	.05	.040	.004	1.0		3+		.075	10	(2)
51.53	.05	6.	2.	.38		1-		.36	10	
52.62	.05	2200.	50.	2.4	.4	1+		2.4	17	
53.54	.05	17.	3.	.62		1-		.60	10	
55.00	.06	.7		.71		3-		.68	10	
55.35	.06	32.	3.	.69		1-		.68	10	
63.45	.06	.006		1.0		3+		.012	66	(2)
68.67	.07	4.		.34		1-		.31	10	
71.75	.05	1700.	50.	1.32		1+		1.32	20	
75.70	.08	2.		.47		3-		.76	10	
77.14	.08	1.3	.6	.9		5+		1.62	10	
81.17	.08	4.		.32		1-		.30	10	
83.08	.08	4.		.75		3+		1.27	10	
83.35	.08	8.		.48		1-		.45	10	
87.20	.09	14.		.52		1-		.50	10	
97.65	.10	20.		.24		1-		.24	12	
98.66	.05	540.	50.	1.65		1+		1.65	15	
99.70	.10	5.		.43		3-		.79	10	
101.6	.1	10.		.36		1-		.35	10	
104.1	.1	5.		.43		3-		.79	10	
112.5	.1	5.		.39		3-		.72	10	
112.8	.1	10.		.59		1-		.56	10	
115.7	.1	13.	3.	.63		3-		1.21	10	
119.7	.1	13.	4.	.58		3-		1.11	10	
120.6	.1	20.	5.	.45		3-		.89	10	
126.3	.1	20.	3.	.90		5+		2.59	10	
130.1	.1	3100.	100.	3.22		1+		3.22	20	
135.6	.1	80.	10.	.70		1-		.69	10	
137.7	.1	15.		.50		3-		.96	10	
140.8	.1	10.		.50		1-		.48	10	
142.6	.1	5.		1.0		3+		1.72	10	
145.3	.1	40.		.57		1-		.56	10	
147.6	.2	3000.	200.	2.31		1+		2.31	20	
150.2	.2	10.		1.06		5+		2.88	10	
152.5	.2	15.		.95		3+		1.78	10	
153.1	.2	30.	5.	.58		3-		1.14	10	

Table 3. ^{54}Fe Resonance Parameters Evaluation (cont.)

E	ΔE	Γ_n	$\Delta\Gamma_n$ (1)	Γ_γ	$\Delta\Gamma_\gamma$	2Jπ	C	A	ΔA	Notes
(keV)		(eV)		(eV)				(eV)	%	
156.9	.2	15.		.76		3+		1.45	10	
159.1	.2	50.	5.	.96		3+		1.89	10	
164.4	.2	35.	3.	1.4		5+		4.12	10	
165.1	.2	37.	5.	.41		3-		.81	10	
173.7	.2	40.		.41		3-		.82	10	
174.0	.5	3200.	300.	3.5		1+		3.5	30	
177.7	.2	5.		1.2		3+		1.88	10	
182.1	.2	75.	8.	.61		3-		1.20	10	
188.7	.2	40.		.50		1-		.49	10	
191.7	.2	20.		.68		3-		1.33	10	
192.	2.	42000.	1000.	10.		1+		10.	40	
193.7	.2	20.		.58		3-		1.14	10	
194.2	.2	50.	8.	.86		3+		1.69	10	
197.3	.2	20.		.63		3-		1.23	10	
203.7	.2	8.	6.	.87		5+		2.37	10	
206.5	.2	45.		.95		3+		1.87	10	
207.2	.2	20.		.68		3-		1.32	10	
209.6	.2	30.	15.	.79		3+		1.54	10	
213.5	.2	25.		1.1		3+		2.09	10	
215.8	.2	3.		.52		1-		.44	10	(2)
222.4	.2	50.		.54		1-		.54	10	
223.3	.2	6.		1.0		3+		1.70	10	(2)
223.5	.5	730.	20.	1.5		1+		1.5	20	
225.3	.2	8.		1.0		5+		2.66	10	(2)
227.6	.2	3.		1.0		3+		1.51	10	(2)
228.8	.2	5.		1.0		3+		1.64	10	(2)
230.8	.2	150.	17.	.85		5+		2.56	10	
233.2	.2	21.		1.0		3+		1.91	10	(2)
237.2	.2	50.		1.20		3+		2.35	10	
241.5	.2	50.		.74		3-		1.46	10	
244.8	.2	360.	40.	.91		3+		1.82	10	
246.8	.5	19700.	1000.	5.7		1+		5.7	25	
252.0	.2	50.		.63		3-		1.24	10	
254.3	.2	3.5		1.0		3+		1.56	10	(2)
257.0	.5	3360.	400.	1.2		1+		1.19	10	
261.8	.3	25.		1.2		3+		2.28	10	
262.6	.3	33.		1.1		5+		3.23	10	
263.6	.3	50.		1.17		3+		2.30	10	
266.3	.3	2.		.52		3-		.79	10	(2)
270.0	.3	20.		.54		3-		1.05	10	
270.9	.3	3.		1.0		3+		1.50	10	(2)
275.8	.3	100.		.72		3-		1.43	10	
276.8	.3	100.	20.	1.47		5+		4.37	10	
279.5	.3	100.		.66		1-		.66	10	
280.5	.3	150.	30.	.64		1-		.64	10	
282.3	.3	50.		.97		3+		1.91	10	
288.7	.3	50.		1.03		3+		2.02	10	
291.5	.5	1100.	100.	1.1		1+		1.1	18	
291.7	.3	10.		.52		3-		.99	20	(2)
292.3	.3	8.		.52		3-		.98	10	(2)
302.8	.3	50.		.64		3-		1.26	10	
305.3	.3	63.	17.	1.1		5+		3.21	10	
308.1	.5	5400.	100.	2.7		1+		2.7	30	
308.4	.3	50.		1.22		3+		2.39	10	
311.0	.3	9.		1.0		3+		1.79	10	(2)

Table 3. ^{54}Fe Resonance Parameters Evalution (cont.)

E	ΔE	Γ_n	$\Delta\Gamma_n$ (1)	Γ_γ	$\Delta\Gamma_\gamma$	2Jπ	C	A	ΔA	Notes
(keV)		(eV)		(eV)				(eV)	%	
315.5	.3	2.		.52		3-		.84	10	(2)
321.4	.3	67.	17.	1.1		5+		3.11	10	
323.7	.3	33.	20.	1.37		5+		3.90	10	
325.3	.3	20.		1.0		5+		2.86	10	(2)
326.3	.5	20,000.	3000.	6.0		1+		6.0	10	
329.5	.3	100.		.65		1-		.65	10	
331.9	.3	33.		1.0		3+		1.94	10	(2)
332.4	.5	24,000.	2000.	3.6		1+		3.6	50	
335.8	.3	50.		1.04		3+		2.03	10	
338.6	.3	50.		.71		3-		1.40	10	
343.0	.3	50.		.94		5+		2.76	10	
344.6	.3	125.	25.	.83		3+		1.64	10	
356.4	.4	117.	17.	1.7		5+		5.18	10	
360.1	.4	50.		1.19		3+		2.32	10	
363.1	.4	230.	50.	.59		1-		.59	10	
367.4	.4	133.	33.	2.4		5+		7.06	10	
369.3	.4	100.		1.03		3+		2.04	12	
371.0	.4	9400.	1000.	2.1		1+		2.10	15	
374.0	.4	100.		.69		3-		1.37	10	
382.2	.4	150.	33.	.91		5+		2.71	10	
383.8	.4	2.		.52		3-		.81	17	(2)
390.0	.4	33.	17.	1.6		5+		4.71	10	
395.6	.4	100.		.43		3-		.86	10	
396.5	.4	5.		1.0		3+		1.65	10	(2)
397.6	.4	11.		1.0		3+		1.83	10	(2)

Notes:

(1) Above 50 keV, $\Delta\Gamma_n$ is given only when Γ_n has been determined from transmission experiment.

(2) Γ_γ is set equal to the average value $\overline{\Gamma_\gamma}$ which is 0.52 eV for p-waves and 1.0 eV for d-wave resonances.

Table 4. ^{57}Fe Resonance Parameter Evaluation.

E	ΔE	Γ_n	$\Delta\Gamma_n^{(1)}$	Γ_γ	$\Delta\Gamma_\gamma$	$J\pi$	A	ΔA	Notes
(keV)		(eV)		(eV)			(eV)	%	
1.63	.05	.043		.57		2-	.05	20.	(2)
3.95	.05	200.	25.	1.14	.06	0+			
4.75	.05	.08		.57		1-	.05	12.	(2)
6.21	.1	410.	30.	1.3	.14	1+			
7.17	.04	.7		.57		2-	.40	15.	(2)
7.87	.04	.6		.57		1-	.22	20.	(2)
12.73	.05	.9	.3	.69		1-	.30	17.	
13.93	.05	1.2		.57		2-	.48	12.	(2)
18.20	.05	5.	3.	.72		1-	.47	10.	
21.28	.05	2.	1.	.60		2-	.60	8.	
24.85	.1	.13		.57		1-	.08	25.	(2)
25.8	.1	.3		.57		0-	.05	40.	(2)
27.2	.1	.09		.57		1-	.06	33.	(2)
28.6	.2	.4		.57		2-	.29	10.	(2)
29.1	.1	3250.	300.	2.3	.3	1+			
31.9	.2	.38		.57		1-	.17	12.	(2)
35.2	.2	.55		.57		2-	.35	12.	(2)
37.0	.1	5.	3.	.39		1-	.27	8.	
39.4	.1	11.	5.	.57		1-	.41	10.	
41.4	.2	1000.	100.	.9	.2	1+			
41.9	.1	16.	8.	.68		0-	.16	20.	
47.05	.1	450.	100.	.55	.05	1+			
51.1	.3	4.		.57		0-	.12	18.	(2)
52.7	.1	21.	10.	.45		1-	.33	15.	
55.8	.2	10,000.	1500.	1.5		0+			(2)
56.2	.1	12.	6.	.60		0-	.14	20.	
58.7	.4	.13		.57		1-	.08	40.	(2)
61.0	.5	3700.	500.	1.2	.1	1+			
64.0	.5	6.		.57		1-	.39	10.	(2)
66.8	.5	.6		.57		2-	.36	10.	(2)
72.9	.6	1.1		.57		1-	.28	15.	(2)
77.2	.6	2000.	200.	.5	.1	1+			
80.7	.6	1.7		.57		1-	.32	12.	(2)
88.0	.2	15.	8.	.57		2-			(2)
89.7	.2	20.	10.	.57		1-			(2)
93.7	.6	200.	50.	1.9	.2	1+			
101.8	.3	10.	5.	.44		2-	.55	10.	
109.6	.6	2300.	300.	1.5		1+			(2)
110.1	.6	1200.	100.	2.0	.3	1+			
119.2	.4	28.	14.	.57		1-			(2)
125.0	.6	1500.	200.	1.5		1+			(2)
126.0	.6	2500.	500.	1.5		0+			(2)
129.5	.6	4200.	700.	1.5		1+			(2)
134.5	.7	3300.	500.	1.5		0+			(2)
141.0	.7	1500.	300.	1.5		0+			(2)
167.3	.8	1100.	100.	1.5		1+			(2)
169.0	.8	1700.	200.	1.5		1+			(2)
176.3	.9	700.	100.	1.5		0+			(2)
185.5	.9	3500.	400.	1.5		1+			(2)
189.5	.9	3200.	400.	1.5		0+			(2)

Notes:

(1) $\Delta\Gamma_n$ is given only when Γ_n has been determined from transmission experiment.

(2) Γ_γ is set equal to the average value $\overline{\Gamma}_\gamma$ which is 1.5 eV for s-waves and 0.57 eV for p-wave resonances.

