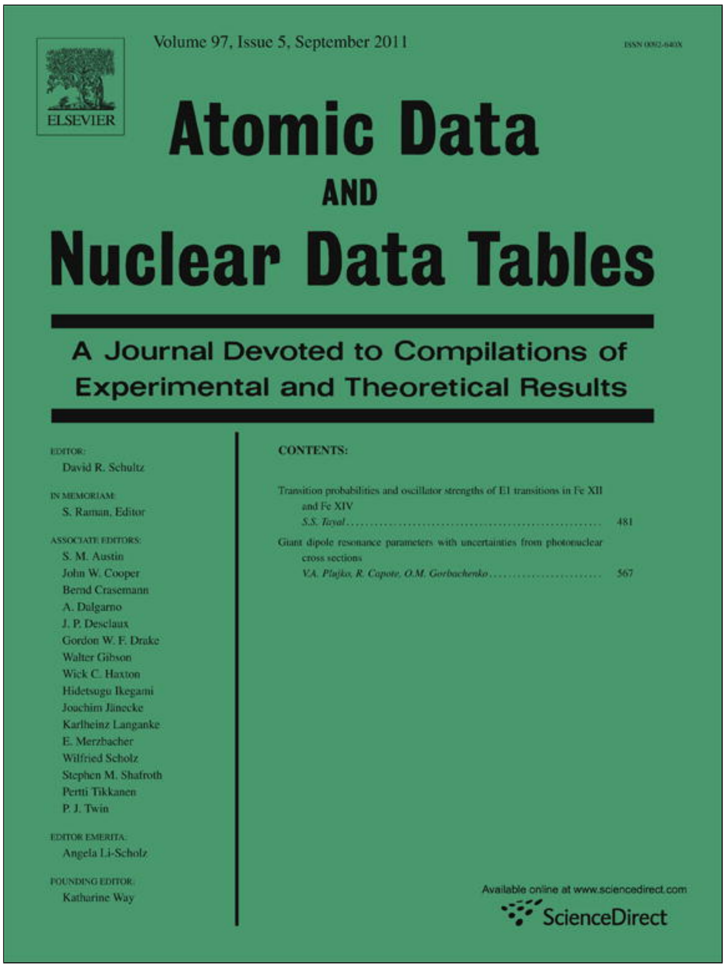

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Giant dipole resonance parameters with uncertainties from photonuclear cross sections

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ABSTRACT

Updated values and corresponding uncertainties of isovector giant dipole resonance (IVGDR or GDR) model parameters are presented that are obtained by the least-squares fitting of theoretical photoabsorption cross sections to experimental data. The theoretical photoabsorption cross section is taken as a sum of the components corresponding to excitation of the GDR and quasideuteron contribution to the experimental photoabsorption cross section. The present compilation covers experimental data as of January 2010.

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Contents

1. Introduction

Isovector giant dipole resonances (IVGDR or GDR) are strongly displayed in electric dipole (E1) gamma transitions in processes of photoabsorption and gamma-decay of the atomic nuclei [1–5]. The experimental values of the GDR parameters in cold atomic nuclei are most reliably deduced from photoabsorption data. An extensive compilation of the parameters of Lorentzian curves fitted to the total photoneutron cross section data for medium and heavy nuclei ($A > 50$) was prepared by Dietrich and Berman [6]. Additional analysis of experimental data was presented by Berman et al. [7]. The data from Ref. [6] and GDR parameters for the light nuclei ^{12}C, ^{14}N, ^{16}O, ^{27}Al, and ^{28}Si nuclei were listed in the RIPL-1 database [4], as well as in the RIPL-3 [5] gdr-parameters-exp-LOR.dat file. If the contribution of photoproton cross sections to the total photoabsorption cross section is small, then the Lorentzian parameters of the total photoneutron cross sections in spherical and axially deformed nuclei can be identified with the GDR parameters (see Section 2 for details).

Comprehensive databases of the photonuclear reaction parameters are also presented in Refs. [8,9]. The photoproton contribution was included there, but the parameters were obtained without the least-squares fitting to Lorentzian shape. Specifically, those databases listed full width at half maximum data for the largest peak in the photonuclear cross sections, that is, they do not contain explicit information on the GDR components of the damping widths in axially deformed nuclei.

Microscopic predictions of the GDR energies and widths for about 6000 nuclei from $14 \leq Z \leq 110$ between the proton and the neutron drip lines are given in the RIPL-3 database [5]. These GDR parameters were provided by Goriely et al. [10, 11] and resulted from a fit of microscopic calculations of the Lorentzian functions. The calculations were performed on the basis of the quasi-particle random-phase approximation as well as the microscopic Hartree–Fock–Bogoliubov plus quasi-particle random-phase approximation model with a realistic Skyrme interaction.

For heated atomic nuclei, the GDR parameters are determined by gamma-decay data. Compilation and parametrization of the GDR resonances built on excited states are given in Refs. [12,13].

A comprehensive experimental database containing a proper estimate of the accuracy of the GDR parameters is very important in nuclear reaction codes for the reliable modeling of E1 gamma-ray cascades in highly excited nuclei as well as for the verification of different theoretical approaches used to describe GDR resonances. In this contribution, we present tables of updated values of the GDR parameters with estimations of their uncertainties (one-sigma standard deviation). The GDR parameters are treated as variables in the least-squares fitting of the calculated total photoabsorption cross sections to the experimental data retrieved from the EXFOR database [14]. The GDR component of the photoabsorption cross section is calculated within Lorentzian-like models described in more details in Section 2.

For experimental data, we use either the total photoabsorption cross sections (if they exist in the EXFOR database), or a combination of experimental partial cross sections best suited for approximation to the total photoabsorption cross section. Estimated data also include contributions from photoproton reactions, which are important for light nuclei. The evaluation of measured total photoabsorption data and their uncertainties is discussed in Section 3. The values and corresponding uncertainties of the Lorentzian-like model parameters are given in Tables 1 and 2. These values are derived from a fit of the theoretical photoabsorption cross sections to the experimental data for 132 isotopes from ^{10}B to ^{239}Pu nuclei (262 entries) and 9 elements of natural isotopic composition (14 entries). Theoretical photoabsorption cross sections are given by a standard Lorentzian (SLO) model (using parameters from Table 1) or by a simplified version of the modified Lorentzian (SMLO) approach (using parameters from Table 2; see also Ref. [5] for a detailed description). This compilation updates and extends the RIPL-3 database [5] contained in files gdr-parameters&errors-exp-SLO.dat and gdr-parameters&errors-exp-MLO.dat. References to experimental and evaluated cross section data taken from EXFOR are listed in Table 3.

2. Theoretical considerations

The theoretical photoabsorption cross section $\sigma_{abs}(\epsilon_\gamma)$ as a function of gamma-ray energy ϵ_γ is taken as a sum of the terms

$$\sigma_{abs}(\epsilon_\gamma) = \sigma_{\mathrm{GDR}}(\epsilon_\gamma) + \sigma_{qd}(\epsilon_\gamma), \tag{1}$$

where the component $\sigma_{\mathrm{GDR}}(\epsilon_\gamma)$ corresponds to the excitation of the GDR and $\sigma_{qd}(\epsilon_\gamma)$ is a quasideuteron contribution (a photoabsorption by a neutron–proton pair), which is taken in accordance with the model proposed by Chadwick et al. [15] (see also Ref. [9]),

$$\sigma_{qd}(\epsilon_\gamma) = 6.5\,\frac{NZ}{A}\,\sigma_d(\epsilon_\gamma)\,f(\epsilon_\gamma). \tag{2}$$

Here, $\sigma_d(\epsilon_\gamma)$ is the experimental photodisintegration cross section of the free deuteron,

$$\sigma_d(\epsilon_\gamma) = 61.2\,\frac{(\epsilon_\gamma - 2.224)^{3/2}}{\epsilon_\gamma^3}, \tag{3}$$

with ϵ_γ in MeV and σ_d in units of mb. The function $f(\epsilon_\gamma)$ accounts for the Pauli blocking of the excited neutron–proton pair in the nuclear medium;

$$\begin{aligned} &f(\epsilon_\gamma < 20\ \mathrm{MeV}) = \exp(-73.3/\epsilon_\gamma),\\ &f(20 < \epsilon_\gamma < 140\ \mathrm{MeV}) = 8.3714 \times 10^{-2}\\ &\quad - 9.8343 \times 10^{-3}\epsilon_\gamma + 4.1222 \times 10^{-4}\epsilon_\gamma^2\\ &\quad - 3.4762 \times 10^{-6}\epsilon_\gamma^3 + 9.3537 \times 10^{-9}\epsilon_\gamma^4. \end{aligned} \tag{4}$$

The GDR component $\sigma_{\rm GDR}(\epsilon_\gamma)$ of the total photoabsorption cross section is taken as given in Refs. [1–6,9] to be equal to the photoabsorption cross section of electric dipole gamma rays $\sigma_{\rm E1}(\epsilon_\gamma)$, which is proportional to the strength function $S_{\rm E1}(\epsilon_\gamma)$,

$$\sigma_{\rm E1}(\epsilon_\gamma) = \frac{8\pi\alpha}{3}\,\epsilon_\gamma S_{\rm E1}(\epsilon_\gamma) \tag{5}$$

with fine structure constant $\alpha = e^2/(\hbar c)^2$.

The strength function $S_{\rm E1}(\epsilon_\gamma)$ is determined by the imaginary part $\chi''(\omega)$ of the response function of the atomic nucleus to the E1 field of frequency $\omega = \epsilon_\gamma/\hbar$. In the vicinity of an isolated resonance state, the strength function has Lorentzian-like shape

$$S_{\rm E1}(\epsilon_\gamma) = -\frac{\pi}{2}\chi''(\omega) = \frac{2}{\pi}S_{\rm EWSR}\,\frac{\epsilon_\gamma \Gamma(\epsilon_\gamma)}{\left(\epsilon_\gamma^2 - E_r^2\right)^2 + \left(\Gamma(\epsilon_\gamma)\,\epsilon_\gamma\right)^2} \tag{6}$$

when the resonance state corresponds to the almost exhausted energy-weighted sum rule

$$S_{\rm EWSR} \equiv \hbar^2\int_0^\infty \omega\chi''(\omega)\,{\rm d}\omega. \tag{7}$$

In Eq. (6), E_r and $\Gamma(\epsilon_\gamma)$ are the resonance energy and the energy-dependent scaling parameter of the shape ("width"), which is equal to the resonance width Γ_r at the resonance energy: $\Gamma(\epsilon_\gamma = E_r) = \Gamma_r$. In the presence of intrinsic excitations (heated nuclei), the widths $\Gamma(\epsilon_\gamma)$ and Γ_r are also dependent on the temperature. The resonance parameters E_r and Γ_r usually are named the GDR energy and width because the giant dipole excitation is the leading contribution to the energy-weighted sum rule. The Lorentzian shape of Eq. (6) stems from the random-phase approximation. It is also predicted by the extended hydrodynamic model of Steinwedel–Jensen for heated nuclei with friction between the proton and neutron fluids, and by a semiclassical Landau–Vlasov equation with a memory-dependent collision term [5,16].