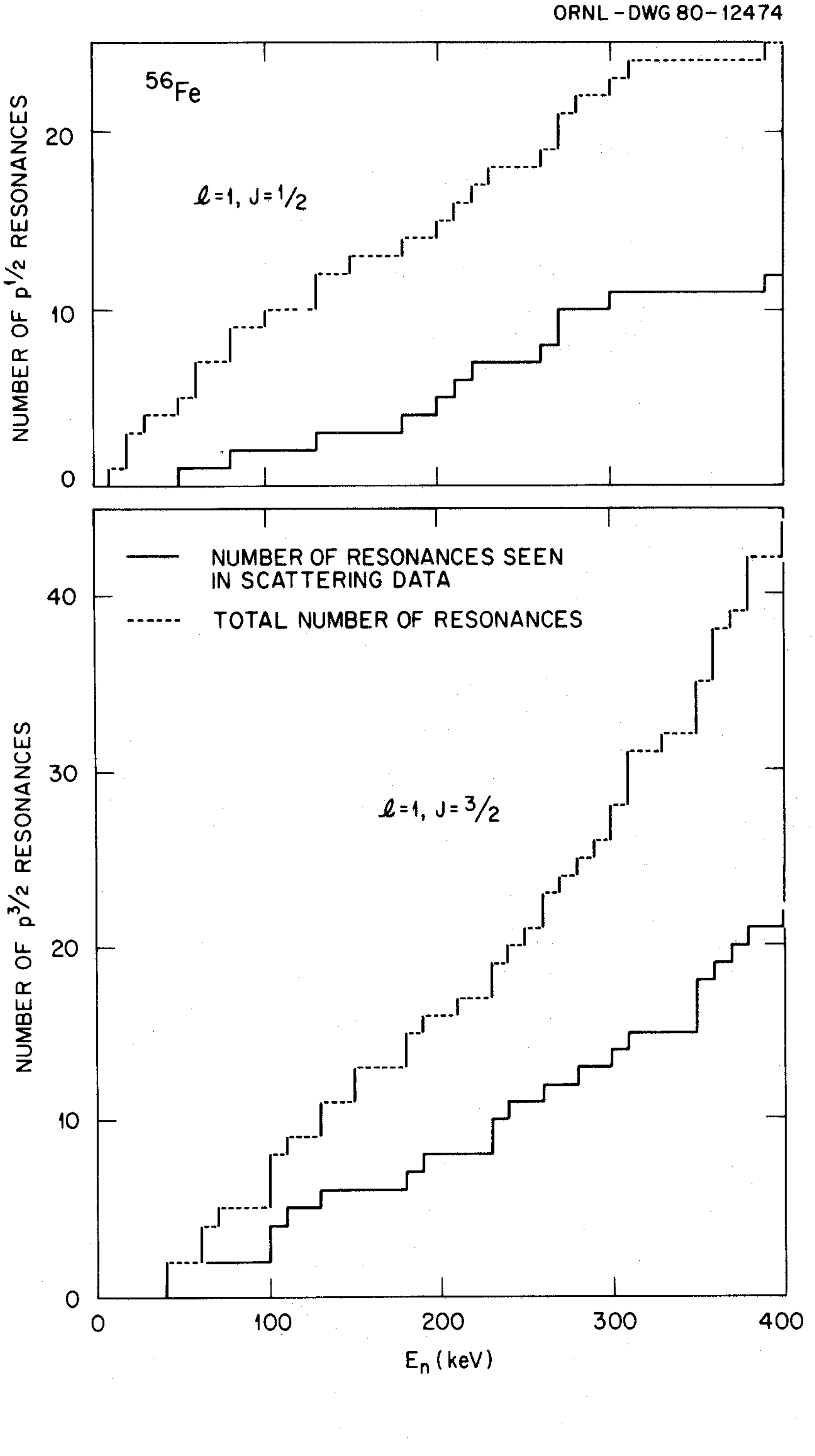

Fig. 1. Cumulative number of p-wave resonances as a function of neutron energy for ^{56}Fe.

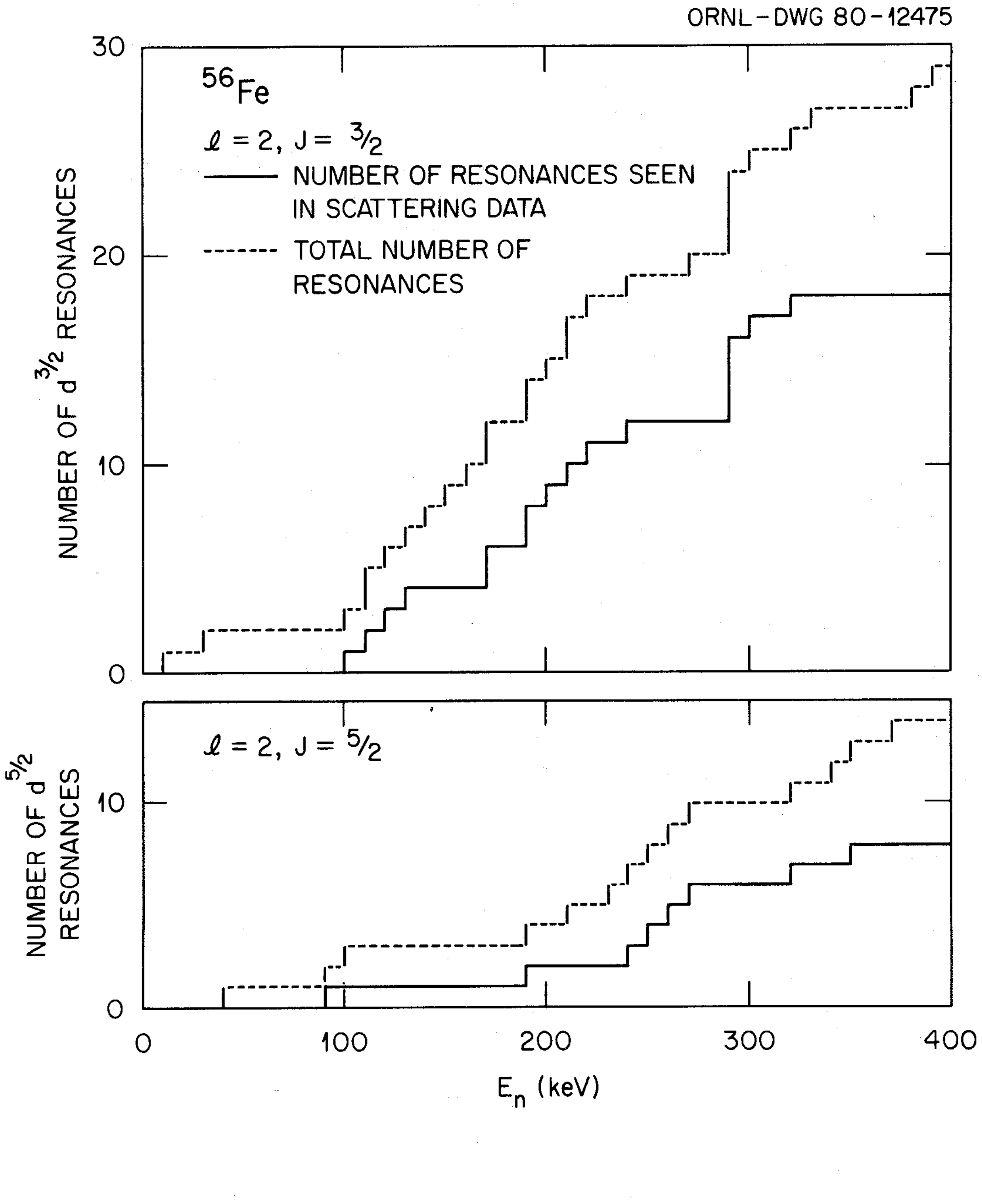

Fig. 2. Cumulative number of d-wave resonances as a function of neutron energy for ^{56}Fe.

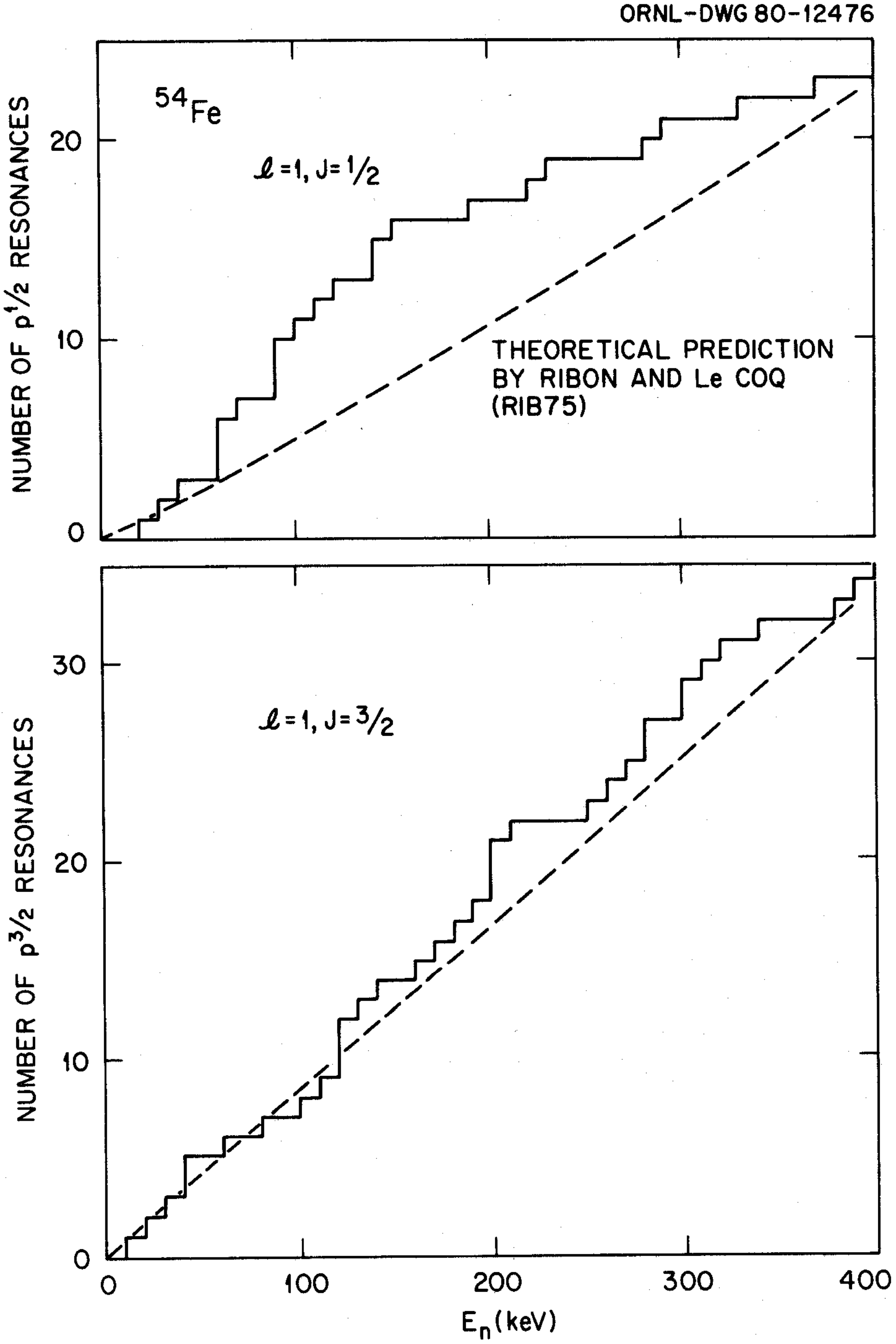

Fig. 3. Cumulative number of p-wave resonances as a function of neutron energy for ^{54}Fe. The dashed lines are the theoretical predictions by Ribon and Le Coq (RIB75).

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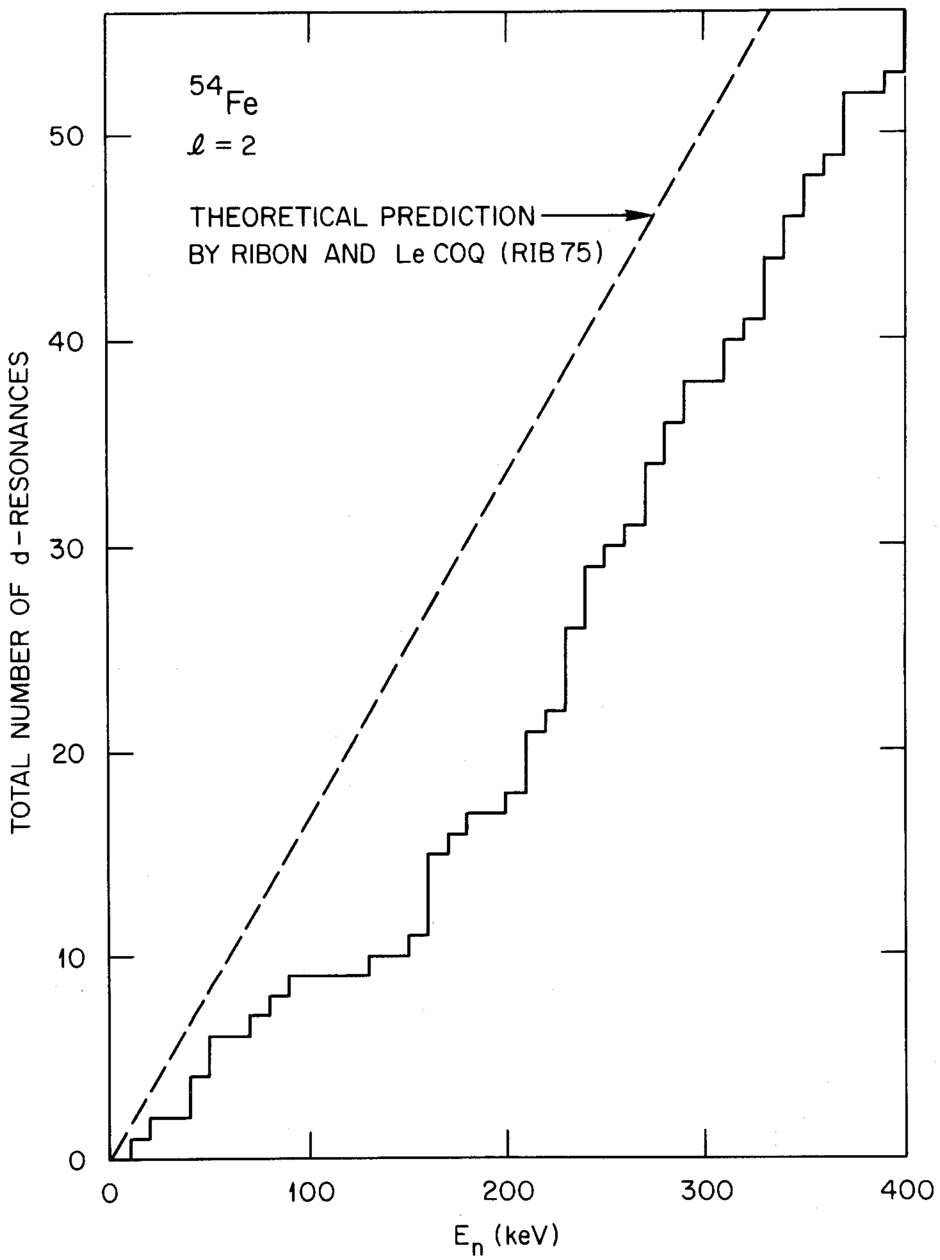

Fig. 4. Cumulative number of d-wave resonances as a function of neutron energy for ^{54}Fe. The dashed line is the theoretical predictions by Ribon and Le Coq (RIB75).