Phenomenological models based on Eq. (6) with the GDR parameters as input quantities [4,5] have been successfully used for a description of the average probabilities of gamma-decay and photoabsorption for γ-ray energies below 30 MeV. These models differ mainly in the expressions for the shape parameter $\Gamma(\epsilon_\gamma)$, which is determined by complex mechanisms of nuclear dissipation and still remains under study [17–22]. In particular, the gamma-energy dependence of the width $\Gamma_c(\epsilon_\gamma)$ results from two-body nucleon–nucleon collisions with retardation effects [23,24]. Redistribution of the γ-strength in a self-consistent mean field can be considered as a fragmentation component of the GDR width [17,25]. It arises from the nucleon collisions with a moving nuclear surface [26] (or one-body dissipation [27]), and is originally independent of the GDR energy [28,29]. Therefore, a fragmentation component of the width $\Gamma_c(\epsilon_\gamma)$ can be treated as independent of the gamma-ray energy. In accordance with Eqs. (5) and (6), the GDR component of the total photoabsorption cross section for gamma-ray energies in the neighborhood of the GDR peak has a Lorentzian-like shape. For axially deformed nuclei, the $\sigma_{\rm GDR}$ is a sum of two Lorentzian-like components corresponding to collective vibrations along and perpendicular to the axis of symmetry ($j_m = 2$) (correspondingly in spherical nuclei $j_m = 1$), namely

$$\sigma_{\rm GDR}(\epsilon_\gamma) = \frac{2}{\pi}\sigma_{\rm TRK}\sum_{j=1}^{j_m} S_{r,j}\frac{\epsilon_\gamma^2\Gamma_j(\epsilon_\gamma)}{(\epsilon_\gamma^2 - E_{r,j}^2)^2 + (\epsilon_\gamma\Gamma_j(\epsilon_\gamma))^2}. \tag{8}$$

Here, $E_{r,j}$ ($S_{r,j}$) is the energy (strength) of the corresponding mode of the giant dipole excitation. The strength is given in units of the Thomas–Reiche–Kuhn (TRK) sum rule $\sigma_{\rm TRK}$ [3,5]. An energy-dependent scaling parameter $\Gamma_j(\epsilon_\gamma)$ of the shape is equal to the appropriate component of the GDR width $\Gamma_{r,j}$ at the GDR energy: $\Gamma_j(\epsilon_\gamma = E_{r,j}) = \Gamma_{r,j}$. The TRK sum rule for a nucleus with N neutrons, Z protons, and mass number $A = N + Z$ is equal to

$$\begin{aligned}&\sigma_{\rm TRK} = 60\frac{NZ}{A} = 15A(1 - I^2)\quad [\text{mb}\cdot\text{MeV}],\\ &\sum_j S_{r,j} = 1 + \Delta,\quad \Delta \approx 0.2 \div 0.3,\end{aligned} \tag{9}$$

where $I = (N - Z)/A$ is the neutron–proton asymmetry and Δ is the contribution from interactions that do not commute with the kinetic energy operator (velocity-dependent and exchange forces). In the approximation of equally probable excitation of different modes, the giant collective vibration, which is perpendicular to the axis of symmetry, is twofold degenerated and equal to

$$S_{r,2} = 2S_{r,1}(\beta > 0)\quad \text{and}\quad S_{r,1} = 2\,S_{r,2}\ (\beta < 0), \tag{10}$$

where β is a parameter of quadrupole deformation and the subindex 1(2) in $S_{r,1}$ ($S_{r,2}$) corresponds to a low (high) value component $E_{r,1}$ ($E_{r,2}$) of the GDR energy.

For the GDR component of the total photoabsorption cross section, we use the standard Lorentzian approach and a simplified version of the modified Lorentzian approach, which are based on different assumptions of the dependence of scaling parameter $\Gamma_j(\epsilon_\gamma)$ on gamma-ray energy [5]. In the SLO model, the width $\Gamma_j(\epsilon_\gamma)$ is taken as energy-independent and equal to the GDR width, that is, the absorption cross section (8) in axially deformed atomic nuclei is given by double-peak Lorentzian functions

$$\begin{aligned}\sigma_{\rm GDR}(\epsilon_\gamma) &= \sigma_{\rm E1,SLO}(\epsilon_\gamma)\\ &= \frac{2}{\pi}\sigma_{\rm TRK}\sum_j S_{r,j}\,\frac{\epsilon_\gamma^2\Gamma_{r,j}}{(\epsilon_\gamma^2 - E_{r,j}^2)^2 + (\epsilon_\gamma\Gamma_{r,j})^2}.\end{aligned} \tag{11}$$

The GDR strength $S_{r,j}$ is related to the peak value $\sigma_{r,j}$ of the cross section component of the Eq. (11) corresponding to the giant dipole vibration along the j-axis

$$\sigma_{r,j} = \frac{2}{\pi}\sigma_{\rm TRK}\,S_{r,j}/\Gamma_{r,j}. \tag{12}$$

For the SLO model, the product of $\sigma_{r,j}$ and $\Gamma_{r,j}$ is proportional to the total integrated cross section

$$\sigma_{int,\rm SLO} = \int_0^\infty \sigma_{\rm E1,SLO}(\epsilon_\gamma){\rm d}\epsilon_\gamma = \frac{\pi}{2}\sum_j \sigma_{r,j}\Gamma_{r,j}. \tag{13}$$

In the SMLO approach [5,30], the total photoabsorption cross section is given by Eq. (8) with the scaling width $\Gamma_j(\epsilon_\gamma)$ being proportional to the gamma-ray energy

$$\Gamma_j(\epsilon_\gamma) = a_j\,\epsilon_\gamma,\qquad \Gamma_{r,j} = a_j\,E_{r,j}. \tag{14}$$

In the SLO model, the quantities $E_{r,j}$, $\Gamma_{r,j}$, and $S_{r,j}$ were used as variables in the fitting. The parameters $E_{r,j}$, a_j, and $S_{r,j}$ were derived by fitting with the SMLO model and the components of the GDR width were calculated by Eq. (14).

A least-squares fitting procedure was employed, in which the data points were weighted according to the inverse square of their uncertainties, that is, a minimum value was sought for χ^2 given by

$$\chi^2 = \frac{1}{N_f}\sum_{i=1}^{N}\frac{\left(\sigma_{abs}(\epsilon_i) - \sigma_{\rm exp}(\epsilon_i)\right)^2}{(\Delta\sigma(\epsilon_i))^2}, \tag{15}$$

where $\sigma_{abs}(\epsilon_i)$ is the value for the theoretical curve fit to the cross section data at gamma-ray energy ϵ_i, $\sigma_{\rm exp}(\epsilon_i)$ is the measured value for the total photoabsorption cross section with uncertainty $\Delta\sigma(\epsilon_i)$ at that energy, and $N_f = N - N_{par}$ is the number of degrees of freedom for the data set fitted, which is equal to the number N of data points within the fitting interval minus the number N_{par} of fitted parameters (3 parameters for each Lorentzian-like curve). For deformed nuclei, we adopted an approximation of axially deformed nuclei. However, following Ref. [6], some deformed nuclei were considered as spherical, if the one-component Lorentzian curve gives a better fit (i.e., a fit having a lower χ^2 per degree of freedom) to the experimental data than a two-component one. The minimization of the least-squares functional is undertaken by the CERN MINUIT package [31]. The standard deviation of the parameters was estimated using the MINOS procedure of this code. The calculation was defined by the following sequence of commands: SEEK 1000, MIGRAD 10000 0.000001, IMPROVE 100, HESSE 1, MINOS 1.

3. Data treatment

Photon-induced reaction data from the EXFOR library [14] were used as the required experimental database on photonuclear cross sections. The evaluated data compiled by Varlamov et al. [32,33] at the Center for Photonuclear Experiment Data at the Institute of Nuclear Physics of the Moscow State University (Moscow, Russia, online at http://cdfe.sinp.msu.ru) are also considered as experimental values. The total photoabsorption reaction cross section $\sigma(\gamma, abs)$ used in the fits should be equal to the sum of the total photoneutron cross section $\sigma(\gamma, sn)$, also denoted as $\sigma(\gamma, tot\ n)$, and the photo-charged-particle reaction cross section $\sigma(\gamma, cp)$, that is,

$$
\begin{aligned}
&\sigma(\gamma, abs) = \sigma(\gamma, sn) + \sigma(\gamma, cp),\\
&\sigma(\gamma, sn) \;=\; \sigma(\gamma, n) + \sigma(\gamma, np) + \sigma(\gamma, 2n) + \sigma(\gamma, 2np)\\
&\qquad\qquad + \sigma(\gamma, 3n) + \cdots + \sigma(\gamma, F),\\
&\sigma(\gamma, cp) \;=\; \sigma(\gamma, p) + \sigma(\gamma, 2p) + \cdots + \sigma(\gamma, d)\\
&\qquad\qquad + \sigma(\gamma, dp) + \cdots + \sigma(\gamma, \alpha) + \cdots.
\end{aligned}
\tag{16}
$$

When measured and evaluated data on the total photoabsorption cross section for a given nuclide were absent in the database, the total photoneutron cross section $\sigma(\gamma, sn)$ was taken instead of the photoabsorption cross section $\sigma(\gamma, abs)$. Such an approximation is valid if the contribution of the photo-charged-particle reaction cross sections is small. In the absence of experimental EXFOR data for the $\sigma(\gamma, sn)$, the total photoneutron cross section was evaluated as a combination of the available experimental cross sections on the inclusive photoneutron yield cross section $\sigma(\gamma, xn)$ and photoneutron cross sections with ejection of more than one neutron,

$$
\begin{aligned}
\sigma(\gamma, xn) &= \sigma(\gamma, sn) + \sigma(\gamma, 2n) + \sigma(\gamma, 2np) + 2\sigma(\gamma, 3n)\\
&\quad + \cdots + (\bar{\nu} - 1)\sigma(\gamma, F),
\end{aligned}
\tag{17}
$$

where $\bar{\nu}$ is the average multiplicity of photofission neutrons.

There are situations where no uncertainties $\Delta\sigma(\epsilon_i)$ of the experimental cross sections $\sigma_{\mathrm{exp}}(\epsilon_i)$ are given in the EXFOR database. For such cases the relative uncertainties $\delta\sigma(\epsilon_i) \equiv \Delta\sigma(\epsilon_i)/\sigma_{\mathrm{exp}}(\epsilon_i)$ were taken either as a constant value of 10% (i.e., $\delta\sigma = 0.1$), or as an energy-dependent quantity. The energy-dependent relative uncertainties were assumed to take minimal values near the GDR energies and maximal values on the GDR tails, that is, the triangular shape given below was accepted for spherical nuclei

$$
\delta(\epsilon_i) = \delta_{\min} + b|\mathrm{E1} - \epsilon_i|,
\tag{18}
$$

and the trapezoidal shape was used in deformed nuclei

$$
\delta(\epsilon_i) = \begin{cases} \delta_{\min} + b|\mathrm{E1} - \epsilon_i|, & \epsilon_i < \mathrm{E1},\\ \delta_{\min}, & \mathrm{E1} \le \epsilon_i \le \mathrm{E2},\\ \delta_{\min} + b|\epsilon_i - \mathrm{E2}|, & \epsilon_i > \mathrm{E2}, \end{cases}
\tag{19}
$$

where $b = (\delta_{\max} - \delta_{\min})/(\mathrm{E1} - \epsilon_{in})$; $\delta_{\min} = 0.1$ and $\delta_{\max} = 0.5$ are the minimal and maximal values of the uncertainty; ϵ_{in} is the smallest value of γ-ray energy in the experimental database. The E1 and E2 are the peak energies for which the uncertainties are the smallest. The peak energies were obtained from the datafile gdr-parameters-exp-LOR.dat [4,5] if both the nucleus and the reference were present in the file. If the reference was different, the peak energies were taken from the first line of the database for this isotope. If the isotope is not listed, then the systematics [5] with parameters from Ref. [1] were used.

4. Policy

No attempt is made here to recommend the best data, that is, to choose between different sets of parameters for the same nucleus found by fit of measured photoabsorption cross sections, neither to set recommended intermediate values. Methods to resolve discrepancies between photoabsorption cross sections measured at different laboratories are discussed in Refs. [7,32–35]. It should be noted, however, that the overall agreement between derived GDR parameters is rather good within quoted uncertainties.

In fact, the energies $E_{r,i}$, widths $\Gamma_{r,i}$, and strengths $S_{r,i}$ presented in Tables 1 and 2 are the shape parameters of Lorentzian-like curves representing the best fit of experimental photoabsorption cross sections within the indicated fitting interval for the SLO and SMLO models, respectively. As mentioned above, the SLO and SMLO models are based on two opposite assumptions regarding the dissipation mechanism in atomic nuclei, namely, the one-body relaxation mechanism is assumed in the SLO model while the two-body relaxation mechanism is adopted in the SMLO model. Differences in the values of the derived shape parameters to describe the GDR component of the total theoretical photoabsorption cross section demonstrate the impact of such assumptions about the dissipation mechanism on the fit.

The accuracy of approximation of the GDR parameters by shape parameters depends on many factors. Besides well-known problems of the selection and verification of the experimental data and the estimation of the contributions of cross section with ejection of different particles to the total photoabsorption cross section, there are also ambiguities in the theoretical description of the dipole strength function $S_{\mathrm{E1}}(\epsilon_\gamma)$ given by Eq. (6). Namely, the approximation of S_{E1} by a one- or two-component Lorentzian-like curve near the beta-stability valley is appropriate for rather heavy ($A \gtrsim 50$) spherical and axially deformed nuclei ($155 \lesssim A \lesssim 190$ or $225 \lesssim A \lesssim 250$) for gamma-ray energies close to the GDR energy. In other situations, additional physical effects should be taken into account (e.g., the isospin splitting of the GDR, possible intermediate-structure effects, the neutron excess and the triaxial deformation [29,36]).

It is also important to remark that the present tables contain parameter uncertainties only. However, to obtain the total uncertainty of calculated photoabsorption cross sections we have to consider additionally the uncertainty of the theoretical model used in the fit. Such model uncertainty is rather difficult to estimate; a good guess of the model uncertainty could be the difference between results obtained using SLO and SMLO parameters of Tables 1 and 2, respectively. The biggest differences are located in the low-energy tail of the GDR peak because the SMLO model is asymmetric compared to the symmetric SLO model.

Uncertainty estimates of Lorentzian-like parameters as well as SLO and SMLO model uncertainties are needed in modern computer codes like EMPIRE [37] and TALYS [38] for a proper estimation of corresponding cross section uncertainties including both parameter and model uncertainties.