APPENDIX

Data Base for ^{56}Fe, ^{54}Fe, and ^{57}Fe Resonance Parameter Evaluation

DATA BASE FØR FE-56 RESØNANCE PARAMETER EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
2,35				0,0004 (1)		HØC69
2,35 (5)	1,5	2	0,0004 (1)	0,0004 (1)	0,84 (25)	EVALUATIØN
12,45 (1)		>0		0,0023 (3)		ALL76
12,45 (4)	0,5	1	0,0023 (3)	0,0023 (3)	0,54 (16)	EVALUATIØN
17,75 (2)		>0		0,019 (2)		ALL76
17,75 (5)	0,5	1	0,019 (2)	0,019 (2)	0,54 (16)	EVALUATIØN
20,17 (2)		>0		0,0094 (10)		ALL76
20,17 (5)	1,5	2	0,0094 (10)	0,0094 (10)	0,84 (25)	EVALUATIØN
22				0,2 (2)		MAC64
22,7 (10)						MØX65
22,7				0,19 (2)		HØC69
22,79 (7)				0,16 (3)		ERN70
22,79 (2)		>0		0,18 (2)		ALL76
22,79 (5)	0,5	1	0,27 (6)	0,18 (2)	0,54 (16)	EVALUATIØN
28,30 (25)		0	1670 (200)			BIL61
28	0,5	0	1600 (100)			MAC64
27,7 (1)					<1,3	MØX65
27,7					1,44 (14)	HØC69
27,68 (8)		0	1600 (100)		1,4 (3)	ERN70
27,66 (10)	0,5	0	1520 (40)			GAR71
27,7	0,5	0				JAC71
27,66 (10)		0	1500 (50)			PAN75
27,6 (2)	0,5	0			1,43 (7)	ALL76
27,67 (3)	0,5*	0*	1520 (30)		1,4 (1)	EVALUATIØN
34,1				0,59 (7)		HØC69
34,25 (10)		1		0,62 (8)		ERN70
34,1	0,5	1				JAC71
34,21 (3)		>0		0,66 (7)		ALL76
34,20 (5)	1,5	1	1,6 (6)	0,64 (5)	0,54 (16)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
36						MAC64
36,6				0,30 (3)		HØC69
36,7 (1)		1		0,28 (4)		ERN70
36,69 (4)		>0		0,28 (3)		ALL76
36,70 (5)	2,5	2	0,33 (3)	0,28 (2)	0.84 (25)	EVALUATIØN
38,3				0,46 (5)		HØC69
38,38 (12)		1		0,44 (6)		ERN70
38,39 (4)		>0		0,38 (4)		ALL76
38,40 (5)	1,5	1	0,64 (16)	0,40 (4)	0.54 (16)	EVALUATIØN
45,8				0,32 (4)		HØC69
46,04 (14)		1		0,44 (6)		ERN70
46,02 (5)		>0	10	0,53 (5)		ALL76
46,04 (5)	0,5*	1*	10 (3)	0,50 (5)	0.53 (5)	EVALUATIØN
51,55 (5)		>0	0,35 (20)			PAN75
50		>0		1,9 (6)		MAC64
51,9				0,51 (5)		HØC69
52,20 (26)		1		0,58 (9)		ERN70
52,12 (2)		>0	23.8 (17)			PAN75
52,10 (5)		>0		0,81 (8)		ALL76
52,12 (2)	1,5*	1*	24 (2)	0,81 (8)	0,42 (4)	EVALUATIØN
53,3				0,54 (6)		HØC69
53,60 (16)		1		0,48 (7)		ERN70
53,54 (2)		>0	1,0 (4)			PAN75
53,52 (5)		>0		0,40 (4)		ALL76
53,54 (2)	0,5	1	1,0 (4)	0,40 (4)	0.67 (17)	EVALUATIØN
55,0				0,14 (4)		HØC69
55,3 (2)		1		0,08 (5)		ERN70
55,37 (2)		>0	1.9 (3)			PAN75
55,37 (2)	0,5	1	1,9 (3)	0,11 (4)	0.12 (5)	EVALUATIØN
59,0				0,54 (6)		HØC69
59,25 (18)		1		0,72 (10)		ERN70
59,0	0,5	1				JAC71
59,20 (2)		>0	8,1 (9)			PAN75
59,19 (6)		>0		0,87 (9)		ALL76
59,20 (2)	1,5*	1*	8,0 (10)	0,87 (9)	0.49 (5)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
63,1						HOC69
63,45 (19)		1		0,61 (9)		ERN70
63,44 (2)		>0	1,6 (3)			PAN75
63,42 (6)		>0		0,65 (7)		ALL76
63,44 (2)	1,5	1	1,6 (3)	0,65 (7)	0,55 (13)	EVALUATION
72,6						HOC69
72,5 (5)		1		0,05 (5)		ERN70
72,93 (7)		>0		0,70 (7)		ALL76
72,98 (5)	0,5*	1*	10 (5)	0,70 (7)	0.75 (8)	EVALUATION
74,0 (5)	0,5	0	420 (60)			BIL61
74,0	0,5		539 (42)			ROH66
74,6						HOC69
73,9 (5)	0,5	0	540 (40)		1.3 (2)	ERN70
73,9 (3)	0,5	0	540 (70)			GAR71
72,8	0,5	0				JAC71
73,98 (5)	0,5	0	530 (20)			PAN75
73,90 (7)	0,5	0		0.73 (7)		ALL76
73,98 (5)	0,5*	0*	535 (10)	0.73 (7)	0.73 (7)	EVALUATION
76,7						HOC69
76,9 (5)		1	4,3 (3)	0,26 (5)		FRO74
77,04 (2)		>0	3,1 (6)			PAN75
76,99 (8)		>0		0,30 (3)		ALL76
77,04 (2)	0,5	1	3,6 (5)	0.30 (3)	0.33 (3)	EVALUATION
80,4						HOC69
80,8 (3)		1	9,0 (20)	1.8 (3)		ERN70
80,80 (2)		>0	20 (2)			PAN75
80,78 (8)		>0		2,04 (20)		ALL76
80,80 (2)	2,5*	2*	21 (2)	2,04 (20)	0.74 (8)	EVALUATION
83,5 (5)	0,5	0	1040 (100)			BIL61
83,5	0,5		919 (80)			ROH66
83,6 (3)	0,5	0	910 (80)		0,9 (3)	ERN70
83,6 (4)	0,5	0	1030 (80)			GAR71
83,65 (8)	0,5	0	1300 (50)			PAN75
83,55 (8)	0,5	0		1,28 (13)		ALL76
83,65 (8)	0,5*	0*	1250 (50)	1,28 (13)	1.28 (13)	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
90,2	0,5		50			RØH66
90						HØC69
90,2 (3)		(0)	70 (15)		1,2 (2)	ERN70
90,29 (3)		>0	28 (1)			PAN75
90,24 (9)		>0		0,89 (9)		ALL76
90,29 (3)	1,5*	1*	28 (1)	0,89 (9)	0.46 (5)	EVALUATIØN
92,1						HØC69
92,6 (3)		1	3 (1)	1,6 (3)		ERN70
92,65 (3)		>0	3,2 (6)			PAN75
92,5 (1)		>0		0,93 (9)		ALL76
92,65 (3)	1,5*	2*	3,2 (6)	0,93 (9)	0,65 (11)	EVALUATIØN
92,75 (10)		>0		0,53 (5)		ALL76
92,78 (5)	1,5	1	1,04 (30)	0,53 (5)	0.54 (16)	EVALUATIØN
95,9						HØC69
96,1 (3)		1	25 (4)	2,2 (4)		ERN70
96,14 (3)		>0	2,0 (15)			PAN75
96,15 (10)		>0		1,26 (13)		ALL76
96,14 (3)	2,5	2	2,0 (15)	1,26 (13)	1.1 (9)	EVALUATIØN
96,29 (3)		>0	1,3 (12)			PAN75
96,57 (3)		>0	5,0 (6)			PAN75
96,44 (10)		>0		1,05 (10)		ALL76
96,29 (3)	0,5	1	1,3 (12)	0,30 (15)	0.4 (3)	EVALUATIØN
96,57 (3)	1,5*	1*	5,0 (6)	0,70 (35)	0.4 (2)	EVALUATIØN
102						HØC69
102,4 (3)		1	35 (6)	1,6 (3)		ERN70
102,63 (3)		>0	42 (2)			PAN75
102,5 (2)		>0		0,71 (7)		ALL76
102,9 (2)		>0		0,80 (8)		ALL76
102,63 (3)	1,5*	1*	42 (2)	0,71 (7)	0,36 (4)	EVALUATIØN
103,0 (1)	1,5	2	1,5 (5)	0,80 (8)	0,84 (25)	EVALUATIØN
105						HØC69
105,8 (3)		1	<2	1,4 (3)		ERN70
105,87 (5)		>0	5,6 (6)			PAN75
105,8 (2)		>0		1,55 (16)		ALL76
105,87 (5)	1,5*	2*	5,6 (6)	1,55 (16)	1.07 (17)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
112						HØC69
112,6 (3)		1		1,1 (3)		ERN70
112,64 (5)		>0	11 (1)			PAN75
112,5 (2)		>0		1,17 (12)		ALL76
112,64 (5)	1,5*	2*	11 (1)	1,17 (12)	0,65 (7)	EVALUATIØN
120,8 (2)		>0		0,026 (5)		ALL76
120,9 (1)	0,5	1	0,026 (5)	0,026 (5)	0,54 (16)	EVALUATIØN
122,4	0,5		125 (23)			RØH66
122,5 (6)	0,5	0	14 (5)			GAR71
122,8	0,5	0				JAC71
122,5 (4)	0,5	0	65 (10)		1.0 (2)	FRØ74
122,71 (5)		>0	92 (3)			PAN75
122,4 (2)		>0		0,15 (2)		ALL76
122,6 (2)		>0		0,54 (5)		ALL76
122,5 (1)	1,5	1	0,18 (2)	0,15 (2)	0,54 (16)	EVALUATIØN
122,71 (5)	1,5*	1*	92 (3)	0,54 (5)	0.27 (3)	EVALUATIØN
124,0 (5)	0,5	0	130 (40)			BIL61
124						HØC69
124,10 (5)		>0	7,5 (10)			PAN75
123,9 (2)		>0		0,63 (6)		ALL76
124,10 (5)	0,5*	1*	7,5 (10)	0,63 (6)	0.68 (7)	EVALUATIØN
124,5 (4)	0,5	0	13 (5)		1,8 (4)	FRØ74
125,09 (5)		>0	19 (2)			PAN75
124,9 (2)		>0		1,27 (13)		ALL76
125,09 (5)	1,5*	2*	19 (2)	1,27 (13)	0.65 (7)	EVALUATIØN
131 (1)	0,5	0	400 (80)			BIL61
129,5	0,5		479 (38)			RØH66
129						HØC69
129,8 (4)	0,5	0	380 (50)		1,2 (2)	ERN70
129,6 (6)	0,5	0	660 (100)			GAR71
129,8	0,5	0				JAC71
129,8 (2)	0,5	0	600 (50)			PAN75
129,6 (3)	0,5	0		0,79 (8)		ALL76
129,8 (2)	0,5*	0*	500 (50)	1,0 (2)	1,0 (2)	EVALUATIØN
130,0 (3)		>0		1,04 (10)		ALL76
130,2 (2)	1,5	2	3 (2)	1,04 (10)	0.84 (25)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
141,5 (5)	0,5	0	2360 (240)			BIL61
139,9	0,5		2460 (110)			RØH66
140,3 (5)	0,5	0	2460 (110)			ERN70
139,9 (8)	0,5	0	2270 (200)			GAR71
141	0,5	0				JAC71
140,4 (2)	0,5	0	2800 (50)			PAN75
140,3 (3)	0,5	0		2,19 (22)		ALL76
140,4 (2)	0,5*	0*	2700 (100)	2,19 (22)	2,2 (2)	EVALUATIØN
141,1 (3)		>0		0,68 (7)		ALL76
142,2 (3)		>0		0,55 (6)		ALL76
143,4 (3)		>0		0,04 (3)		ALL76
141,3 (2)	1,5	2	1,15 (35)	0,68 (7)	0,84 (25)	EVALUATIØN
142,4 (2)	1,5	1	1,12 (35)	0,55 (6)	0,54 (16)	EVALUATIØN
143,6 (2)	0,5	1	0,04 (3)	0,04 (3)	0,54 (16)	EVALUATIØN
151,0 (10)		1				ERN70
149,6 (3)		>0		0,29 (3)		ALL76
149,8 (2)	1,5	1	0,40 (6)	0,29 (3)	0,54 (16)	EVALUATIØN
153,0 (10)		1				ERN70
153,7 (3)		>0		0,56 (6)		ALL76
153,9 (2)	1,5	2	0,84 (18)	0,56 (6)	0,84 (25)	EVALUATIØN
164,0 (5)	0,5	0	45 (2)			BIL61
163,0 (1)		1				ERN70
161,64 (5)		>0	13 (2)			PAN75
161,4 (3)		>0		1,14 (11)		ALL76
161,64 (5)	1,5*	2*	13 (2)	1,14 (11)	0,62 (6)	EVALUATIØN
169,0 (5)	0,5	0	630 (60)			BIL61
168,4	0,5		874 (74)			RØH66
169,0 (10)	0,5	0	870 (70)			ERN70
168,7 (10)	0,5	0	760 (110)			GAR71
169	0,5	0				JAC71
169,2 (5)	0,5	0	1000 (100)			PAN75
168,8 (3)	0,5	0		1,07 (11)		ALL76
169,0 (2)	0,5*	0*	1000 (100)	1,1 (1)	1,1 (1)	EVALUATIØN
169,30 (10)		>0	10 (6)			PAN75
168,8 (3)		>0		2,0 (2)		ALL76
169,3 (1)	1,5*	2*	12 (6)	2,0 (2)	1,20 (15)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
172,9 (3)		>0		0,56 (6)		ALL76
173,60 (10)		>0	83 (2)			PAN75
174,4 (3)		>0		0,36 (4)		ALL76
173,1 (2)	1,5	1	1,16 (35)	0,56 (6)	0,54 (16)	EVALUATIØN
173,6 (1)	1,5*	1*	83 (2)	0,36 (4)	0.18 (2)	EVALUATIØN
179,4 (12)		1				ERN70
179,61 (10)		>0	13 (3)			PAN75
179,3 (4)		>0		0,53 (5)		ALL76
179,6 (1)	0,5*	1*	13 (3)	0,53 (5)	0,55 (5)	EVALUATIØN
180,7 (12)		1				ERN70
181,02 (10)		>0	51 (5)			PAN75
180,8 (4)		>0		3,2 (3)		ALL76
181,0 (1)	2,5*	2*	51 (5)	3,2 (3)	1.1 (1)	EVALUATIØN
182,25 (10)		>0	6 (3)			PAN75
182,25 (10)	1,5*	1*	6 (3)		0,54 (16)	EVALUATIØN
186,98 (10)		>0	5 (3)			PAN75
186,7 (4)		>0		0,60 (6)		ALL76
187,0 (1)	1,5*	2*	5 (3)	0,60 (6)	0,34 (4)	EVALUATIØN
189,0 (10)	0,5	0	2480 (250)			BIL61
186,5	0,5	0	3500			BØW62
186,3	0,5		3420 (270)			RØH66
188,0 (10)	0,5	0	3430 (270)			ERN70
187 (1)	0,5	0	3200 (230)			GAR71
188	0,5	0				JAC71
187,6 (4)	0,5	0	3700 (100)			PAN75
187,6 (4)	0,5	0		2,98 (30)		ALL76
187,6 (2)	0,5*	0*	3600 (100)	2,98 (30)	3.0 (3)	EVALUATIØN
189,88 (10)		>0	30 (15)			PAN75
189,5 (4)		>0		1,04 (10)		ALL76
189,9 (1)	1,5*	2*	30 (15)	1,04 (10)	0,53 (5)	EVALUATIØN