Note on references

When data from this compilation are cited, reference should also be made to the original publication.

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Explanation of Tables

Table 1 **Experimental values and uncertainties of GDR parameters within the standard Lorentzian (SLO) approach**

Nucl	The target studied (symbol); *nat* supra-index indicates a natural isotopic composition
Id	Type of experimental data used in fitting: 0—experimental $\sigma(\gamma, abs)$ with experimental uncertainties; 1a—experimental $\sigma(\gamma, abs)$ with constant uncertainties (10%); 1b—experimental $\sigma(\gamma, abs)$ with energy-dependent uncertainties; 2—evaluated $\sigma(\gamma, abs)$ with experimental uncertainties; 3a—evaluated $\sigma(\gamma, abs)$ with constant uncertainties (10%); 3b—evaluated $\sigma(\gamma, abs)$ with energy-dependent uncertainties; 4—experimental $\sigma(\gamma, sn)$ with experimental uncertainties; 5a—experimental $\sigma(\gamma, sn)$ with constant uncertainties (10%); 5b—experimental $\sigma(\gamma, sn)$ with energy-dependent uncertainties; 6—composed $\sigma(\gamma, sn)$ as a combination of selected experimental cross sections: $\sigma(\gamma, sn) = (\sigma(\gamma, xn) + \sigma(\gamma, 1n))/2$ with absolute uncertainties: $\Delta\sigma(\gamma, sn) = \sqrt{\Delta\sigma^2(\gamma, xn) + \Delta\sigma^2(\gamma, 1n)/2}$; 7—composed $\sigma(\gamma, sn)$ as a combination of the experimental cross sections: $\sigma(\gamma, sn) = \sigma(\gamma, xn) - \sigma(\gamma, 2n)$ with absolute uncertainties: $\Delta\sigma(\gamma, sn) = \sqrt{\Delta\sigma^2(\gamma, xn) + \Delta\sigma^2(\gamma, 2n)}$; 8—composed $\sigma(\gamma, sn)$ as a combination of selected experimental cross sections: $\sigma(\gamma, sn) = \sigma(\gamma, 1n) + \sigma(\gamma, 2n)$ with absolute uncertainties: $\Delta\sigma(\gamma, sn) = \sqrt{\Delta\sigma^2(\gamma, 1n) + \Delta\sigma^2(\gamma, 2n)}$; 9—composed $\sigma(\gamma, sn)$ as a combination of selected experimental cross sections: $\sigma(\gamma, sn) = \sigma(\gamma, 1n) + \sigma(\gamma, 2n) + \sigma(\gamma, 3n)$ with absolute uncertainties: $\Delta\sigma(\gamma, sn) = \sqrt{\Delta\sigma^2(\gamma, 1n) + \Delta\sigma^2(\gamma, 2n) + \Delta\sigma^2(\gamma, 3n)}$; 10—composed $\sigma(\gamma, sn)$ as a combination of selected experimental cross sections: $\sigma(\gamma, sn) = \sigma(\gamma, 1n) + \sigma(\gamma, 2n) + \sigma(\gamma, f)$ with absolute uncertainties: $\Delta\sigma(\gamma, sn) = \sqrt{\Delta\sigma^2(\gamma, 1n) + \Delta\sigma^2(\gamma, 2n) + \Delta\sigma^2(\gamma, f)}$; 11—composed $\sigma(\gamma, sn)$ as a combination of selected experimental cross sections: $\sigma(\gamma, sn) = (\sigma(\gamma, xn) + \sigma(\gamma, 1n) + \sigma(\gamma, f))/2$ with absolute uncertainties: $\Delta\sigma(\gamma, sn) = \sqrt{\Delta\sigma^2(\gamma, xn) + \Delta\sigma^2(\gamma, 1n) + \Delta\sigma^2(\gamma, f)}/2$; 12—experimental $\sigma(\gamma, 1n)$ with experimental uncertainties; 13—experimental $\sigma(\gamma, xn)$ with experimental uncertainties; 13a—experimental $\sigma(\gamma, xn)$ with constant uncertainties (10%); 13b—experimental $\sigma(\gamma, xn)$ with energy-dependent uncertainties
$E_{r,i}$,$\Gamma_{r,i}$, $S_{r,i}$	parameters of energy, width, and strength of Lorentzian curves fitted to the corresponding photoabsorption cross sections within the indicated fitting interval. Notation 'spherical' ($i = 1$) implies that a one-component Lorentzian curve gives a better fit to the data that a two-component one, and 'axially deformed' ($i = 1, 2$) implies the opposite.
$E_{r,1}$	energy of the first component of the GDR with uncertainty (one-sigma standard deviation), MeV.
$\Gamma_{r,1}$	width of the first component of the GDR with uncertainty (one-sigma standard deviation), MeV.
$S_{r,1}$	strength of the first component of the GDR (as a fraction of the TRK sum rule) with uncertainty (one-sigma standard deviation); the values of TRK sum rule for ^{90}Zr and ^{208}Pb are used for ^{nat}Zr and ^{nat}Pb.
$E_{r,2}$	energy of the second component of the GDR with uncertainty (one-sigma standard deviation), MeV.
$\Gamma_{r,2}$	width of the second component of the GDR with uncertainty (one-sigma standard deviation), MeV.
$S_{r,2}$	strength of the second component of the GDR (as a fraction of the TRK sum rule) with uncertainty (one-sigma standard deviation).
S	sum of strengths of the first and second component of the GDR ($S = S_{r,1} + S_{r,2}$) with uncertainty (one-sigma standard deviation); the values of TRK sum rule for ^{90}Zr and ^{208}Pb are used for ^{nat}Zr and ^{nat}Pb.
$\epsilon_{\min}$ ($\epsilon_{\max}$)	lower (upper) energy limit of fitting interval, MeV.
Ref	Short references on the experimental data used in the fit.

Table 2 **Experimental values and uncertainties of GDR parameters within the modified Lorentzian (SMLO) approach**

Same as for Table 1.

Table 3 **References to experimental and evaluated cross section data taken from EXFOR**

Nucl	The target studied (symbol); *nat* supra-index indicates a natural isotopic composition.
Id	Type of experimental data used in fitting (with a letter indicating the method of uncertainty estimation employed). See the explanation for Table 1.
Reaction	Type of reaction.
Ref	Short references on the experimental data.
EXFOR	EXFOR 8-digit entry and subentry number.

Table 1
Experimental values and uncertainties of GDR parameters within the standard Lorentzian (SLO) approach.

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min}-\epsilon_{\max}$ (MeV)	Ref.
^{10}B	5a	21.72 *10*	9.08 *16*	0.441 *8*				0.441 *8*	8.5–24.9	1987Ahs
	5b	22.54 *32*	10.81 *63*	0.518 *26*				0.518 *26*	8.5–24.9	1987Ahs
^{12}C	0	22.79 *7*	3.62 *28*	0.494 *27*				0.494 *27*	14.0–24.9	1963Bur
	0	22.86 *2*	3.61 *7*	0.671 *10*				0.671 *10*	20.1–25.0	1969Bez
	1a	22.87 *6*	3.35 *23*	0.611 *35*				0.611 *35*	21.1–24.0	1975Ahr
	1b	22.85 *8*	3.32 *29*	0.607 *47*				0.607 *47*	21.1–24.0	1975Ahr
	3a	23.07 *5*	3.65 *23*	0.641 *25*				0.641 *25*	21.2–25.0	2002Ish
	3b	23.05 *8*	3.65 *30*	0.640 *38*				0.640 *38*	21.2–25.0	2002Ish
	3a	22.71 *3*	3.21 *9*	0.579 *10*				0.579 *10*	20.1–25.0	2003Var
	3b	22.65 *10*	3.40 *27*	0.589 *39*				0.589 *39*	20.1–25.0	2003Var
^{13}C	3a	24.60 *13*	8.43 *41*	0.868 *22*				0.868 *22*	14.5–29.0	2002Ish
	3b	24.40 *17*	7.70 *63*	0.828 *36*				0.828 *36*	14.5–29.0	2002Ish
^{14}C	3a	15.41 *26*	5.82 *90*	0.333 *47*	26.13 *15*	7.78 *92*	0.483 *46*	0.816 *66*	14.5–30.0	2002Ish
	3b	16.68 *57*	3.10 *67*	0.177 *23*	25.87 *17*	6.84 *84*	0.490 *46*	0.667 *51*	9.0–30.0	2002Ish
^{14}N	0	23.05 *3*	6.95 *13*	1.193 *16*				1.193 *16*	18.2–28.0	1969Bez
	3a	23.39 *8*	4.83 *17*	0.729 *15*				0.729 *15*	15.0–28.0	2002Ish
	3b	23.13 *18*	4.83 *35*	0.725 *47*				0.725 *47*	15.0–28.0	2002Ish
^{15}N	1a	24.68 *1*	1.22 *1*	0.435 *3*				0.435 *3*	9.7–26.5	1989Bat
	1b	24.72 *1*	2.99 *2*	0.554 *2*				0.554 *2*	9.7–26.5	1989Bat
	3a	24.78 *26*	12.82 *63*	1.242 *56*				1.242 *56*	14.5–28.0	2002Ish
	3b	24.96 *39*	12.47 *134*	1.259 *111*				1.259 *111*	14.5–28.0	2002Ish
^{nat}O	2	22.52 *27*	9.89 *111*	1.710 *187*				1.710 *187*	21.8–25.5	1985Ahr
^{16}O	0	23.37 *4*	5.54 *14*	0.957 *19*				0.957 *19*	18.5–26.0	1969Bez
	0	23.70 *4*	5.36 *12*	0.981 *16*				0.981 *16*	18.1–26.0	1975Ahr
	3a	23.71 *7*	3.98 *12*	0.762 *17*				0.762 *17*	18.2–26.0	2002Ish
	3b	23.89 *11*	4.59 *23*	0.820 *29*				0.820 *29*	18.2–26.0	2002Ish
^{17}O	3a	23.40 *10*	5.48 *31*	0.739 *24*				0.739 *24*	18.5–26.5	2002Ish
	3b	23.38 *13*	5.57 *49*	0.740 *36*				0.740 *36*	18.5–26.5	2002Ish
^{18}O	3a	19.08 *14*	2.12 *57*	0.064 *18*	24.10 *16*	5.25 *83*	0.417 *49*	0.481 *52*	18.5–26.0	2002Ish
	3b	16.61 *65*	7.82 *204*	0.263 *64*	24.07 *20*	4.71 *111*	0.337 *71*	0.600 *96*	11.5–26.0	2002Ish
^{19}F	3a	21.91 *34*	12.89 *58*	1.211 *66*				1.211 *66*	10.0–24.5	2002Ish
^{23}Na	0	17.43 *13*	3.10 *42*	0.175 *35*	21.13 *10*	4.51 *52*	0.555 *63*	0.730 *72*	14.2–23.0	1981Ish
	3a	17.45 *15*	3.08 *33*	0.178 *34*	20.98 *12*	4.34 *49*	0.492 *55*	0.670 *65*	14.3–23.0	2002Ish
^{23}Na	3b	17.39 *22*	2.90 *69*	0.161 *48*	20.94 *14*	4.55 *59*	0.519 *71*	0.680 *86*	14.3–23.0	2002Ish
^{24}Mg	3a	19.76 *10*	3.28 *32*	0.467 *49*	22.92 *34*	1.96 *106*	0.118 *77*	0.585 *91*	18.2–23.0	2002Ish
	3b	19.75 *9*	3.41 *35*	0.484 *49*	22.90 *29*	1.80 *90*	0.105 *63*	0.589 *80*	18.2–23.0	2002Ish
	3a	19.74 *5*	2.45 *15*	0.310 *24*	24.51 *12*	6.34 *66*	0.554 *57*	0.864 *62*	16.3–26.0	2003Var
	3b	19.75 *6*	2.82 *19*	0.352 *29*	24.62 *12*	5.84 *75*	0.500 *63*	0.852 *69*	16.3–26.0	2003Var
^{25}Mg	3a	22.06 *10*	6.09 *15*	0.894 *20*				0.894 *20*	9.0–24.2	2002Ish
	3b	22.09 *16*	6.30 *30*	0.902 *34*				0.902 *34*	9.0–24.2	2002Ish
^{26}Mg	3a	17.38 *5*	2.21 *17*	0.151 *11*	23.54 *8*	6.90 *32*	1.098 *40*	1.249 *41*	16.1–26.0	2003Var
	3b	17.37 *12*	1.74 *30*	0.119 *17*	23.50 *9*	7.41 *38*	1.174 *50*	1.293 *53*	16.1–26.0	2003Var
^{27}Al	1a	20.82 *6*	6.60 *17*	1.037 *17*				1.037 *17*	14.2–24.4	1975Ahr
	1b	20.84 *9*	6.73 *30*	1.044 *32*				1.044 *32*	14.2–24.4	1975Ahr
	3a	20.58 *7*	4.46 *11*	0.772 *16*				0.772 *16*	14.2–23.0	2002Ish
	2	20.78 *7*	7.88 *30*	1.180 *32*				1.180 *32*	16.3–25.4	1985Ahr
^{nat}Si	0	20.35 *3*	4.53 *9*	0.871 *18*	25.16 *19*	2.86 *67*	0.112 *25*	0.983 *31*	16.4–25.8	1975Ahr
^{28}Si	3a	19.81 *12*	2.56 *20*	0.371 *73*	21.81 *16*	3.15 *36*	0.474 *89*	0.845 *115*	16.7–23.0	2003Var
	3b	19.73 *21*	2.24 *86*	0.238 *183*	21.56 *36*	4.03 *68*	0.676 *236*	0.914 *299*	16.7–23.0	2003Var
^{29}Si	3a	20.70 *8*	5.60 *17*	0.810 *19*				0.810 *19*	14.2–23.0	2002Ish
	3b	20.73 *12*	5.76 *34*	0.821 *32*				0.821 *32*	14.2–23.0	2002Ish
^{30}Si	3a	20.86 *13*	7.40 *31*	0.767 *27*				0.767 *27*	14.2–23.0	2002Ish
	3b	20.91 *19*	7.51 *58*	0.778 *48*				0.778 *48*	14.2–23.0	2002Ish
^{32}S	3a	21.17 *9*	5.08 *12*	0.967 *25*				0.967 *25*	14.4–23.0	2002Ish
	3b	21.51 *14*	5.67 *30*	1.082 *50*				1.082 *50*	14.4–23.0	2002Ish
^{34}S	3a	20.89 *47*	9.61 *77*	1.501 *149*				1.501 *149*	12.0–25.0	1986Ass
	3b	20.89 *47*	9.61 *77*	1.501 *149*				1.501 *149*	12.0–25.0	1986Ass
	3a	21.13 *10*	12.58 *36*	1.755 *41*				1.755 *41*	14.1–25.1	2003Var
	3b	21.57 *19*	11.07 *63*	1.652 *82*				1.652 *82*	12.3–25.1	2003Var
^{nat}S	13	20.31 *10*	5.48 *37*	0.858 *44*				0.858 *44*	17.2–23.6	1965Wyc
^{40}Ar	3a	19.86 *15*	9.12 *31*	1.372 *36*				1.372 *36*	10.5–25.0	2002Ish
	3b	20.12 *37*	10.65 *87*	1.471 *103*				1.471 *103*	10.5–25.0	2002Ish
^{nat}Ar	1a	20.47 *20*	9.44 *62*	1.080 *45*				1.080 *45*	16.5–27.5	1960Fas
	1b	20.53 *62*	10.55 *209*	1.144 *190*				1.144 *190*	16.5–27.5	1960Fas
^{nat}K	4	21.12 *2*	6.89 *8*	0.418 *4*				0.418 *4*	16.0–25.9	1974Ve1
^{nat}Ca	1a	20.23 *2*	5.03 *6*	1.225 *10*				1.225 *10*	13.5–25.9	1975Ahr
	1b	20.22 *2*	5.03 *6*	1.226 *10*				1.226 *10*	13.5–25.9	1975Ahr
	2	19.98 *4*	4.82 *11*	1.128 *19*				1.128 *19*	9.4–24.0	1985Ahr
^{40}Ca	3a	19.96 *9*	5.52 *29*	1.286 *46*				1.286 *46*	18.2–24.0	2003Er
	3b	19.92 *14*	5.51 *46*	1.286 *85*				1.286 *85*	18.2–24.0	2003Er
^{42}Ca	3a	20.11 *10*	8.07 *40*	1.455 *50*				1.455 *50*	15.2–23.0	2003Er
	3b	20.23 *16*	7.63 *68*	1.426 *101*				1.426 *101*	15.2–23.0	2003Er

(*continued on next page*)

Table 1 (*continued*)

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min}-\epsilon_{\max}$ (MeV)	Ref.
^{44}Ca	3a	19.60 *18*	11.33 *76*	1.732 *78*				1.732 *78*	15.5–26.0	2003Er
	3b	19.95 *33*	10.39 *97*	1.603 *123*				1.603 *123*	12.5–26.0	2003Er
^{48}Ca	0	19.70 *14*	6.23 *90*	1.474 *180*				1.474 *180*	17.9–21.6	1987O'k
	3a	19.75 *13*	7.11 *55*	1.353 *66*				1.353 *66*	15.5–23.0	2003Er
	3b	19.62 *22*	6.60 *85*	1.293 *128*				1.293 *128*	15.5–23.0	2003Er
^{46}Ti	3a	19.96 *8*	6.92 *19*	1.246 *22*				1.246 *22*	13.2–25.0	2002Ish
	3b	19.79 *20*	7.54 *52*	1.282 *73*				1.282 *73*	13.2–25.0	2002Ish
^{48}Ti	3a	19.78 *17*	8.42 *53*	1.179 *56*				1.179 *56*	14.5–23.0	2002Ish
	3b	19.90 *38*	9.21 *124*	1.248 *150*				1.248 *150*	14.5–23.0	2002Ish
^{51}V	3a	17.71 *13*	3.46 *114*	0.279 *179*	22.03 *59*	11.41 *185*	1.739 *392*	2.018 *431*	15.2–25.0	2003Var
	3b	17.76 *23*	4.08 *152*	0.447 *349*	22.37 *60*	8.83 *473*	1.292 *827*	1.739 *898*	15.2–25.0	2003Var
	4	17.90 *6*	4.55 *14*	0.569 *36*	21.26 *13*	4.37 *76*	0.239 *52*	0.808 *63*	14.1–22.9	1962Fu1
^{52}Cr	3a	19.16 *7*	6.19 *20*	1.020 *22*				1.020 *22*	14.3–23.0	2002Ish
	3b	19.24 *18*	6.88 *51*	1.068 *66*				1.068 *66*	14.3–23.0	2002Ish
^{55}Mn	4	16.43 *6*	2.95 *32*	0.153 *31*	19.77 *17*	8.61 *43*	0.860 *59*	1.013 *67*	14.0–23.0	1979Al2
^{nat}Fe	0	11.89 *14*	1.01 *66*	0.161 *49*	17.46 *46*	6.93 *149*	1.053 *175*	1.214 *182*	10.0–24.0	1969Dob
	13a	17.76 *4*	6.03 *12*	0.711 *12*				0.711 *12*	13.2–24.0	1967Cos
	13b	17.59 *6*	7.07 *22*	0.817 *23*				0.817 *23*	13.2–24.0	1967Cos
^{54}Fe	0	19.35 *8*	5.50 *28*	1.570 *49*				1.570 *49*	16.0–23.0	1978Nor
^{59}Co	1a	16.68 *18*	0.59 *114*	0.024 *21*	18.88 *31*	7.92 *85*	1.195 *97*	1.219 *99*	14.5–21.0	1965Wyc
	1b	16.67 *29*	0.60 *171*	0.023 *31*	18.78 *51*	7.62 *128*	1.157 *179*	1.180 *182*	14.5–21.0	1965Wyc
	8	16.43 *7*	2.73 *37*	0.138 *39*	18.64 *20*	7.31 *31*	0.747 *52*	0.885 *65*	14.0–20.9	1979Al2
^{58}Ni	3a	18.98 *10*	6.50 *32*	0.987 *32*				0.987 *32*	14.4–22.0	2002Ish
	3b	18.74 *20*	6.18 *63*	0.945 *78*				0.945 *78*	14.4–22.0	2002Ish
	3a	18.78 *5*	5.57 *15*	0.885 *14*				0.885 *14*	14.1–22.0	2003Var
	3b	18.66 *10*	5.50 *30*	0.873 *38*				0.873 *38*	14.1–22.0	2003Var
	4	18.26 *6*	6.95 *17*	0.294 *6*				0.294 *6*	12.2–21.8	1974Fu3
^{60}Ni	3a	16.99 *15*	2.88 *31*	0.196 *51*	19.19 *16*	4.21 *25*	0.523 *60*	0.719 *79*	12.2–21.0	2003Var
	3b	16.78 *7*	0.91 *29*	0.039 *14*	18.75 *13*	4.85 *22*	0.729 *33*	0.768 *36*	12.2–21.0	2003Var
	4	16.30 *9*	2.45 *70*	0.147 *85*	18.49 *39*	6.26 *48*	0.592 *120*	0.739 *147*	14.0–20.9	1974Fu3
	4	16.39 *2*	0.41 *4*	0.019 *2*	18.35 *3*	6.55 *9*	0.768 *8*	0.787 *8*	14.1–22.0	1970Gor
^{63}Cu	3a	16.43 *28*	4.84 *72*	0.646 *213*	20.15 *34*	5.52 *289*	0.456 *333*	1.102 *395*	14.0–21.0	2003Var
	3b	16.35 *64*	4.59 *257*	0.566 *742*	20.12 *101*	6.75 *1042*	0.602 *1362*	1.168 *1551*	14.0–21.0	2003Var
	6	16.72 *10*	4.17 *16*	0.460 *42*	19.08 *15*	3.43 *40*	0.166 *41*	0.626 *59*	14.0–21.0	1968Su1
	4	16.25 *10*	4.64 *31*	0.469 *53*	19.62 *19*	4.47 *120*	0.191 *69*	0.660 *87*	14.2–20.7	1964Fu1
^{65}Cu	3a	16.92 *7*	8.09 *38*	1.139 *37*				1.139 *37*	14.2–21.0	2003Var
	3b	16.85 *26*	7.46 *119*	1.079 *154*				1.079 *154*	14.2–21.0	2003Var
	4	16.68 *6*	6.78 *27*	0.822 *27*				0.822 *27*	14.2–19.9	1964Fu1
^{64}Zn	8	16.23 *13*	3.25 *48*	0.220 *74*	19.16 *25*	5.91 *89*	0.533 *119*	0.753 *140*	14.0–20.8	1976Ca1
^{65}Zn	1a	16.17 *11*	3.06 *44*	0.173 *47*	19.04 *21*	6.50 *34*	0.585 *62*	0.758 *78*	12.0–21.0	2003Rod
	1b	16.21 *22*	3.32 *97*	0.208 *127*	19.16 *45*	6.12 *126*	0.529 *188*	0.737 *227*	12.0–21.0	2003Rod
^{70}Ge	0	15.16 *18*	5.92 *45*	1.432 *81*				1.432 *81*	10.0–20.0	1975Mcc
	8	16.76 *8*	7.55 *34*	1.006 *35*				1.006 *35*	13.1–20.8	1976Ca1
^{72}Ge	0	17.88 *16*	5.71 *39*	1.409 *70*				1.409 *70*	10.0–24.0	1975Mcc
	8	16.63 *6*	7.48 *25*	1.173 *30*				1.173 *30*	13.1–20.8	1976Ca1
^{74}Ge	8	14.51 *11*	2.01 *81*	0.074 *55*	17.03 *27*	7.97 *49*	1.158 *108*	1.232 *121*	13.1–20.8	1976Ca1
^{76}Ge	0	16.40 *16*	7.04 *43*	1.140 *108*	24.63 *107*	10.86 *346*	0.748 *296*	1.888 *315*	10.0–24.0	1975Mcc
	8	15.48 *38*	4.37 *211*	0.381 *462*	18.87 *228*	10.99 *242*	1.104 *595*	1.485 *753*	13.1–20.8	1976Ca1
^{75}As	4	14.98 *13*	3.66 *53*	0.217 *82*	17.59 *28*	7.12 *39*	0.760 *109*	0.977 *136*	13.1–20.9	1969Be1
	8	15.19 *29*	4.43 *102*	0.419 *273*	18.12 *80*	7.66 *126*	0.819 *353*	1.238 *446*	13.1–20.8	1976Ca1
^{76}Se	0	15.67 *8*	6.33 *32*	1.337 *50*				1.337 *50*	13.1–19.7	1978Gur
	8	16.69 *8*	9.38 *40*	1.398 *48*				1.398 *48*	13.1–20.8	1976Ca1
^{78}Se	8	14.97 *16*	3.91 *61*	0.376 *113*	18.42 *28*	6.19 *100*	0.671 *161*	1.047 *197*	13.1–20.8	1976Ca1
^{80}Se	8	16.16 *11*	5.51 *36*	1.004 *63*				1.004 *63*	13.1–17.0	1976Ca1
^{82}Se	0	16.00 *5*	5.68 *21*	1.308 *35*				1.308 *35*	13.1–19.9	1978Gur
	8	16.63 *5*	5.80 *17*	1.125 *24*				1.125 *24*	13.1–20.8	1976Ca1
^{89}Y	3a	16.80 *6*	4.49 *28*	1.253 *55*				1.253 *55*	15.3–19.0	2003Var
	3b	16.80 *22*	4.50 *101*	1.255 *255*				1.255 *255*	15.3–19.0	2003Var
	4	16.74 *1*	4.23 *3*	1.135 *7*				1.135 *7*	14.0–19.0	1971Le1
	4	16.78 *1*	3.92 *2*	0.861 *3*				0.861 *3*	14.0–18.9	1967Be2
	12	16.83 *3*	3.68 *8*	0.893 *16*				0.893 *16*	14.0–18.1	1972Yo
^{90}Zr	3a	16.82 *5*	3.99 *23*	1.192 *47*				1.192 *47*	14.9–18.5	2003Var
	3b	16.79 *15*	3.85 *62*	1.164 *164*				1.164 *164*	14.9–18.5	2003Var
	4	16.84 *1*	3.99 *3*	0.861 *5*				0.861 *5*	14.0–18.9	1967Be2
	8	16.73 *1*	4.14 *3*	1.025 *6*				1.025 *6*	14.0–19.0	1971Le1
^{91}Zr	4	16.58 *2*	4.17 *7*	0.892 *10*				0.892 *10*	14.0–18.9	1967Be2
^{92}Zr	4	16.26 *2*	4.64 *9*	0.885 *12*				0.885 *12*	14.0–18.9	1967Be2
^{94}Zr	4	16.21 *2*	5.25 *11*	0.956 *15*				0.956 *15*	14.0–18.9	1967Be2
^{nat}Zr	8	16.51 *3*	4.37 *15*	0.890 *23*				0.890 *23*	14.9–19.0	1987Ber
^{93}Nb	8	16.58 *1*	4.95 *6*	1.132 *10*				1.132 *10*	14.0–19.0	1971Le1
^{92}Mo	3a	17.16 *6*	4.68 *22*	1.287 *42*				1.287 *42*	14.4–19.0	2003Var
	3b	17.10 *14*	4.34 *55*	1.227 *135*				1.227 *135*	14.4–19.0	2003Var
^{92}Mo	4	16.82 *1*	4.11 *4*	0.756 *5*				0.756 *5*	14.0–18.9	1974Be3