192,88 (10)		>0	40 (20)			PAN75
192,5 (4)		>0		1,13 (11)		ALL76
192,9 (1)	1,5*	2*	40 (20)	1,13 (11)	0,57 (6)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
195,1 (10)		1	50 (12)			ERN70
195,57 (10)		>0	66 (8)			PAN75
195,3 (4)		>0		0.69 (7)		ALL76
195,6 (1)	0,5*	1*	66 (8)	0.69 (7)	0.70 (7)	EVALUATION
201,1 (10)		1	71 (18)			ERN70
201,4 (1)		>0	48 (3)			PAN75
201,1 (4)		>0		1,95 (20)		ALL76
201,4 (1)	1,5*	2*	48 (3)	1,95 (20)	1.0 (1)	EVALUATION
205,4 (4)		>0		1.45 (15)		ALL76
205,7 (2)	2,5	2	2,3 (7)	1.45 (15)	0.84 (25)	EVALUATION
207,8 (1)		>0	22 (2)			PAN75
207,5 (4)		>0		1,19 (12)		ALL76
207,8 (1)	0,5*	1*	22 (2)	1,19 (12)	1.26 (13)	EVALUATION
208,5 (4)		>0		0,27 (3)		ALL76
208,8 (2)	1,5	1	0,36 (6)	0,27 (3)	0,54 (16)	EVALUATION
209,5 (4)		>0		0.39 (4)		ALL76
209,8 (2)	1,5	2	0,50 (8)	0.39 (4)	0.84 (25)	EVALUATION
210 (1)		1	20 (5)			ERN70
210,5 (1)		>0	18 (1)			PAN75
210,2 (4)		>0		1,33 (13)		ALL76
210,5 (1)	1,5*	2*	18 (1)	1,33 (13)	0.72 (7)	EVALUATION
215,2 (4)		>0		0,40 (6)		ALL76
215,6 (2)	0,5*	1*	10 (5)	0,40 (6)	0,42 (7)	EVALUATION
220,0	0,5	0	1300			BOW62
219,2	0,5		1470 (80)			ROH66
220 (1)	0,5	0	1470 (80)			ERN70
220	0,5	0				JAC71
220,5 (5)	0,5	0	990 (50)			PAN75
220,0 (4)	0,5	0		2,16 (22)		ALL76
220,5 (5)	0,5*	0*	1150 (50)	2,16 (22)	2.16 (22)	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
221,6 (1)		>0	15 (5)			PAN75
221,2 (4)		>0		0,64 (6)		ALL76
221,6 (1)	1,5*	1*	15 (5)	0,64 (6)	0,34 (4)	EVALUATIØN
222,2 (4)		>0		0,21 (2)		ALL76
223,1 (4)		>0		1,32 (13)		ALL76
224	0,5	1				JAC71
222,6 (2)	0,5	1	0,34 (5)	0,21 (2)	0,54 (16)	EVALUATIØN
223,5 (2)	2,5	2	2,8 (10)	1,32 (13)	0,84 (25)	EVALUATIØN
225 (1)		1	200 (50)			ERN70
225,64 (10)		>0	56 (3)			PAN75
225,2 (4)		>0		1,0 (1)		ALL76
225,6 (1)	1,5*	1*	56 (3)	1,0 (1)	0,51 (5)	EVALUATIØN
231,0 (1)		>0	15 (1)			PAN75
229,3 (4)		>0		0,62 (6)		ALL76
231,0 (1)	1,5*	1*	15 (1)	0,62 (6)	0,33 (3)	EVALUATIØN
232	1,5	1				JAC71
232,3 (1)		>0	40 (2)			PAN75
231,9 (4)		>0		2,67 (27)		ALL76
232,3 (1)	1,5*	2*	40 (2)	2,67 (27)	1,4 (2)	EVALUATIØN
234 (1)		1	160 (40)			ERN70
234,7 (1)		>0	60 (3)			PAN75
234,3 (4)		>0		2,51 (25)		ALL76
234,7 (1)	2,5*	2*	60 (3)	2,51 (25)	0,87 (9)	EVALUATIØN
241,4 (1)		>0	29 (2)			PAN75
241,0 (4)		>0		3,84 (38)		ALL76
241,4 (1)	2,5*	2*	29 (2)	3,84 (38)	1,47 (15)	EVALUATIØN
242,8 (4)		>0		0,14 (1)		ALL76
244	1,5	1				JAC71
243,2 (2)	1,5	1	0,16 (2)	0,14 (1)	0,54 (16)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
243,5	0,5	0	400			BOW62
242,7	0,5		630			ROH66
245,0 (10)		1	630 (40)			ERN70
245,0 (10)	0,5	0	590 (20)			PAN75
244,4 (5)	0,5	0		0,80 (8)		ALL76
245,0 (5)	0,5*	0*	600 (20)	0,80 (8)	0.80 (8)	EVALUATION
251,8 (5)		>0		0,24 (2)		ALL76
252,2 (3)	1,5	1	0,30 (4)	0,24 (2)	0,54 (16)	EVALUATION
253,0 (20)		1				ERN70
253,3 (2)		>0	84 (4)			PAN75
252,8 (5)		>0		1,53 (15)		ALL76
253,3 (2)	2,5*	2*	84 (6)	1,53 (15)	0.52 (5)	EVALUATION
255,9 (2)		>0	11 (2)			PAN75
255,4 (5)		>0		1,08 (11)		ALL76
255,9 (2)	1,5*	1*	11 (2)	1,08 (11)	0.60 (6)	EVALUATION
259,6 (2)		>0	29.0 (25)			PAN75
259,2 (5)		>0		0,54 (5)		ALL76
259,6 (2)	0,5*	1*	29.0 (25)	0,54 (5)	0.55 (6)	EVALUATION
263,4 (2)		>0	140 (5)			PAN75
262,9 (5)		>0		0,68 (7)		ALL76
263,4 (2)	0,5*	1*	140 (5)	0,68 (7)	0.68 (7)	EVALUATION
263,7 (5)		>0		0,26 (3)		ALL76
264,2 (3)	1,5	1	0,34 (5)	0.26 (3)	0,54 (16)	EVALUATION
265		>0	110			BOW62
266,8 (2)		>0	164 (5)			PAN75
266,3 (5)		>0		1,0 (1)		ALL76
267,0 (5)		>0		0,58 (6)		ALL76
266,8 (2)	2,5*	2*	164 (5)	1,0 (1)	0.33 (3)	EVALUATION
267,5 (3)	1,5	2	0,88 (18)	0,58 (6)	0.84 (25)	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
267		>0	<100			BØW62
269,5 (2)		>0	144 (5)			PAN75
269,0 (5)		>0		0,30 (3)		ALL76
269,5 (2)	0,5*	1*	144 (5)	0,30 (3)	0.30 (3)	EVALUATIØN
274,2 (6)		>0		0,20 (2)		ALL76
274,7 (3)	0,5	1	0,32 (7)	0,20 (2)	0,54 (16)	EVALUATIØN
276,1 (2)		>0	170 (80)			PAN75
275,5 (6)		>0		0,32 (3)		ALL76
276,1 (2)	1,5*	1*	170 (80)	0,32 (3)	0,16 (2)	EVALUATIØN
273,0	0,5	0	3500			BØW62
276,6 (14)	0,5	0	4300 (100)			PAN75
276,6 (6)	0,5	0		1,01 (10)		ALL76
276,6 (10)	0,5*	0*	4000 (300)	1,01 (10)	1,0 (1)	EVALUATIØN
280	1,5	1				JAC71
280,8 (2)		>0	15 (5)			PAN75
280,3 (6)		>0		1,69 (17)		ALL76
280,8 (2)	1,5*	2*	15 (5)	1,69 (17)	0,95 (10)	EVALUATIØN
282,1 (6)		>0		0,47 (5)		ALL76
282,6 (3)	1,5	1	0,84 (26)	0,47 (5)	0,54 (16)	EVALUATIØN
283,7 (2)		>0	24 (2)			PAN75
283,2 (6)		>0		1,54 (15)		ALL76
283,7 (2)	1,5*	2*	24 (2)	1,54 (15)	0,82 (8)	EVALUATIØN
285,2 (2)		>0	29 (2)			PAN75
284,7 (6)		>0		1,79 (18)		ALL76
285,2 (2)	1,5*	2*	29 (2)	1,79 (18)	0,95 (10)	EVALUATIØN
288	0,5	1				JAC71
288,45 (20)		>0	23 (3)			PAN75
287,9 (6)		>0		1,26 (13)		ALL76
288,4 (2)	1,5*	2*	23 (3)	1,26 (13)	0,67 (7)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
290,1 (2)		>0	26 (3)			PAN75
289,7 (6)		>0		1,32 (13)		ALL76
290,1 (2)	1,5*	1*	26 (3)	1,32 (13)	0,70 (7)	EVALUATIØN
290		>0	<100			BØW62
292,9 (2)		>0	130 (40)			PAN75
292,4 (6)		>0		0,60 (6)		ALL76
292,9 (2)	0,5*	1*	130 (40)	0,60 (6)	0,60 (6)	EVALUATIØN
295,1 (6)		>0		0,42 (4)		ALL76
295,6 (3)	1,5	1	0,68 (14)	0,42 (4)	0,54 (16)	EVALUATIØN
299,6 (2)		>0	45 (3)			PAN75
299,1 (6)		>0		1,46 (15)		ALL76
299,6 (2)	1,5*	2*	45 (3)	1,46 (15)	0,75 (8)	EVALUATIØN
302,0 (6)		>0		0,30 (3)		ALL76
302,5 (3)	1,5	1	0,42 (8)	0,30 (3)	0,54 (16)	EVALUATIØN
304,2 (2)		>0	37 (3)			PAN75
303,6 (6)		>0		0,65 (6)		ALL76
304,2 (2)	1,5*	1*	37 (3)	0,65 (6)	0,33 (3)	EVALUATIØN
305,7 (6)		>0		0,30 (3)		ALL76
306,2 (6)		>0		0,40 (4)		ALL76
306,2 (3)	0,5	1	0,68 (24)	0,30 (3)	0,54 (16)	EVALUATIØN
306,7 (3)	1,5	1	0,64 (16)	0,40 (4)	0,54 (16)	EVALUATIØN
310,7 (2)		>0	75 (10)			PAN75
310,0 (6)		>0		0,85 (9)		ALL76
310,7 (2)	1,5*	2*	75 (10)	0,85 (9)	0,43 (4)	EVALUATIØN
314,5 (2)		>0	85 (15)			PAN75
313,7 (6)		>0		2,60 (26)		ALL76
314,5 (2)	2,5*	2*	85 (15)	2,60 (26)	0,89 (9)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
314,5	0,5	0	5500			BØW62
317,0 (10)	0,5	0	8800 (500)			PAN75
318,0 (6)	0,5	0		1,7 (6)		ALL76
317,0 (10)	0,5*	0*	6500 (1000)	1,7 (6)	1,7 (6)	EVALUATIØN
320,8 (6)		>0		1,26 (13)		ALL76
321,5 (3)	1,5	2	5 (3)	1,26 (13)	0,84 (25)	EVALUATIØN
323,0 (6)		>0		0,37 (4)		ALL76
323,7 (3)	1,5	1	0,56 (12)	0,37 (4)	0,54 (16)	EVALUATIØN
331,2 (8)	0,5	0	320 (50)			PAN75
330,4 (7)	0,5	0		1,27 (13)		ALL76
331,2 (3)	0,5*	0*	320 (50)	1,27 (13)	1,27 (13)	EVALUATIØN
333,4 (7)		>0		1,68 (17)		ALL76
334,1 (3)	2,5	2	5 (2)	1,68 (17)	0,84 (25)	EVALUATIØN
337,0 (15)		>0	120			BØW62
340,35 (20)		>0	250 (10)			PAN75
340,0 (7)		>0		2,68 (27)		ALL76
340,4 (2)	1,5*	1*	250 (10)	2,68 (27)	1,35 (14)	EVALUATIØN
344,3 (2)		>0	94 (8)			PAN75
343,6 (7)		>0		1,12 (11)		ALL76
344,3 (2)	1,5*	1*	94 (8)	1,12 (11)	0,57 (6)	EVALUATIØN
348,4 (2)		>0	240 (15)			PAN75
347,9 (7)		>0		1,18 (12)		ALL76
348,4 (2)	1,5*	1*	240 (15)	1,18 (12)	0,59 (6)	EVALUATIØN
350,0 (15)		>0	700 (100)			BØW62
349,8 (2)		>0	80 (12)			PAN75
349,2 (7)		>0		1,45 (15)		ALL76
349,8 (2)	2,5*	2*	80 (12)	1,45 (15)	0,49 (5)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
353,5 (2)		>0	40 (8)			PAN75
352,7 (7)		>0		1,42 (14)		ALL76
353,5 (2)	1,5*	1*	40 (8)	1,42 (14)	0,76 (8)	EVALUATION
354,5 (7)		>0		0,43 (4)		ALL76
355,2 (3)	1,5	1	0,72 (20)	0,43 (4)	0.54 (16)	EVALUATION
355,8 (7)		>0		0,74 (7)		ALL76
356,5 (3)	1,5	1	2,3 (12)	0,74 (7)	0.54 (16)	EVALUATION
356,9 (15)	0,5	0	3600 (300)			PAN75
356,9 (8)	0,5	0		1,10 (21)		ALL76
356,9 (15)	0,5*	0*	3600 (300)	1,10 (21)	1,10 (21)	EVALUATION
357,0 (15)		>0	250 (50)			BOW62
360,5 (15)	0,5	0	9300			BOW62
362,0 (10)	0,5	0	6700 (500)			PAN75
362,0 (8)	0,5	0		1,30 (32)		ALL76
362,0 (15)	0,5*	0*	6700 (500)	1,30 (32)	1,30 (32)	EVALUATION
362,4 (4)		>0	90 (10)			PAN75
361,3 (8)		>0		1,10 (11)		ALL76
362,4 (4)	1,5*	1*	90 (10)	1,10 (11)	0,56 (6)	EVALUATION
365,5 (8)		>0		2,63 (52)		ALL76
366,2 (5)	2,5	2	21 (12)	2,63 (52)	1.0 (3)	EVALUATION
369,9 (8)		>0		0,52 (5)		ALL76
370,6 (5)	1,5	1	1,0 (3)	0,52 (5)	0,54 (16)	EVALUATION
372,5 (8)		>0		1,56 (18)		ALL76
373,2 (5)	1,5	2	8 (6)	1,56 (18)	1,0 (3)	EVALUATION
376,2 (8)		>0		0,92 (9)		ALL76
377,0 (5)	1,5	1	6 (6)	0,92 (9)	0,54 (16)	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
378,9 (4)		>0	51 (6)			PAN75
377,8 (8)		>0		1.31 (13)		ALL76
378,9 (4)	1,5*	1*	51 (6)	1.31 (13)	0.67 (7)	EVALUATIØN
382,0 (15)	0,5	0	10000			BØW62
380,9 (15)	0,5	0	13800 (1400)			PAN75
380,9 (8)	0,5	0		1,60 (64)		ALL76
380,9 (15)	0,5*	0*	10800 (2000)	1,60 (64)	1,6 (6)	EVALUATIØN
386,5 (4)		>0	46 (5)			PAN75
384,9 (8)		>0		4,22 (42)		ALL76
386,5 (5)	0,5*	1*	46 (5)	4,22 (42)	4,6 (5)	EVALUATIØN
387,3 (8)		>0		1,66 (17)		ALL76
388,3 (7)	1,5	2	10 (10)	1.66 (17)	1.0 (3)	EVALUATIØN
393,1 (4)		>0	68 (7)			PAN75
391,6 (8)		>0		0,98 (10)		ALL76
393,1 (5)	1,5*	1*	68 (7)	0,98 (10)	0,51 (5)	EVALUATIØN
397,6 (8)		>0		0,95 (10)		ALL76
398,6 (7)	1,5	1	8 (8)	0,95 (10)	0,54 (16)	EVALUATIØN

*When a star follows J or ℓ, the spin and parity has been confirmed by R-function analysis of elastic angular distribution.

DATA BASE FØR FE-54 RESØNANCE PARAMETER EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
3,097 (3)		>0		0,0030 (3)		ALL76A
3,097 (3)	1,5	2	0,0030 (3)	0,0030 (3)	1.0 (3)	EVALUATIØN
7,25 (25)		0	1000 (50)			BIL61
7,25 (20)					≤3	MØX65
7,82						HØC69
7,76 (1)	0,5	0	1020 (20)			GAR71
7,67 (20)	0,5	0	1010 (10)			BEE75
7,60 (10)	0,5	0	1040 (100)			PAN75
7,68 (10)	0,5	0		2,10 (40)		ALL76A
7,64 (10)	0,5	0	1020 (20)	2,10 (40)	2,1 (4)	EVALUATIØN
9,4 (4)				0,6 (2)		MØX65
9,48		1		0,51 (5)		HØC69
9,47 (1)		>0	1,2 (3)			PAN75
9,482 (10)		>0		0,55 (6)		ALL76A
9,48 (1)	1,5	1	1,2 (3)	0,55 (6)	0.50 (15)	EVALUATIØN
11,19 (3)		>0	~7	0,80 (16)		BEE75
11,18 (1)		>0	7,7 (8)			PAN75
11,18 (1)		>0		0,69 (7)		ALL76A
11,18 (1)	0,5	1	7,7 (8)	0,69 (7)	0.76 (8)	EVALUATIØN
14,4		1		0,53 (14)		HØC69
14,44 (8)		>0		0,92 (16)		BEE75
14,46 (1)		>0	1,4 (5)			PAN75
14,46 (1)		>0		0,62 (6)		ALL76A
14,46 (1)	1,5	1	1,4 (5)	0,62 (6)	0.55 (15)	EVALUATIØN
19,26 (2)		>0		0,047 (5)		ALL76A
19,26 (2)	1,5	2	0,047 (5)	0,047 (5)	1.0 (3)	EVALUATIØN
22,97 (16)		>0		0,57 (11)		BEE75
23,01 (2)		>0	'0,7'	0,39 (4)		ALL76A
23,01 (2)	1,5	1	0,7 (2)	0,39 (4)	0.44 (13)	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
28,24 (10)		>0		0,16 (6)		BEE75
28,19 (3)		>0	'0,5'	0.17 (2)		ALL76A
28,19 (3)	0,5	1	0,50 (15)	0.17 (2)	0.26 (5)	EVALUATIØN
30,70 (10)		>0	~10	1,07 (16)		BEE75
30,64 (3)		>0	7,7 (10)			PAN75
30,64 (3)		>0		0,96 (10)		ALL76A
30,64 (3)	1.5	1	7,7 (10)	0,96 (10)	0.55 (5)	EVALUATIØN
34,21 (3)		>0		0.015 (2)		ALL76A
34,21 (3)	1,5	2	0,015 (2)	0.015 (2)	1.0 (3)	EVALUATIØN
35,31 (15)		>0		0,33 (7)		BEE75
35,21 (4)		>0	'0,5'	0,26 (3)		ALL76A
35,21 (4)	0,5	1	0,50 (15)	0.26 (3)	0,54 (18)	EVALUATIØN
38,5 (2)		>0		1,00 (15)		BEE75
38,39 (4)		>0	'1,4'	0,92 (9)		ALL76A
38,39 (4)	2,5	2	1,4 (5)	0,92 (9)	0.89 (33)	EVALUATIØN
39,18 (12)		>0	~15	1,31 (19)		BEE75
39,11 (4)		>0	17 (2)			PAN75
39,09 (4)		>0		0,82 (8)		ALL76A
39,10 (4)	1.5	1	17 (2)	0,82 (8)	0,43 (4)	EVALUATIØN
41,15 (4)		>0		0.028 (3)		ALL76A
41,15 (4)	1,5	2	0,028 (3)	0,028 (3)	1.0 (3)	EVALUATIØN
50,09 (5)		>0		0,075 (8)		ALL76A
50,09 (5)	1,5	2	0,080 (8)	0,075 (8)	1,0 (3)	EVALUATIØN
51,7 (3)		>0		0,40 (8)		BEE75
51,55 (5)		>0	6 (2)			PAN75
51,52 (5)		>0		0,36 (4)		ALL76A
51,53 (5)	0,5	1	6 (2)	0,36 (4)	0.38	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
52,5 (10)	0,5	0	2100 (300)			BIL61
52,00						HOC69
52,5 (4)	0,5	0	2540 (120)			GAR71
52,78 (18)	0,5	0	2160 (20)		1,8 (3)	BEE75
52,62 (5)	0,5	0	1950 (100)			PAN75
52,62 (5)	0,5	0		2,40 (40)		ALL76A
52,62 (5)	0,5	0	2200 (50)	2,4 (4)	2,4 (4)	EVALUATION
53,7 (4)		>0		0,76 (11)		BEE75
53,54 (5)		>0	17 (3)			PAN75
53,54 (5)		>0		0,60 (6)		ALL76A
53,54 (5)	0,5	1	17 (3)	0,60 (6)	0.62	EVALUATION
55,00 (6)		>0	'1,3'	0,68 (7)		ALL76A
55,00 (6)	1,5	1	1,3	0,68 (7)	0,71	EVALUATION
55,46 (19)		>0	30 (20)	0,90 (13)		BEE75
55,4 (1)		>0	32 (3)			PAN75
55,35 (6)		>0		0,68 (7)		ALL76A
55,35 (6)	0,5	1	32 (3)	0,68 (7)	0.69	EVALUATION
63,45 (6)		>0		0,012 (8)		ALL76A
63,45 (6)	1,5	2	0,012	0,012 (8)	1.0	EVALUATION
68,8 (4)		>0		0,5 (1)		BEE75
68,67 (7)		>0	'4'	0,31 (3)		ALL76A
68,67 (7)	0,5	1	4	0,31 (3)	0.34	EVALUATION
72,0 (10)	0,5	0	1600 (400)			BIL61
71,80 (30)	0,5	0	2480 (210)			GAR71
71,86 (25)	0,5	0	1770 (30)		0.8 (2)	BEE75
71,75 (5)	0,5	0	1540 (100)			PAN75
71,75 (5)	0,5	0		1,32 (26)		ALL76A
71,75 (5)	0,5	0	1700 (50)	1,32 (26)	1.32	EVALUATION
75,9 (5)		>0		1,0 (5)		BEE75
75,70 (8)		>0	'4'	0,76 (8)		ALL76A
75,70 (8)	1,5	1	4	0,76 (8)	0.47	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)[a]	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
77,4 (5)		>0		1,5 (3)		BEE75
77,17 (8)		>0	4 (2)			PAN75
77,12 (8)		>0		1,62 (16)		ALL76A
77,14 (8)	2,5	2	4 (2)	1,62 (16)	0,9	EVALUATION
81,17 (8)		>0	'4'	0,30 (3)		ALL76A
81,17 (8)	0,5	1	4	0,30 (3)	0.32	EVALUATION
83,4 (5)		>0		1,7		BEE75
83,08 (8)		>0	'8'	1,27 (13)		ALL76A
83,35 (8)		>0	'8'	0,45 (5)		ALL76A
83,08 (8)	1,5	2	8	1,27 (13)	0,75	EVALUATION
83,35 (8)	0,5	1	8	0,45 (5)	0.48	EVALUATION
87,4 (6)		>0		0,8 (2)		BEE75
87,20 (9)		>0	'14'	0,50 (5)		ALL76A
87,20 (9)	0,5	1	14	0,50 (5)	0.52	EVALUATION
97,65 (10)		>0	'20'	0,24 (3)		ALL76A
97,65 (10)	0,5	1	20	0,24 (3)	0,24	EVALUATION
96,0 (15)	0,5	0	400			BOW62
98,5 (4)	0,5	0	580 (160)			GAR71
98,5 (4)	0,5	0	510 (50)		3,2 (5)	BEE75
98,66 (3)	0,5	0	550 (100)			PAN75
98,61 (5)	0,5	0		1.65 (25)		ALL76A
98,66 (5)	0,5	0	540 (50)	1.65 (25)	1.65	EVALUATION
99,70 (10)		>0	'10'	0,79 (8)		ALL76A
99,70 (10)	1,5	1	10	0,79 (8)	0,43	EVALUATION
101,6 (1)		>0	'10'	0,35 (2)		ALL76A
101,6 (1)	0,5	1	10	0,35 (4)	0.36	EVALUATION
102,8 (5)	0,5	0	1375 (550)			BIL61
102,0 (5)	0,5	0	590 (250)			GAR71