(*continued on next page*)

Table 1 (*continued*)

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{min} - \epsilon_{max}$ (MeV)	Ref.
^{94}Mo	4	16.53 *2*	5.12 *5*	1.113 *8*				1.113 *8*	9.6–18.9	1974Be3
^{96}Mo	4	16.11 *4*	5.64 *15*	1.155 *29*				1.155 *29*	13.2–17.0	1974Be3
^{98}Mo	4	15.79 *3*	5.90 *16*	1.211 *24*				1.211 *24*	13.2–18.9	1974Be3
^{100}Mo	9	15.72 *3*	7.68 *14*	1.404 *19*				1.404 *19*	12.1–20.0	1974Be3
^{103}Rh	3a	16.24 *7*	7.49 *39*	1.486 *57*				1.486 *57*	13.1–19.0	2003Var
	3b	16.23 *17*	7.60 *81*	1.500 *138*				1.500 *138*	13.1–19.0	2003Var
	4	16.14 *3*	7.22 *17*	1.414 *26*				1.414 *26*	13.2–18.9	1974Le1
^{107}Ag	4	15.83 *4*	6.49 *12*	1.193 *17*				1.193 *17*	9.5–19.0	1969Ish
	4	15.89 *4*	6.65 *18*	0.986 *23*				0.986 *23*	13.1–18.7	1969Be1
^{109}Ag	4	13.54 *19*	3.49 *167*	0.275 *165*	16.62 *18*	4.41 *46*	0.490 *124*	0.765 *206*	13.1–19.0	1969Ish
^{115}In	4	15.63 *1*	5.22 *5*	1.285 *10*				1.285 *10*	13.1–17.8	1969Fu1
	4	15.72 *1*	5.57 *6*	1.273 *10*				1.273 *10*	13.2–17.8	1974Le1
^{116}Sn	4	15.55 *1*	5.06 *6*	1.254 *11*				1.254 *11*	13.1–17.9	1974Le1
	4	15.67 *2*	4.17 *7*	1.017 *11*				1.017 *11*	13.0–18.0	1969Fu1
^{117}Sn	4	15.64 *2*	5.02 *9*	1.181 *17*				1.181 *17*	13.2–17.8	1974Le1
	4	15.65 *1*	5.00 *6*	1.153 *9*				1.153 *9*	13.1–17.9	1969Fu1
^{118}Sn	4	15.43 *1*	4.84 *6*	1.221 *11*				1.221 *11*	13.1–17.9	1974Le1
	4	15.59 *1*	4.75 *4*	1.097 *7*				1.097 *7*	13.1–17.9	1969Fu1
^{119}Sn	4	15.53 *2*	4.78 *6*	1.085 *11*				1.085 *11*	13.0–17.9	1969Fu1
^{120}Sn	4	15.37 *1*	5.08 *6*	1.295 *12*				1.295 *12*	13.1–17.9	1974Le1
	4	15.40 *1*	4.86 *4*	1.219 *8*				1.219 *8*	13.1–17.9	1969Fu1
^{124}Sn	3a	15.31 *5*	4.94 *22*	1.173 *34*				1.173 *34*	13.1–18.0	2003Var
	3b	15.29 *8*	4.86 *36*	1.162 *66*				1.162 *66*	13.1–18.0	2003Var
	4	15.27 *2*	4.77 *8*	1.150 *14*				1.150 *14*	13.2–17.8	1974Le1
	4	15.18 *2*	4.79 *7*	1.183 *14*				1.183 *14*	13.1–17.8	1969Fu1
^{124}Te	6	15.23 *2*	5.50 *8*	1.337 *15*				1.337 *15*	12.0–18.9	1976Le2
^{126}Te	6	15.15 *2*	5.36 *7*	1.358 *13*				1.358 *13*	12.0–18.9	1976Le2
^{128}Te	6	15.12 *2*	5.30 *8*	1.367 *14*				1.367 *14*	12.0–18.9	1976Le2
^{130}Te	6	15.11 *2*	4.98 *7*	1.334 *13*				1.334 *13*	12.0–18.9	1976Le2
^{127}I	4	14.59 *30*	4.12 *58*	0.856 *358*	16.74 *78*	4.73 *121*	0.445 *377*	1.301 *520*	12.1–19.8	1969Be6
	4	13.91 *9*	1.10 *63*	0.052 *38*	15.20 *10*	4.73 *10*	1.088 *49*	1.140 *62*	12.2–20.0	1989Ras
	4	14.25 *15*	3.28 *39*	0.340 *122*	16.30 *30*	5.15 *34*	0.632 *142*	0.972 *187*	12.1–19.9	1966Br1
	8	14.61 *20*	2.62 *104*	0.163 *196*	15.72 *50*	6.19 *115*	1.012 *142*	1.175 *243*	12.1–16.9	1987Ber
^{133}Cs	4	15.33 *1*	5.28 *2*	1.351 *4*				1.351 *4*	12.0–19.0	1974Le1
	4	15.24 *2*	4.97 *8*	1.155 *12*				1.155 *12*	12.1–18.7	1969Be1
^{138}Ba	4	15.25 *1*	4.58 *5*	1.176 *9*				1.176 *9*	12.1–18.7	1970Be8
^{139}La	4	15.11 *1*	3.96 *4*	1.045 *7*				1.045 *7*	12.0–18.9	1971Be4
^{140}Ce	6	15.03 *1*	4.39 *4*	1.292 *9*				1.292 *9*	12.0–18.9	1976Le2
^{142}Ce	6	14.85 *2*	5.08 *8*	1.284 *15*				1.284 *15*	12.0–18.9	1976Le2
^{141}Pr	4	15.14 *2*	4.40 *6*	1.083 *10*				1.083 *10*	12.1–18.7	1966Br1
	4	15.39 *2*	3.80 *6*	1.039 *12*				1.039 *12*	12.0–18.9	1972De1
	4	15.19 *1*	4.23 *8*	1.106 *18*				1.106 *18*	12.1–16.9	1987Ber
	12	15.23 *1*	3.98 *4*	1.031 *7*				1.031 *7*	12.1–19.0	1970Su1
	12	15.04 *1*	4.47 *3*	1.179 *5*				1.179 *5*	12.0–16.9	1971Be4
	12	15.35 *2*	4.05 *4*	1.021 *8*				1.021 *8*	12.0–18.1	1972Yo
^{142}Nd	3a	14.93 *3*	4.54 *12*	1.229 *17*				1.229 *17*	12.0–19.0	2003Var
	3b	14.94 *11*	4.52 *35*	1.227 *76*				1.227 *76*	12.0–19.0	2003Var
	4	14.94 *1*	4.41 *3*	1.195 *7*				1.195 *7*	12.0–18.9	1971Ca1
^{143}Nd	4	15.00 *2*	4.73 *8*	1.236 *14*				1.236 *14*	12.0–19.0	1971Ca1
^{144}Nd	4	15.04 *2*	5.25 *7*	1.239 *12*				1.239 *12*	12.0–18.9	1971Ca1
^{145}Nd	4	14.94 *4*	6.27 *18*	1.378 *28*				1.378 *28*	12.0–18.9	1971Ca1
^{146}Nd	4	14.73 *2*	5.74 *10*	1.314 *17*				1.314 *17*	12.0–18.9	1971Ca1
^{148}Nd	4	12.78 *26*	4.03 *69*	0.326 *126*	15.49 *19*	5.22 *39*	0.827 *143*	1.153 *191*	10.8–18.6	1971Ca1
^{150}Nd	4	12.30 *6*	3.38 *26*	0.432 *46*	16.03 *9*	5.12 *31*	0.821 *62*	1.253 *77*	10.8–18.6	1971Ca1
^{144}Sm	4	15.31 *2*	4.42 *7*	1.251 *13*				1.251 *13*	12.1–18.9	1974Ca5
^{148}Sm	4	14.82 *1*	5.06 *5*	1.242 *9*				1.242 *9*	12.1–18.9	1974Ca5
^{150}Sm	4	14.59 *3*	5.92 *11*	1.324 *18*				1.324 *18*	12.1–18.9	1974Ca5
^{152}Sm	4	12.39 *3*	2.99 *12*	0.377 *21*	15.73 *4*	5.15 *13*	0.853 *28*	1.230 *35*	10.9–18.8	1974Ca5
^{154}Sm	0	12.17 *20*	2.80 *95*	0.360 *187*	15.63 *49*	5.89 *151*	0.873 *286*	1.233 *342*	10.9–18.6	1981Gur
	4	12.27 *3*	2.97 *15*	0.381 *26*	15.94 *6*	5.62 *20*	0.845 *37*	1.226 *45*	11.0–18.6	1974Ca5
^{153}Eu	4	12.33 *4*	2.77 *17*	0.305 *27*	15.78 *7*	5.76 *19*	0.892 *40*	1.197 *48*	10.9–18.7	1969Be8
^{156}Gd	0	12.46 *19*	3.14 *74*	0.501 *162*	15.79 *32*	4.56 *100*	0.683 *201*	1.184 *258*	10.9–18.7	1981Gur
^{160}Gd	3a	12.28 *10*	3.33 *42*	0.532 *83*	16.06 *15*	5.12 *42*	0.863 *97*	1.395 *128*	10.9–18.8	2003Var
	3b	12.26 *12*	3.27 *60*	0.513 *123*	16.03 *20*	5.32 *79*	0.897 *167*	1.410 *207*	10.9–18.8	2003Var
	4	12.23 *5*	2.78 *23*	0.409 *38*	15.95 *8*	5.23 *26*	0.822 *50*	1.231 *63*	10.9–18.7	1969Be8
^{159}Tb	4	12.42 *4*	2.71 *14*	0.317 *28*	15.86 *6*	5.98 *20*	1.205 *46*	1.522 *54*	11.1–19.0	1976Gor
	4	12.22 *4*	2.65 *17*	0.327 *28*	15.66 *7*	4.91 *28*	0.731 *45*	1.058 *53*	10.8–18.7	1964Br1
	4	12.08 *5*	2.97 *25*	0.397 *40*	15.87 *7*	5.06 *27*	0.848 *53*	1.245 *66*	11.0–18.7	1968Be5
^{165}Ho	0	12.38 *11*	2.59 *56*	0.376 *94*	15.48 *21*	4.05 *70*	0.604 *122*	0.980 *154*	11.1–18.7	1981Gur
	4	12.28 *2*	2.58 *9*	0.365 *16*	15.78 *3*	4.94 *13*	0.793 *23*	1.158 *28*	10.9–18.7	1969Be8
	4	12.01 *3*	2.50 *17*	0.394 *34*	15.58 *7*	5.08 *22*	0.968 *47*	1.362 *58*	11.0–18.7	1968Be5
^{168}Er	0	12.09 *25*	3.66 *129*	0.562 *242*	15.54 *27*	3.99 *85*	0.652 *221*	1.214 *328*	10.9–18.8	1981Gur