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)[a]	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
104,3 (10)		>0		1,1 (2)		BEE75
104,1 (1)		>0	'10'	0,79 (8)		ALL76A
104,1 (1)	1,5	1	10	0,79 (8)	0,43	EVALUATION
113,0 (8)		>0		1,5 (3)		BEE75
112,5 (1)		>0	'10'	0,72 (7)		ALL76A
112,8 (1)		>0	'10'	0,56 (6)		ALL76A
112,5 (1)	1,5	1	10	0,72 (7)	0.39	EVALUATION
112,8 (1)	0,5	1	10	0,56 (6)	0,59	EVALUATION
115,7 (8)		>0		1,3 (2)		BEE75
115,78 (10)		>0	26 (5)			PAN75
115,7 (1)		>0		1,21 (12)		ALL76A
115,7 (1)	1,5	1	26 (5)	1,21 (12)	0,63	EVALUATION
119,75 (10)		>0	26 (8)			PAN75
119,7 (1)		>0		1,11 (11)		ALL76A
119,7 (1)	1,5	1	26 (8)	1,11 (11)	0,58	EVALUATION
120,3 (8)		>0		2,6 (4)		BEE75
120,67 (10)		>0	40 (10)			PAN75
120,6 (1)		>0		0,89 (9)		ALL76A
120,6 (1)	1,5	1	40 (10)	0,89 (9)	0,45	EVALUATION
126,3 (10)		>0		2,3 (3)		BEE75
126,41 (10)		>0	60 (10)			PAN75
126,2 (1)		>0		2,59 (26)		ALL76A
126,3 (1)	2,5	2	60 (10)	2,59 (26)	0,90	EVALUATION
130 (2)		0	2300 (700)			BIL61
130,0 (15)		0	1270			BOW62
128,5 (6)	0,5	0	950 (280)			GAR71
129,6 (5)	0,5	0	3000 (90)		3,0 (6)	BEE75
130,1 (1)	0,5	0	3340 (300)			PAN75
130,1 (1)	0,5	0		3,22 (64)		ALL76A
130,1 (1)	0,5	0	3100 (100)	3,22 (64)	3,22	EVALUATION
135,64 (10)		>0	80 (10)			PAN75
135,5 (1)		>0		0,69 (7)		ALL76A
135,6 (1)	0,5	1	80 (10)	0,69 (7)	0,70	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
137,7 (1)		>0	'30'	0,96 (10)		ALL76A
137,7 (1)	1.5	1	30	0,96 (10)	0,50	EVALUATION
140,8 (1)		>0	'10'	0,48 (5)		ALL76A
140,8 (1)	0,5	1	10	0,48 (5)	0.50	EVALUATION
142,4 (14)		>0				BEE75
142,6 (1)		>0	'10'	1,72 (17)		ALL76A
142,6 (1)	1,5	2	10	1,72 (17)	1.0	EVALUATION
145,3 (1)		>0	'40'	0,56 (6)		ALL76A
145,3 (1)	0,5	1	40	0,56 (6)	0.57	EVALUATION
147 (2)	0,5	0	2800 (800)			BIL61
146,0 (15)		0	1510			BOW62
147,2 (8)	0,5	0	3550 (500)			GAR71
147,1 (7)	0.5	0	2750 (110)		3,0 (6)	BEE75
147,4 (2)	0,5	0	3380 (300)			PAN75
147,8 (2)	0,5	0		2,31 (46)		ALL76A
147,6 (2)	0,5	0	3000 (200)	2,31 (46)	2.31	EVALUATION
150,2 (2)		>0	'30'	2,88 (29)		ALL76A
150,2 (2)	2,5	2	30	2,88 (29)	1.06	EVALUATION
152 (2)		>0				BEE75
153,13 (15)		>0	60 (10)			PAN75
152,5 (2)		>0	'30'	1,78 (18)		ALL76A
153,0 (2)		>0		1,14 (11)		ALL76A
152,5 (2)	1,5	2	30	1,78 (18)	0.95	EVALUATION
153,1 (2)	1,5	1	60 (10)	1,14 (11)	0,58	EVALUATION
156,9 (2)		>0	'30'	1,45 (15)		ALL76A
156,9 (2)	1,5	2	30	1,45 (15)	0,76	EVALUATION
159,0 (8)	0,5	0	180 (90)		3,9 (8)	BEE75
159,20 (15)		>0	100 (10)			PAN75
159,0 (2)		>0		1,89 (19)		ALL76A
159,1 (2)	1,5	2	100 (10)	1,89 (19)	0,96	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
163,0 (15)		>0	110			BOW62
163,0 (9)	0,5	0	530 (110)			GAR71
164,36 (15)		>0	105 (10)			PAN75
164,4 (2)		>0		4,12 (41)		ALL76A
164,4 (2)	2,5	2	105 (10)	4,12 (41)	1.4	EVALUATION
165,0 (15)		>0				BEE75
165,16 (15)		>0	75 (10)			PAN75
165,1 (2)		>0		0,81 (8)		ALL76A
165,1 (2)	1,5	1	75 (10)	0,81 (8)	0.41	EVALUATION
173,9 (2)		>0				PAN75
173,7 (2)		>0	'80'	0,82 (8)		ALL76A
173,7 (2)	1,5	1	80	0,82 (8)	0.41	EVALUATION
173,0 (15)	0,5	0	4800			BOW62
172,5 (10)	0,5	0				GAR71
173,9 (8)	0,5	0	2800 (100)		2,4 (5)	BEE75
174,2 (5)	0,5	0	3800 (300)			PAN75
174,0 (5)	0,5	0		3,5 (11)		ALL76A
174,0 (5)	0,5	0	3200 (300)	3,5 (11)	3,5	EVALUATION
177,7 (2)		>0	'10'	1,88 (19)		ALL76A
177,7 (2)	1,5	2	10	1,88 (19)	1.2	EVALUATION
182,22 (15)		>0	150 (15)			PAN75
182,0 (2)		>0		1,20 (12)		ALL76A
182,1 (2)	1,5	1	150 (15)	1,20 (12)	0.61	EVALUATION
188,7 (2)		>0	'40'	0,49 (3)		ALL76A
188,7 (2)	0,5	1	40	0,49 (5)	0,50	EVALUATION
191,7 (2)		>0	'40'	1,33 (13)		ALL76A
191,7 (2)	1,5	1	40	1,33 (13)	0.68	EVALUATION
188,5 (15)	0,5	0	38000			BOW62
191,2 (10)	0,5	0	42400 (500)			BEE75
192,2 (20)	0,5	0	40000 (1500)			PAN75
192,2 (20)	0,5	0		10,0 (40)		ALL76A
192 (2)	0,5	0	42000 (1000)	10,0 (40)	10	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
193,7 (2)		>0	'40'	1,14 (11)		ALL76A
193,7 (2)	1,5	1	40	1,14 (11)	0,58	EVALUATION
194,25 (20)		>0	100 (15)			PAN75
194,2 (2)		>0		1,69 (17)		ALL76A
194,2 (2)	1,5	2	100 (15)	1,69 (17)	0,86	EVALUATION
197,3 (2)		>0	'40'	1,23 (12)		ALL76A
197,3 (2)	1,5	1	40	1,23 (12)	0,63	EVALUATION
203,86 (20)		>0	25 (20)			PAN75
203,6 (2)		>0		2,37 (24)		ALL76A
203,7 (2)	2,5	2	25 (20)	2,37 (24)	0,87	EVALUATION
206,5 (2)		>0	'90'	1,87 (19)		ALL76A
206,5 (2)	1,5	2	90	1,87 (19)	0,95	EVALUATION
207,2 (2)		>0	'40'	1,32 (13)		ALL76A
207,2 (2)	1,5	1	40	1,32 (13)	0,68	EVALUATION
209,85 (20)		>0	60 (30)			PAN75
209,5 (2)		>0		1,54 (15)		ALL76A
209,6 (2)	1,5	2	60 (30)	1,54 (15)	0,79	EVALUATION
213,64 (20)		>0				PAN75
213,5 (2)		>0	'100'	2,09 (21)		ALL76A
213,5 (2)	1,5	2	50	2,09 (21)	1,1	EVALUATION
215,8 (2)		>0	'100'	0,44 (4)		ALL76A
215,8 (2)	0,5	1	3	0,44 (4)	0,52	EVALUATION
222,4 (2)		>0	'100'	0,54 (4)		ALL76A
222,4 (2)	0,5	1	50	0,54 (5)	0,54	EVALUATION
223,3 (2)		>0	'100'	1,70 (17)		ALL76A
223,3 (2)	1,5	2	11	1,70 (17)	1,0	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
223,0 (15)	0,5	0	1900			BOW62
222,8 (12)	0,5	0	1570 (140)			BEE75
223,5 (5)	0,5	0	730 (20)			PAN75
223,5 (5)	0,5	0		1,50 (30)		ALL76A
223,5 (5)	0,5	0	730 (20)	1,50 (30)	1,5	EVALUATION
225,3 (2)		>0	'100'	2.66 (27)		ALL76A
225,3 (2)	2,5	2	25	2.66 (27)	1.0	EVALUATION
227,6 (2)		>0	'100'	1,51 (15)		ALL76A
227,6 (2)	1,5	2	6	1,51 (15)	1,0	EVALUATION
228,8 (2)		>0	'100'	1.64 (16)		ALL76A
228,8 (2))	1,5	2	10	1.64 (16)	1.0	EVALUATION
230,0 (15)	0,5	0	500			BOW62
230,2 (12)	0,5	0	260 (140)			BEE75
231,02 (20)		>0	450 (50)			PAN75
230,7 (2)		>0		2,56 (26)		ALL76A
230,8 (2)	2,5	2	450 (50)	2,56 (26)	0,85	EVALUATION
233,2 (2)		>0	'100'	1,91 (19)		ALL76A
233,2 (2)	1,5	2	42	1,91 (19)	1,0	EVALUATION
237,2 (2)		>0	'100'	2,35 (24)		ALL76A
237,2 (2)	1,5	2	100	2,35 (24)	1.2	EVALUATION
241,5 (2)		>0	'100'	1,46 (15)		ALL76A
241,5 (2)	1,5	1	100	1,46 (15)	0,74	EVALUATION
245,0 (15)		>0	239			BOW62
245,06 (20)		>0	720 (80)			PAN75
244,7 (2)		>0		1,82 (18)		ALL76A
244,8 (2)	1,5	2	720 (80)	1,82 (18)	0,91	EVALUATION

E_n (KEV)	J	$\hat{\ell}$	$g\Gamma_n$ (EV)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
244,5 (15)	0,5	0	13000			BØW62
245,7 (13)	0,5	0	24600 (600)			BEE75
246,8 (5)	0,5	0	19700 (1000)			PAN75
246,8 (5)	0,5	0		5,7 (14)		ALL76A
246,8 (5)	0,5	0	19700 (1000)	5,7 (14)	5.7	EVALUATIØN
252,0 (2)		>0	'100'	1,24 (12)		ALL76A
252,0 (2)	1,5	1	100	1,24 (12)	0.63	EVALUATIØN
254,3 (2)		>0	'100'	1,56 (16)		ALL76A
254,3 (2)	1,5	2	7	1,56 (16)	1.0	EVALUATIØN
258,0 (5)	0,5	0	3360 (400)			PAN75
256,7 (2)		>0		1,19 (8)		ALL76A
257,0 (5)	0,5	0	3360 (400)	1,19 (12)	1.2	EVALUATIØN
262,0 (15)		>0	200			BØW62
261,8 (3)		>0	'100'	2,28 (23)		ALL76A
262,6 (3)		>0	'100'	3,23 (32)		ALL76A
261,8 (3)	1,5	2	50	2,28 (23)	1,2	EVALUATIØN
262,6 (3)	2,5	2	100	3,23 (32)	1.1	EVALUATIØN
263,6 (3)		>0	'100'	2,30 (23)		ALL76A
263,6 (3)	1,5	2	100	2,30 (23)	1,17	EVALUATIØN
266,3 (3)		>0	'100'	0,79 (8)		ALL76A
266,3 (3)	1,5	1	4	0,79 (8)	0.52	EVALUATIØN
270,0 (3)		>0	'100'	1,05 (11)		ALL76A
270,0 (3)	1,5	1	40	1,05 (11)	0,54	EVALUATIØN
270,9 (3)		>0	'100'	1,50 (15)		ALL76A
270,9 (3)	1,5	2	6	1,50 (15)	1.0	EVALUATIØN
275,8 (3)		>0	'300'	1,43 (10)		ALL76A
275,8 (3)	1,5	1	200	1,43 (14)	0.72	EVALUATIØN

E_n (KEV)	J	ℓ	$g\Gamma_n$ (Ev)^a	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (Ev)	REFERENCE
277,0 (15)		>0	260			BOW62
276,96 (25)		>0	300 (60)			PAN75
276,7 (3)		>0		4.37 (44)		ALL76A
276,8 (3)	2,5	2	300 (60)	4.37 (44)	1.47	EVALUATION
279,5 (3)		>0	'100'	0,66 (5)		ALL76A
279,5 (3)	0,5	1	100	0,66 (7)	0,66	EVALUATION
280,0 (15)		>0	107			BOW62
280,67 (25)		>0	150 (30)			PAN75
280,4 (3)		>0		0.64 (6)		ALL76A
280,5 (3)	0,5	1	150 (30)	0.64 (6)	0.64	EVALUATION
282,0 (15)		>0	250			BOW62
282,3 (3)		>0	'100'	1,91 (17)		ALL76A
282,3 (3)	1,5	2	100	1,91 (19)	0.97	EVALUATION
288,7 (3)		>0	'100'	2,02 (20)		ALL76A
288,7 (3)	1,5	2	100	2,02 (20)	1,03	EVALUATION
291,1 (5)	0,5	0		1,1 (2)		ALL76A
291,7 (3)		>0	'100'	0,99 (20)		ALL76A
292,3 (3)		>0	'100'	0,98 (10)		ALL76A
292,4 (5)	0,5	0	1100 (100)			PAN75
293,0 (15)		>0	450			BOW62
291,5 (5)	0,5	0	1100 (100)	1,1 (2)	1,1	EVALUATION
291,7 (3)	1,5	1	20	0,99 (20)	0,52	EVALUATION
292,3 (3)	1,5	1	16	0,98 (10)	0.52	EVALUATION
302,8 (3)		>0	'100'	1,26 (13)		ALL76A
302,8 (3)	1,5	1	100	1,26 (13)	0,64	EVALUATION
305,57 (25)		>0	190 (50)			PAN75
305,2 (3)		>0		3,21 (32)		ALL76A
305,3 (3)	2,5	2	190 (50)	3,21 (32)	1,1	EVALUATION
305,5 (15)	0,5	0	7000			BOW62
308,0 (5)	0,5	0	5400 (100)			PAN75
308,1 (5)	0,5	0		2,7 (8)		ALL76A
308,1 (5)	0,5	0	5400 (100)	2,7 (8)	2.7	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)[a]	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
308,4 (3)		>0	'100'	2,39 (19)		ALL76A
308,4 (3)	1,5	2	100	2,39 (24)	1,22	EVALUATION
311,0 (3)		>0	'100'	1,79 (18)		ALL76A
311,0 (3)	1,5	2	18	1,79 (18)	1.0	EVALUATION
315,5 (3)		>0	'100'	0,84 (5)		ALL76A
315,5 (3)	1,5	1	4	0,84 (8)	0.52	EVALUATION
317,0 (15)	0,5	0	14000			BOW62
321,59 (30)		>0	200 (50)			PAN75
321,3 (3)		>0		3,11 (31)		ALL76A
321,4 (3)	2,5	2	200 (50)	3,11 (31)	1.1	EVALUATION
324,00 (30)		>0	100 (60)			PAN75
323,5 (3)		>0		3,90 (39)		ALL76A
323,7 (3)	2,5	2	100 (60)	3,90 (39)	1.37	EVALUATION
325,3 (3)		>0	'100'	2,86 (29)		ALL76A
325,3 (3)	2,5	2	60	2,86 (29)	1.0	EVALUATION
326,0 (8)	0,5	0	20000 (3000)			PAN75
326,3 (8)	0,5	0		6,0 (6)		ALL76A
326,3 (5)	0,5	0	20000 (3000)	6,0 (6)	6.0	EVALUATION
329,5 (3)		>0	'100'	0,65 (6)		ALL76A
329,5 (3)	0,5	1	100	0,65 (6)	0.65	EVALUATION
331,9 (3)		>0	'100'	1,94 (19)		ALL76A
331,9 (3)	1,5	2	65	1,94 (19)	1.0	EVALUATION
329,5 (15)	0,5	0	2700			BOW62
332,4 (5)	0,5	0	24000 (2000)			PAN75
332,4 (5)	0,5	0		3,6 (18)		ALL76A
332,4 (5)	0,5	0	24000 (2000)	3,6 (18)	3.6	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)[a]	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
335,8 (3)		>0	'100'	2,03 (20)		ALL76A
335,8 (3)	1,5	2	100	2,03 (20)	1.04	EVALUATION
338,6 (3)		>0	'100'	1,40 (14)		ALL76A
338,6 (3)	1,5	1	100	1,40 (14)	0,71	EVALUATION
343,0 (3)		>0	'300'	2,76 (28)		ALL76A
343,0 (3)	2,5	2	150	2,76 (28)	0.94	EVALUATION
344,84 (30)		>0	250 (50)			PAN75
344,4 (3)		>0		1.64 (16)		ALL76A
344,6 (3)	1,5	2	250 (50)	1.64 (16)	0.83	EVALUATION
356,56 (30)		>0	350 (50)			PAN75
356,3 (4)		>0		5,18 (52)		ALL76A
356,4 (4)	2,5	2	350 (50)	5,18 (52)	1.7	EVALUATION
360,1 (4)		>0	'100'	2,32 (23)		ALL76A
360,1 (4)	1,5	2	100	2,32 (23)	1,19	EVALUATION
363,55 (30)		>0	230 (50)			PAN75
362,8 (4)		>0		0,59 (6)		ALL76A
363,1 (4)	0,5	1	230 (50)	0,59 (6)	0,59	EVALUATION
367,38 (30)		>0	400 (100)			PAN75
367,4 (4)		>0		7,06 (71)		ALL76A
367,4 (4)	2,5	2	400 (100)	7,06 (71)	2,4	EVALUATION
369,3 (4)		>0	'400'	2,04 (24)		ALL76A
369,3 (4)	1,5	2	200	2,04 (24)	1,03	EVALUATION
369,0 (15)	0,5	0	3000			BOW62
371,0 (5)	0,5	0	9400 (1000)			PAN75
371,0 (5)	0,5	0		2,10 (30)		ALL76A
371,0 (5)	0,5	0	9400 (1000)	2,10 (30)	2,1	EVALUATION

E_n (KEV)	J	ℓ	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
374,0 (4)		>0	'400'	1,37 (14)		ALL76A
374,0 (4)	1,5	1	200	1,37 (14)	0,69	EVALUATIØN
382,48 (40)		>0	450 (100)			PAN75
382,0 (4)		>0		2,71 (27)		ALL76A
382,2 (4)	2,5	2	450 (100)	2,71 (27)	0,91	EVALUATIØN
383,8 (4)		>0	'100'	0,81 (14)		ALL76A
383,8 (4)	1,5	1	4	0,81 (14)	0,52	EVALUATIØN
390,01 (40)		>0	100 (50)			PAN75
390,0 (4)		>0		4,71 (47)		ALL76A
390,0 (4)	2,5	2	100 (50)	4,71 (47)	1,6	EVALUATIØN
396,5 (4)		>0	'300'	0,86 (9)		ALL76A
396,5 (4)	1,5	1	200	0,86 (9)	0,43	EVALUATIØN
396,5 (4)		>0	'100'	1,65 (17)		ALL76A
396,5 (4)	1,5	2	10	1,65 (17)	1,0	EVALUATIØN
397,6 (4)		>0	'100'	1,83 (18)		ALL76A
397,6 (4)	1,5	2	22	1,83 (18)	1,0	EVALUATIØN

[a] Between apostrophes are assumed values of $g\Gamma_n$ by Allen *et al.* (ALL76A).

DATA BASE FOR FE-57 RESONANCE PARAMETER EVALUATION

S-WAVE RESONANCES

E_n (KEV)	J	ℓ	4g	Γ_n (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
3,9	0	0		220 (50)			MIL59
4,0 (1)						≤1	MOX65
3,87	0	0		177			GOO66
3,96	0	0				1,14 (6)	HOC69
3,95 (5)	0	0	1	200 (25)		1,14 (6)	EVALUATION
6,1	1	0		420 (50)			MIL59
6,00 (25)	1	0		650 (200)			BIL61
6,1 (1)						≤1.7	MOX65
6,10	1	0		396			GOO66
6,21	1	0				1.32 (14)	HOC69
6,28 (1)				2400 (100)			GAR71
6,21 (10)	1	0	3	410 (30)		1,32 (14)	EVALUATION
27	1	0				6 (2)	MAC64
28,7	1	0		3018			GOO66
29	1	0				4 (1)	HOC69
29,15	1	0		3450 (400)			ROH69
29,15	1	0				2.3 (3)	BEE75
29,1 (1)	1	0	3	3250 (300)		2.3 (3)	EVALUATION
40,5		0		1258			GOO66
40							HOC69
41,4	1	0		1000 (100)			ROH69
41,4	1	0				0.9 (2)	BEE75
41,4 (2)	1	0	3	1000 (100)		0.9 (2)	EVALUATION
45,5		0		404			GOO66
47,05	1	0		450 (100)			ROH69
47,05	1	0				0,55 (5)	BEE75
47,05 (10)	1	0	3	450 (100)		0.55 (5)	EVALUATION
55,81	0	0		10000 (1500)			ROH69
55,8 (2)	0	0	1	10000 (1500)		1.5	EVALUATION

E_n (KEV)	J	ℓ	4g	Γ_n (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
61,0	1	0		3700 (500)			ROH69
61,0	1	0				1,2 (1)	BEE75
61,0 (5)	1	0	3	3700 (500)		1.2 (1)	EVALUATION
77,2	1	0		1950 (200)			ROH69
77,2	1	0				0,5 (1)	BEE75
77,2 (6)	1	0	3	2000 (200)		0.5 (1)	EVALUATION
93,7	1	0		200 (50)			ROH69
93,7	1	0				1,9 (2)	BEE75
93,7 (6)	1	0	3	200 (50)		1,9 (2)	EVALUATION
109,6	1	0		2300 (300)			ROH69
109,6 (6)	1	0	3	2300 (300)		1.5	EVALUATION
110,15	1	0		1200 (100)			ROH69
110,15	1	0				2.0 (3)	BEE75
110,1 (6)	1	0	3	1200 (100)		2.0 (3)	EVALUATION
125,0	1	0	3	1500 (200)			ROH69
126,0	0	0	1	2500 (500)			ROH69
129,5	1	0	3	4200 (700)			ROH69
134,5	0	0	1	3300 (500)			ROH69
141,0	0	0	1	1500 (300)			ROH69
167,3	1	0	3	1100 (100)			ROH69
169,0	1	0	3	1700 (200)			ROH69
176,3	0	0	1	700 (100)			ROH69
185,5	1	0	3	3500 (400)			ROH69
189,5	0	0	1	3200 (400)			ROH69

ℓ >0 RESONANCES

E_n (KEV)	J	ℓ	4g	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
1,63					0,05 (1)		HOC69
1,63 (5)	2	1	5	0.054	0,05 (1)	0.57	EVALUATION
4,75					0,051 (6)		HOC69
4,75 (5)	1	1	3	0.06	0,051 (6)	0.57	EVALUATION
7,22					0,36 (9)		HOC69
7,17 (3)		>0			0,42 (8)		BEE75
7,17 (4)	2	1	5	0.9	0,40 (6)	0.57	EVALUATION
7,90					0,18 (5)		HOC69
7,87 (4)		>0			0,25 (5)		BEE75
7,87 (4)	1	1	3	0.45	0,22 (4)	0.57	EVALUATION
12,7							MIL59
12,7					2,0 (3)		MAC64
12,7 (5)				0,7 (2)			MOX65
12,8					0,42 (10)		HOC69
12,73 (8)		>0			0,27 (2)		BEE75
12,73 (5)	1	1	3	0.7 (2)	0,30 (5)	0.69	EVALUATION
13,90					0,70 (20)		HOC69
13,93 (9)		>0			0,40 (6)		BEE75
13,93 (5)	2	1	5	1.5	0,48 (6)	0.57	EVALUATION
17,0					1,5 (5)		MAC64
17,5 (5)				1.1 (3)			MOX65
18,0					0,52 (16)		HOC69
18,25 (2)		>0		~4	0,47 (4)		BEE75
18,20 (5)	1	1	3	4 (2)	0,47 (4)	0.72	EVALUATION
20,5					1,8 (5)		MAC64
21,3					1,09 (28)		HOC69
21,28 (3)		>0		~3	0,60 (5)		BEE75
21,28 (5)	2	1	5	3 (2)	0,60 (5)	0.60	EVALUATION

E_n (KEV)	J	ℓ	4g	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
24,85 (11)		>0			0.08 (2)		BEE75
24,85 (11)	1	1	3	0.10	0,08 (2)	0.57	EVALUATION
25,79 (12)		>0			0,05 (2)		BEE75
25,8 (1)	0	1	1	0.075	0,05 (2)	0,57	EVALUATION
27,23 (12)		>0			0.06 (2)		BEE75
27,2 (1)	1	1	3	0.07	0.06 (2)	0.57	EVALUATION
28,64 (13)		>0			0,29 (3)		BEE75
28,6 (2)	2	1	5	0.5	0,29 (3)	0,57	EVALUATION
31,94 (16)		>0			0.17 (2)		BEE75
31,9 (2)	1	1	3	0.3	0.17 (2)	0.57	EVALUATION
35,18 (18)		>0			0,35 (4)		BEE75
35,2 (2)	2	1	5	0.7	0,35 (4)	0,57	EVALUATION
37,01 (6)		>0		~ 4	0.27 (2)		BEE75
37,0 (1)	1	1	3	4 (2)	0.27 (2)	0.39	EVALUATION
39,36 (6)		>0		~ 8	0,41 (4)		BEE75
39,4 (1)	1	1	3	8 (4)	0,41 (4)	0,57	EVALUATION
41,93 (7)		>0		~ 4	0,16 (3)		BEE75
41,9 (1)	0	1	1	4 (2)	0,16 (3)	0,68	EVALUATION
51,1 (3)		>0			0,12 (2)		BEE75
51,1 (3)	0	1	1	1	0,12 (2)	0,57	EVALUATION
52,66 (10)		>0		~ 16	0,33 (5)		BEE75
52,7 (1)	1	1	3	16 (8)	0,33 (5)	0.45	EVALUATION

E_n (KEV)	J	ℓ	4g	$g\Gamma_n$ (EV)	$\frac{g\Gamma_n\Gamma_\gamma}{\Gamma}$ (EV)	Γ_γ (EV)	REFERENCE
56,20 (11)		>0		~3	0,14 (3)		BEE75
56,2 (1)	0	1	1	3 (2)	0,14 (3)	0,60	EVALUATION
58,7 (4)		>0			0,08 (3)		BEE75
58,7 (4)	1	1	3	0.1	0,08 (3)	0.57	EVALUATION
64,0 (5)		>0			0,39 (4)		BEE75
64,0 (5)	1	1	3	4.5	0,39 (4)	0,57	EVALUATION
66,8 (5)		>0			0,36 (4)		BEE75
66,8 (5)	2	1	5	0.7	0,36 (4)	0.57	EVALUATION
72,9 (6)		>0			0,28 (4)		BEE75
72,9 (6)	1	1	3	0.6	0,28 (4)	0,57	EVALUATION
80,7 (6)		>0			0,32 (4)		BEE75
80,7 (6)	1	1	3	1.3	0,32 (4)	0,57	EVALUATION
88,0 (2)		>0		~19			BEE75
88,0 (2)	2	1	5	19 (10)		0,57	EVALUATION
89,7 (2)		>0		~15			BEE75
89,7 (2)	1	1	3	15 (8)		0,57	EVALUATION
101,8 (3)		>0		~13	0,53 (5)		BEE75
101,8 (3)	2	1	5	13 (7)	0,53 (5)	0,44	EVALUATION
119,2 (4)		>0		~21			BEE75
119,2 (4)	1	1	3	21 (10)		0,57	EVALUATION

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