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Table 1 (*continued*)

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min} - \epsilon_{\max}$ (MeV)	Ref.
^{174}Yb	0	12.50 *19*	3.41 *65*	0.724 *189*	15.68 *25*	3.74 *72*	0.683 *196*	1.407 *272*	10.9–18.7	1981Gur
^{175}Lu	4	12.32 *6*	2.59 *28*	0.351 *50*	15.47 *10*	4.64 *31*	0.820 *68*	1.171 *84*	11.0–18.7	1969Be6
^{176}Hf	4	12.34 *3*	2.77 *13*	0.476 *28*	15.67 *6*	4.72 *17*	0.799 *38*	1.275 *47*	10.9–17.9	1977Gor
^{178}Hf	0	12.42 *21*	4.89 *76*	1.086 *208*	15.70 *19*	3.13 *61*	0.449 *150*	1.535 *256*	10.8–18.6	1981Gur
	4	12.44 *4*	2.89 *15*	0.534 *34*	15.78 *6*	4.05 *18*	0.683 *40*	1.217 *52*	11.0–17.9	1977Gor
^{180}Hf	0	12.55 *30*	4.71 *100*	1.004 *281*	15.61 *23*	3.27 *80*	0.482 *217*	1.486 *355*	10.8–18.7	1981Gur
	4	12.46 *3*	2.68 *11*	0.498 *23*	15.75 *4*	3.78 *13*	0.654 *26*	1.152 *35*	11.0–17.9	1977Gor
^{181}Ta	0	12.19 *29*	2.93 *113*	0.462 *297*	14.99 *53*	5.13 *88*	0.979 *347*	1.441 *457*	10.8–18.6	1981Gur
	3a	12.30 *8*	2.44 *22*	0.372 *52*	15.20 *12*	4.51 *23*	0.918 *66*	1.290 *84*	10.0–18.8	2003Var
	3b	12.32 *13*	2.56 *48*	0.388 *110*	15.23 *20*	4.54 *66*	0.907 *165*	1.295 *198*	10.0–18.8	2003Var
	4	12.31 *5*	2.50 *20*	0.392 *42*	15.24 *7*	4.41 *20*	0.892 *53*	1.284 *68*	11.0–18.7	1968Be5
	4	12.54 *5*	1.75 *23*	0.156 *36*	14.89 *14*	5.03 *34*	0.839 *67*	0.995 *76*	10.8–18.7	1963Br1
^{182}W	0	11.98 *37*	3.91 *199*	0.662 *515*	14.94 *61*	5.16 *136*	0.798 *497*	1.460 *716*	11.0–18.8	1981Gur
	4	12.64 *4*	2.60 *11*	0.446 *31*	15.45 *7*	4.66 *13*	0.916 *41*	1.362 *51*	10.8–18.6	1978Gor
^{184}W	0	11.92 *27*	4.52 *167*	0.930 *432*	15.05 *29*	3.87 *110*	0.534 *319*	1.464 *537*	11.0–17.6	1981Gur
	4	12.48 *4*	2.38 *14*	0.363 *35*	15.17 *7*	4.80 *12*	1.023 *45*	1.386 *57*	10.8–18.6	1978Gor
^{186}W	0	13.04 *30*	6.60 *56*	1.591 *202*	14.89 *41*	2.12 *202*	0.086 *134*	1.677 *242*	10.9–18.7	1981Gur
	4	12.59 *3*	2.32 *14*	0.292 *34*	14.89 *8*	5.10 *14*	0.989 *48*	1.281 *59*	10.9–18.7	1969Be8
	4	12.58 *5*	2.53 *16*	0.379 *42*	15.07 *8*	4.72 *15*	0.988 *55*	1.367 *69*	11.0–17.8	1978Gor
^{186}Os	7	13.04 *11*	3.14 *28*	0.570 *91*	15.27 *12*	3.33 *27*	0.575 *93*	1.145 *130*	11.1–18.7	1979Be4
^{188}Os	9	12.81 *6*	2.77 *15*	0.419 *55*	14.88 *8*	4.15 *15*	0.929 *67*	1.348 *87*	10.8–18.7	1979Be4
^{189}Os	9	12.64 *6*	2.60 *14*	0.373 *48*	14.63 *7*	3.78 *14*	0.884 *60*	1.257 *77*	10.8–18.7	1979Be4
^{190}Os	9	12.64 *9*	2.53 *25*	0.283 *76*	14.36 *11*	4.17 *13*	0.981 *90*	1.264 *118*	10.8–18.7	1979Be4
^{192}Os	9	12.64 *9*	2.53 *25*	0.281 *76*	14.36 *11*	4.17 *13*	0.974 *89*	1.255 *117*	10.8–18.7	1979Be4
^{191}Ir	4	12.72 *10*	2.08 *73*	0.217 *167*	14.21 *32*	5.27 *27*	1.148 *208*	1.365 *267*	11.0–16.8	1978Gor
^{193}Ir	4	12.86 *6*	1.90 *37*	0.247 *92*	14.30 *22*	5.62 *29*	1.132 *110*	1.379 *143*	11.0–16.8	1978Gor
^{194}Pt	4	13.42 *7*	3.61 *20*	0.918 *128*	15.97 *63*	6.16 *95*	0.386 *159*	1.304 *204*	11.0–17.8	1978Gor
^{195}Pt	4	12.99 *15*	2.92 *49*	0.584 *286*	14.90 *66*	4.85 *91*	0.689 *355*	1.273 *456*	11.0–17.8	1978Gor
^{196}Pt	4	13.28 *4*	3.10 *27*	0.597 *126*	14.81 *40*	7.51 *42*	0.808 *143*	1.405 *191*	11.0–17.8	1978Gor
^{198}Pt	4	13.31 *4*	3.88 *6*	1.141 *27*	16.12 *10*	2.77 *35*	0.152 *27*	1.293 *38*	8.0–17.8	1978Gor
^{197}Au	0	13.58 *7*	5.32 *28*	1.539 *61*				1.539 *61*	11.1–17.0	1981Gur
	4	13.71 *2*	4.51 *7*	1.354 *16*				1.354 *16*	11.0–16.8	1970Ve1
	4	13.83 *3*	3.84 *8*	1.170 *19*				1.170 *19*	11.1–16.8	1962Fu2
	8	13.71 *3*	4.88 *14*	1.345 *32*				1.345 *32*	12.1–16.9	1987Ber
^{206}Pb	4	13.58 *1*	3.83 *5*	1.041 *8*				1.041 *8*	10.0–17.0	1964Ha2
^{207}Pb	4	13.55 *2*	3.95 *5*	1.002 *8*				1.002 *8*	10.0–17.0	1964Ha2
^{208}Pb	3a	13.37 *3*	3.93 *8*	1.337 *16*				1.337 *16*	10.9–18.8	2003Var
	3b	13.41 *7*	3.97 *19*	1.342 *45*				1.342 *45*	10.9–18.8	2003Var
	4	13.42 *2*	4.14 *4*	1.368 *11*				1.368 *11*	10.2–16.8	1970Ve1
	4	13.45 *1*	3.89 *4*	1.004 *7*				1.004 *7*	10.0–17.0	1964Ha2
	12	13.63 *2*	3.93 *5*	1.334 *13*				1.334 *13*	10.0–14.9	1972Yo
^{nat}Pb	8	13.57 *2*	3.78 *9*	1.227 *24*				1.227 *24*	12.1–16.9	1987Ber
^{209}Bi	0	13.79 *8*	5.02 *29*	1.546 *64*				1.546 *64*	10.9–18.3	1976Gur
	4	13.44 *1*	3.96 *4*	1.077 *6*				1.077 *6*	10.0–17.0	1964Ha2
	12	13.56 *1*	3.72 *4*	1.259 *10*				1.259 *10*	10.0–14.8	1972Yo
^{232}Th	0	10.37 *209*	3.57 *430*	0.470 *905*	13.75 *34*	4.66 *95*	0.804 *454*	1.274 *1012*	11.0–18.3	1976Gur
	4	11.27 *36*	4.34 *106*	0.588 *252*	14.18 *28*	4.43 *98*	0.636 *264*	1.224 *365*	9.2–16.3	1973Ve1
	10	11.04 *2*	2.71 *7*	0.394 *23*	13.87 *4*	4.73 *15*	1.005 *37*	1.399 *44*	9.4–17.8	1980Ca1
^{233}U	11	11.10 *2*	1.78 *7*	0.263 *17*	13.97 *3*	5.26 *6*	2.370 *29*	2.633 *34*	9.4–17.8	1986Be2
^{234}U	11	11.08 *5*	2.20 *19*	0.530 *59*	14.23 *5*	4.43 *19*	1.775 *79*	2.305 *99*	9.4–17.8	1986Be2
^{235}U	0	11.11 *13*	1.12 *53*	0.128 *72*	13.41 *20*	4.98 *45*	0.992 *103*	1.120 *126*	11.0–18.4	1976Gur
^{236}U	10	10.93 *3*	2.58 *11*	0.335 *24*	13.80 *6*	4.78 *14*	0.915 *35*	1.250 *42*	9.4–17.8	1980Ca1
^{238}U	0	11.21 *22*	1.99 *93*	0.249 *140*	14.13 *22*	4.97 *50*	0.871 *130*	1.120 *191*	11.1–18.8	1976Gur
	4	10.94 *4*	2.64 *14*	0.364 *28*	13.99 *6*	4.56 *18*	0.803 *40*	1.167 *49*	9.1–17.8	1973Ve1
^{237}Np	10	11.01 *25*	2.92 *89*	0.343 *170*	14.10 *32*	4.76 *112*	0.863 *252*	1.206 *304*	9.2–16.6	1973Ve1
	10	10.98 *5*	2.17 *16*	0.312 *38*	14.06 *9*	4.64 *27*	1.160 *65*	1.472 *75*	9.4–17.8	1986Be2
^{239}Pu	0	10.60 *131*	4.18 *518*	0.502 *893*	14.00 *58*	5.44 *127*	0.842 *612*	1.344 *1083*	11.0–18.7	1976Gur
	10	11.31 *10*	2.48 *21*	0.385 *76*	13.90 *22*	4.36 *43*	0.766 *105*	1.151 *130*	9.1–17.8	1986Be2

Table 2
Experimental values and uncertainties of GDR parameters within the modified Lorentzian (SMLO) approach.

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min}-\epsilon_{\max}$ (MeV)	Ref.
^{10}B	5a	23.31 *22*	17.51 *44*	0.755 *25*				0.755 *25*	8.5–24.9	1987Ahs
	5b	24.96 *92*	22.20 *233*	0.967 *122*				0.967 *122*	8.5–24.9	1987Ahs
^{12}C	0	22.82 *7*	3.71 *31*	0.504 *29*				0.504 *29*	14.0–24.9	1963Bur
	0	22.90 *2*	3.69 *7*	0.683 *11*				0.683 *11*	20.1–25.0	1969Bez
	1a	22.91 *7*	3.44 *24*	0.625 *38*				0.625 *38*	21.1–24.0	1975Ahr
	1b	22.90 *9*	3.41 *30*	0.622 *50*				0.622 *50*	21.1–24.0	1975Ahr
	3a	23.10 *6*	3.69 *23*	0.646 *26*				0.646 *26*	21.2–25.0	2002Ish
	3b	23.09 *8*	3.69 *31*	0.647 *39*				0.647 *39*	21.2–25.0	2002Ish
	3a	22.70 *3*	3.27 *10*	0.588 *10*				0.588 *10*	20.1–25.0	2003Var
	3b	22.67 *10*	3.46 *28*	0.598 *41*				0.598 *41*	20.1–25.0	2003Var
^{13}C	3a	25.02 *21*	10.72 *64*	1.012 *40*				1.012 *40*	14.5–29.0	2002Ish
	3b	24.54 *21*	8.63 *82*	0.901 *49*				0.901 *49*	14.5–29.0	2002Ish
^{14}C	3a	15.69 *22*	6.51 *114*	0.381 *55*	26.27 *16*	7.11 *104*	0.420 *53*	0.801 *76*	14.5–30.0	2002Ish
	3b	16.17 *40*	3.80 *62*	0.251 *27*	26.07 *19*	7.05 *117*	0.475 *61*	0.726 *67*	9.0–30.0	2002Ish
^{14}N	0	23.19 *3*	7.09 *14*	1.217 *18*				1.217 *18*	18.2–28.0	1969Bez
	3a	23.36 *9*	5.68 *20*	0.808 *18*				0.808 *18*	15.0–28.0	2002Ish
	3b	23.29 *21*	5.88 *45*	0.809 *58*				0.809 *58*	15.0–28.0	2002Ish
^{15}N	1a	24.58 *1*	1.96 *2*	0.514 *2*				0.514 *2*	9.7–26.5	1989Bat
	1b	25.04 *1*	5.14 *4*	0.718 *4*				0.718 *4*	9.7–26.5	1989Bat
	3a	26.29 *57*	19.45 *144*	1.752 *149*				1.752 *149*	14.5–28.0	2002Ish
	3b	26.35 *90*	18.54 *287*	1.756 *277*				1.756 *277*	14.5–28.0	2002Ish
^{nat}O	2	23.03 *17*	10.03 *122*	1.717 *191*				1.717 *191*	21.8–25.5	1985Ahr
^{16}O	0	23.45 *5*	5.72 *15*	0.983 *22*				0.983 *22*	18.5–26.0	1969Bez
	0	23.78 *4*	5.67 *13*	1.028 *19*				1.028 *19*	18.1–26.0	1975Ahr
	3a	23.72 *8*	4.36 *14*	0.822 *20*				0.822 *20*	18.2–26.0	2002Ish
	3b	23.91 *13*	4.98 *26*	0.882 *35*				0.882 *35*	18.2–26.0	2002Ish
^{17}O	3a	23.46 *11*	5.95 *37*	0.783 *29*				0.783 *29*	18.5–26.5	2002Ish
	3b	23.42 *15*	5.87 *55*	0.774 *42*				0.774 *42*	18.5–26.5	2002Ish
^{18}O	3a	19.12 *13*	2.31 *61*	0.075 *20*	24.19 *18*	5.24 *87*	0.413 *54*	0.488 *58*	18.5–26.0	2002Ish
	3b	17.44 *125*	10.80 *389*	0.372 *136*	24.08 *21*	4.12 *114*	0.278 *76*	0.650 *156*	11.5–26.0	2002Ish
^{19}F	3a	24.63 *90*	26.14 *226*	2.202 *268*				2.202 *268*	10.0–24.5	2002Ish
^{23}Na	0	17.57 *17*	3.75 *45*	0.233 *41*	21.26 *10*	4.35 *54*	0.505 *66*	0.738 *78*	14.2–23.0	1981Ish
	3a	17.61 *20*	3.83 *35*	0.241 *42*	21.11 *11*	4.18 *57*	0.440 *62*	0.681 *75*	14.3–23.0	2002Ish
	3b	17.51 *29*	3.58 *77*	0.219 *59*	21.08 *13*	4.33 *63*	0.466 *77*	0.685 *97*	14.3–23.0	2002Ish
^{24}Mg	3a	19.80 *10*	3.36 *32*	0.482 *46*	22.93 *34*	1.84 *98*	0.101 *67*	0.583 *81*	18.2–23.0	2002Ish
	3b	19.81 *10*	3.48 *35*	0.497 *47*	22.91 *30*	1.70 *84*	0.091 *55*	0.588 *72*	18.2–23.0	2002Ish
	3a	19.68 *7*	2.47 *26*	0.301 *45*	24.97 *24*	8.68 *179*	0.713 *158*	1.014 *164*	16.3–26.0	2003Var
	3b	19.77 *7*	3.00 *20*	0.386 *30*	24.82 *14*	5.86 *87*	0.474 *72*	0.860 *78*	16.3–26.0	2003Var
^{25}Mg	3a	22.73 *17*	8.44 *26*	1.170 *40*				1.170 *40*	9.0–24.2	2002Ish
	3b	22.41 *23*	7.90 *45*	1.092 *59*				1.092 *59*	9.0–24.2	2002Ish
^{26}Mg	3a	17.40 *5*	2.41 *18*	0.177 *12*	23.73 *10*	7.23 *36*	1.128 *49*	1.305 *50*	16.1–26.0	2003Var
	3b	17.37 *11*	1.93 *31*	0.142 *19*	23.73 *11*	7.84 *45*	1.219 *62*	1.361 *65*	16.1–26.0	2003Var
^{27}Al	1a	20.97 *8*	7.80 *23*	1.169 *24*				1.169 *24*	14.2–24.4	1975Ahr
	1b	20.94 *10*	7.47 *39*	1.137 *41*				1.137 *41*	14.2–24.4	1975Ahr
	3a	20.62 *8*	5.32 *14*	0.876 *21*				0.876 *21*	14.2–23.0	2002Ish
	2	21.00 *9*	8.56 *36*	1.253 *41*				1.253 *41*	16.3–25.4	1985Ahr
^{nat}Si	0	20.45 *3*	4.85 *10*	0.929 *17*	25.24 *19*	2.10 *59*	0.063 *17*	0.992 *24*	16.4–25.8	1975Ahr
^{28}Si	3a	19.88 *16*	2.91 *22*	0.418 *104*	21.84 *20*	3.39 *54*	0.464 *128*	0.882 *165*	16.7–23.0	2003Var
	3b	19.78 *36*	2.68 *97*	0.305 *280*	21.68 *45*	4.12 *113*	0.630 *358*	0.935 *454*	16.7–23.0	2003Var
^{29}Si	3a	20.97 *11*	6.88 *25*	0.941 *29*				0.941 *29*	14.2–23.0	2002Ish
	3b	20.91 *16*	6.69 *46*	0.923 *47*				0.923 *47*	14.2–23.0	2002Ish
^{30}Si	3a	21.32 *21*	9.16 *48*	0.916 *48*				0.916 *48*	14.2–23.0	2002Ish
	3b	21.25 *29*	8.88 *82*	0.899 *75*				0.899 *75*	14.2–23.0	2002Ish
^{32}S	3a	21.21 *12*	6.08 *16*	1.098 *36*				1.098 *36*	14.4–23.0	2002Ish
	3b	21.77 *20*	7.04 *41*	1.288 *78*				1.288 *78*	14.4–23.0	2002Ish
^{34}S	3a	21.66 *76*	13.43 *148*	1.963 *299*				1.963 *299*	12.0–25.0	1986Ass
	3b	21.66 *76*	13.43 *148*	1.963 *299*				1.963 *299*	12.0–25.0	1986Ass
	3a	22.32 *22*	17.94 *75*	2.333 *98*				2.333 *98*	14.1–25.1	2003Var
	3b	22.78 *41*	16.62 *136*	2.318 *198*				2.318 *198*	12.3–25.1	2003Var
^{nat}S	13	20.42 *11*	5.74 *40*	0.887 *50*				0.887 *50*	17.2–23.6	1965Wyc
^{40}Ar	3a	19.91 *21*	11.50 *51*	1.648 *62*				1.648 *62*	10.5–25.0	2002Ish
	3b	20.54 *59*	13.98 *160*	1.857 *204*				1.857 *204*	10.5–25.0	2002Ish
^{nat}Ar	1a	20.60 *19*	9.58 *72*	1.087 *50*				1.087 *50*	16.5–27.5	1960Fas
	1b	20.91 *65*	11.27 *261*	1.199 *240*				1.199 *240*	16.5–27.5	1960Fas
^{nat}K	4	21.28 *3*	7.40 *10*	0.443 *5*				0.443 *5*	16.0–25.9	1974Ve1
^{nat}Ca	1a	20.24 *2*	5.23 *7*	1.268 *11*				1.268 *11*	13.5–25.9	1975Ahr
	1b	20.23 *2*	5.22 *7*	1.267 *12*				1.267 *12*	13.5–25.9	1975Ahr
	2	20.02 *4*	5.04 *13*	1.171 *22*				1.171 *22*	9.4–24.0	1985Ahr
^{40}Ca	3a	20.06 *7*	5.30 *28*	1.249 *42*				1.249 *42*	18.2–24.0	2003Er
	3b	20.04 *12*	5.34 *46*	1.255 *81*				1.255 *81*	18.2–24.0	2003Er
^{42}Ca	3a	20.53 *16*	9.75 *58*	1.678 *83*				1.678 *83*	15.2–23.0	2003Er
	3b	20.59 *24*	8.95 *95*	1.622 *151*				1.622 *151*	15.2–23.0	2003Er

(*continued on next page*)

Table 2 (*continued*)

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min}-\epsilon_{\max}$ (MeV)	Ref.
^{44}Ca	3a	20.08 *19*	12.45 *102*	1.858 *110*				1.858 *110*	15.5–26.0	2003Er
	3b	20.38 *47*	12.76 *154*	1.892 *207*				1.892 *207*	12.5–26.0	2003Er
^{48}Ca	0	19.90 *18*	6.42 *96*	1.512 *199*				1.512 *199*	17.9–21.6	1987O'k
	3a	19.95 *18*	7.82 *67*	1.461 *90*				1.461 *90*	15.5–23.0	2003Er
	3b	19.80 *28*	7.11 *100*	1.375 *160*				1.375 *160*	15.5–23.0	2003Er
^{46}Ti	3a	19.95 *9*	7.99 *24*	1.393 *30*				1.393 *30*	13.2–25.0	2002Ish
	3b	19.98 *25*	8.77 *70*	1.451 *103*				1.451 *103*	13.2–25.0	2002Ish
^{48}Ti	3a	20.13 *25*	9.98 *75*	1.352 *88*				1.352 *88*	14.5–23.0	2002Ish
	3b	20.43 *59*	11.23 *187*	1.472 *246*				1.472 *246*	14.5–23.0	2002Ish
^{51}V	3a	17.67 *16*	3.08 *135*	0.191 *150*	22.71 *57*	16.27 *236*	2.443 *452*	2.634 *476*	15.2–25.0	2003Var
	3b	17.96 *36*	4.91 *123*	0.646 *288*	22.87 *65*	8.20 *396*	1.053 *638*	1.699 *700*	15.2–25.0	2003Var
	4	18.18 *6*	5.29 *14*	0.701 *28*	21.37 *15*	3.36 *63*	0.127 *30*	0.828 *41*	14.1–22.9	1962Fu1
^{52}Cr	3a	19.16 *8*	6.70 *24*	1.075 *27*				1.075 *27*	14.3–23.0	2002Ish
	3b	19.36 *22*	7.52 *63*	1.146 *84*				1.146 *84*	14.3–23.0	2002Ish
^{55}Mn	4	16.43 *8*	2.91 *47*	0.122 *37*	20.13 *23*	11.28 *60*	1.107 *79*	1.229 *87*	14.0–23.0	1979Al2
$^{\mathrm{nat}}$Fe	0	11.89 *14*	1.06 *62*	0.178 *51*	17.58 *48*	6.88 *157*	1.046 *188*	1.224 *195*	10.0–24.0	1969Dob
	13a	17.88 *5*	6.50 *14*	0.756 *15*				0.756 *15*	13.2–24.0	1967Cos
	13b	17.82 *6*	7.15 *25*	0.820 *25*				0.820 *25*	13.2–24.0	1967Cos
^{54}Fe	0	19.39 *8*	5.69 *30*	1.606 *54*				1.606 *54*	16.0–23.0	1978Nor
^{59}Co	8	16.44 *9*	2.42 *37*	0.087 *28*	18.68 *22*	8.63 *46*	0.922 *35*	1.009 *45*	14.0–20.9	1979Al2
^{58}Ni	3a	19.14 *13*	7.22 *38*	1.078 *44*				1.078 *44*	14.4–22.0	2002Ish
	3b	18.92 *25*	6.77 *75*	1.022 *100*				1.022 *100*	14.4–22.0	2002Ish
	3a	18.87 *6*	6.16 *17*	0.958 *19*				0.958 *19*	14.1–22.0	2003Var
	3b	18.78 *12*	6.03 *36*	0.942 *47*				0.942 *47*	14.1–22.0	2003Var
	4	18.53 *7*	7.97 *22*	0.330 *9*				0.330 *9*	12.2–21.8	1974Fu3
^{60}Ni	3a	16.77 *8*	0.71 *27*	0.024 *9*	18.76 *9*	5.53 *15*	0.821 *15*	0.845 *17*	12.2–21.0	2003Var
	3b	16.79 *8*	0.67 *23*	0.024 *9*	18.87 *15*	5.80 *28*	0.854 *42*	0.878 *43*	12.2–21.0	2003Var
	4	16.23 *7*	1.83 *56*	0.072 *35*	18.25 *18*	7.09 *24*	0.746 *48*	0.818 *59*	14.0–20.9	1974Fu3
	4	16.38 *2*	0.35 *4*	0.015 *2*	18.46 *3*	7.06 *10*	0.822 *9*	0.837 *9*	14.1–22.0	1970Gor
^{63}Cu	3a	16.79 *31*	5.76 *68*	0.844 *175*	20.37 *32*	4.56 *243*	0.274 *211*	1.118 *274*	14.0–21.0	2003Var
	3b	16.67 *74*	5.44 *197*	0.766 *510*	20.43 *108*	5.62 *776*	0.377 *774*	1.143 *927*	14.0–21.0	2003Var
	6	17.01 *10*	4.80 *15*	0.575 *37*	19.16 *11*	2.55 *49*	0.078 *28*	0.653 *46*	14.0–21.0	1968Su1
	4	16.51 *12*	5.26 *33*	0.557 *49*	19.72 *21*	3.81 *112*	0.117 *49*	0.674 *69*	14.2–20.7	1964Fu1
^{65}Cu	3a	17.23 *8*	8.38 *43*	1.176 *45*				1.176 *45*	14.2–21.0	2003Var
	3b	17.16 *29*	7.87 *138*	1.126 *183*				1.126 *183*	14.2–21.0	2003Var
	4	16.92 *6*	7.04 *31*	0.847 *31*				0.847 *31*	14.2–19.9	1964Fu1
^{64}Zn	8	16.37 *19*	3.84 *46*	0.303 *86*	19.49 *19*	5.82 *120*	0.457 *139*	0.760 *163*	14.0–20.8	1976Ca1
^{65}Zn	1a	16.06 *12*	2.26 *42*	0.077 *23*	18.87 *19*	8.62 *31*	0.842 *26*	0.919 *35*	12.0–21.0	2003Rod
	1b	16.66 *28*	4.86 *53*	0.416 *96*	19.70 *19*	5.03 *115*	0.306 *117*	0.722 *151*	12.0–21.0	2003Rod
^{70}Ge	0	15.31 *23*	7.19 *60*	1.642 *117*				1.642 *117*	10.0–20.0	1975Mcc
	8	17.03 *10*	8.19 *41*	1.076 *46*				1.076 *46*	13.1–20.8	1976Ca1
^{72}Ge	0	17.85 *16*	6.22 *54*	1.461 *84*				1.461 *84*	10.0–24.0	1975Mcc
	8	16.90 *7*	8.03 *30*	1.244 *38*				1.244 *38*	13.1–20.8	1976Ca1
^{74}Ge	0	13.06 *10*	0.07 *14*	1.596 *3225*	17.10 *33*	7.61 *149*	1.478 *237*	3.074 *3234*	12.0–24.0	1975Mcc
	8	14.42 *16*	2.46 *83*	0.115 *84*	17.47 *29*	8.37 *85*	1.159 *166*	1.274 *186*	13.1–20.8	1976Ca1
^{76}Ge	8	15.42 *72*	3.62 *383*	0.197 *504*	18.69 *297*	13.81 *541*	1.604 *354*	1.801 *616*	13.1–20.8	1976Ca1
^{75}As	4	15.25 *24*	4.73 *52*	0.401 *118*	18.16 *25*	6.73 *71*	0.563 *142*	0.964 *185*	13.1–20.9	1969Be1
	8	15.30 *77*	4.91 *173*	0.494 *543*	18.40 *115*	8.18 *281*	0.791 *706*	1.285 *891*	13.1–20.8	1976Ca1
^{76}Se	0	15.86 *7*	6.50 *35*	1.365 *56*				1.365 *56*	13.1–19.7	1978Gur
	8	17.21 *12*	10.66 *55*	1.555 *72*				1.555 *72*	13.1–20.8	1976Ca1
^{78}Se	8	15.23 *23*	4.67 *64*	0.527 *123*	18.76 *19*	5.68 *107*	0.512 *150*	1.039 *194*	13.1–20.8	1976Ca1
^{80}Se	8	16.48 *17*	6.43 *48*	1.152 *94*				1.152 *94*	13.1–17.0	1976Ca1
^{82}Se	0	16.13 *5*	5.81 *23*	1.339 *39*				1.339 *39*	13.1–19.9	1978Gur
	8	16.75 *5*	6.08 *20*	1.168 *29*				1.168 *29*	13.1–20.8	1976Ca1
^{89}Y	3a	16.89 *5*	4.50 *29*	1.255 *57*				1.255 *57*	15.3–19.0	1903Var
	3b	16.91 *22*	4.57 *106*	1.268 *268*				1.268 *268*	15.3–19.0	2003Var
	4	16.82 *1*	4.42 *4*	1.175 *8*				1.175 *8*	14.0–19.0	1971Le1
	4	16.84 *1*	4.14 *3*	0.896 *4*				0.896 *4*	14.0–18.9	1967Be2
	12	16.93 *3*	4.01 *9*	0.956 *20*				0.956 *20*	14.0–18.1	1972Yo
^{90}Zr	3a	16.90 *5*	4.13 *25*	1.226 *53*				1.226 *53*	14.9–18.5	2003Var
	3b	16.87 *16*	3.97 *67*	1.193 *179*				1.193 *179*	14.9–18.5	2003Var
	4	16.91 *1*	4.18 *3*	0.893 *6*				0.893 *6*	14.0–18.9	1967Be2
	8	16.81 *1*	4.31 *4*	1.057 *7*				1.057 *7*	14.0–19.0	1971Le1
^{91}Zr	4	16.64 *2*	4.32 *7*	0.917 *11*				0.917 *11*	14.0–18.9	1967Be2
^{92}Zr	4	16.34 *2*	4.70 *10*	0.898 *13*				0.898 *13*	14.0–18.9	1967Be2
^{94}Zr	4	16.35 *3*	5.52 *12*	0.991 *17*				0.991 *17*	14.0–18.9	1967Be2
$^{\mathrm{nat}}$Zr	8	16.61 *3*	4.45 *15*	0.903 *25*				0.903 *25*	14.9–19.0	1987Ber
^{93}Nb	8	16.70 *2*	5.18 *6*	1.175 *12*				1.175 *12*	14.0–19.0	1971Le1
^{92}Mo	3a	17.28 *7*	5.05 *25*	1.368 *52*				1.368 *52*	14.4–19.0	2003Var
	3b	17.21 *17*	4.62 *62*	1.293 *160*				1.293 *160*	14.4–19.0	2003Var
	4	16.89 *1*	4.28 *4*	0.781 *6*				0.781 *6*	14.0–18.9	1974Be3
^{94}Mo	4	16.73 *2*	6.04 *6*	1.268 *12*				1.268 *12*	9.6–18.9	1974Be3
^{96}Mo	4	16.42 *7*	6.52 *20*	1.315 *43*				1.315 *43*	13.2–17.0	1974Be3

(*continued on next page*)

Table 2 (*continued*)

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min} - \epsilon_{\max}$ (MeV)	Ref.
^{98}Mo	4	15.96 *4*	6.17 *18*	1.257 *28*				1.257 *28*	13.2–18.9	1974Be3
^{100}Mo	9	16.02 *4*	8.44 *18*	1.515 *26*				1.515 *26*	12.1–20.0	1974Be3
^{103}Rh	3a	16.59 *11*	8.44 *51*	1.638 *82*				1.638 *82*	13.1–19.0	2003Var
	3b	16.62 *25*	8.56 *107*	1.658 *193*				1.658 *193*	13.1–19.0	2003Var
	4	16.47 *5*	8.02 *21*	1.543 *35*				1.543 *35*	13.2–18.9	1974Le1
^{107}Ag	4	16.05 *5*	7.51 *17*	1.338 *26*				1.338 *26*	9.5–19.0	1969Ish
	4	16.14 *5*	7.18 *22*	1.053 *29*				1.053 *29*	13.1–18.7	1969Be1
^{109}Ag	4	13.74 *22*	3.81 *154*	0.337 *167*	16.76 *12*	4.17 *53*	0.423 *125*	0.760 *209*	13.1–19.0	1969Ish
^{115}In	4	15.79 *1*	5.58 *6*	1.357 *12*				1.357 *12*	13.1–17.8	1969Fu1
	4	15.91 *2*	6.00 *7*	1.353 *13*				1.353 *13*	13.2–17.8	1974Le1
^{116}Sn	4	15.69 *1*	5.29 *6*	1.302 *12*				1.302 *12*	13.1–17.9	1974Le1
	4	15.74 *2*	4.34 *8*	1.049 *13*				1.049 *13*	13.0–18.0	1969Fu1
^{117}Sn	4	15.77 *2*	5.29 *11*	1.232 *20*				1.232 *20*	13.2–17.8	1974Le1
	4	15.77 *2*	5.31 *7*	1.208 *11*				1.208 *11*	13.1–17.9	1969Fu1
^{118}Sn	4	15.55 *1*	5.02 *6*	1.259 *12*				1.259 *12*	13.1–17.9	1974Le1
	4	15.70 *1*	5.02 *5*	1.148 *8*				1.148 *8*	13.1–17.9	1969Fu1
^{119}Sn	4	15.65 *2*	5.09 *7*	1.144 *14*				1.144 *14*	13.0–17.9	1969Fu1
^{120}Sn	4	15.50 *1*	5.26 *7*	1.334 *13*				1.334 *13*	13.1–17.9	1974Le1
	4	15.53 *1*	5.03 *4*	1.256 *9*				1.256 *9*	13.1–17.9	1969Fu1
^{124}Sn	3a	15.41 *5*	5.06 *24*	1.198 *37*				1.198 *37*	13.1–18.0	2003Var
	3b	15.40 *9*	5.00 *39*	1.189 *73*				1.189 *73*	13.1–18.0	2003Var
	4	15.39 *2*	4.90 *9*	1.174 *16*				1.174 *16*	13.2–17.8	1974Le1
	4	15.30 *2*	4.98 *8*	1.222 *16*				1.222 *16*	13.1–17.8	1969Fu1
^{124}Te	6	15.36 *2*	5.81 *9*	1.394 *18*				1.394 *18*	12.0–18.9	1976Le2
^{126}Te	6	15.27 *2*	5.62 *8*	1.407 *15*				1.407 *15*	12.0–18.9	1976Le2
^{128}Te	6	15.23 *2*	5.55 *8*	1.414 *16*				1.414 *16*	12.0–18.9	1976Le2
^{130}Te	6	15.21 *2*	5.19 *8*	1.377 *15*				1.377 *15*	12.0–18.9	1976Le2
^{127}I	4	14.98 *20*	4.93 *27*	1.228 *158*	17.03 *35*	2.65 *169*	0.106 *125*	1.334 *201*	8.8–19.8	1969Be6
	4	14.64 *22*	4.00 *27*	0.860 *179*	16.51 *39*	3.21 *91*	0.215 *166*	1.075 *244*	12.2–20.0	1989Ras
	4	14.65 *18*	4.34 *26*	0.650 *117*	16.80 *22*	4.24 *64*	0.311 *119*	0.961 *167*	12.1–19.9	1966Br1
	8	14.72 *26*	2.33 *157*	0.098 *205*	15.81 *65*	6.91 *195*	1.206 *80*	1.304 *220*	12.1–16.9	1987Ber
^{133}Cs	4	15.44 *1*	5.50 *2*	1.397 *5*				1.397 *5*	12.0–19.0	1974Le1
	4	15.32 *2*	5.11 *8*	1.186 *14*				1.186 *14*	12.1–18.7	1969Be1
^{138}Ba	4	15.31 *2*	4.76 *6*	1.208 *10*				1.208 *10*	12.1–18.7	1970Be8
^{139}La	4	15.15 *1*	4.09 *4*	1.068 *8*				1.068 *8*	12.0–18.9	1971Be4
^{140}Ce	6	15.09 *1*	4.51 *5*	1.317 *10*				1.317 *10*	12.0–18.9	1976Le2
^{142}Ce	6	14.95 *2*	5.24 *9*	1.313 *16*				1.313 *16*	12.0–18.9	1976Le2
^{141}Pr	4	15.20 *2*	4.63 *6*	1.127 *11*				1.127 *11*	12.1–18.7	1966Br1
	4	15.43 *2*	4.02 *7*	1.081 *13*				1.081 *13*	12.0–18.9	1972De1
	4	15.33 *2*	4.49 *9*	1.165 *21*				1.165 *21*	12.1–16.9	1987Ber
	12	15.26 *1*	4.09 *4*	1.049 *8*				1.049 *8*	12.1–19.0	1970Su1
	12	15.17 *1*	4.88 *3*	1.262 *6*				1.262 *6*	12.0–16.9	1971Be4
	12	15.42 *2*	4.39 *5*	1.081 *10*				1.081 *10*	12.0–18.1	1972Yo
^{142}Nd	3a	14.93 *3*	4.54 *12*	1.228 *18*				1.228 *18*	12.0–19.0	2003Var
	3b	15.00 *11*	4.59 *37*	1.241 *81*				1.241 *81*	12.0–19.0	2003Var
	4	15.01 *1*	4.56 *4*	1.226 *7*				1.226 *7*	12.0–18.9	1971Ca1
^{143}Nd	4	15.08 *2*	4.99 *9*	1.281 *16*				1.281 *16*	12.0–19.0	1971Ca1
^{144}Nd	4	15.17 *2*	5.56 *7*	1.295 *14*				1.295 *14*	12.0–18.9	1971Ca1
^{145}Nd	4	15.14 *5*	6.75 *22*	1.456 *36*				1.456 *36*	12.0–18.9	1971Ca1
^{146}Nd	4	14.88 *3*	6.04 *11*	1.361 *20*				1.361 *20*	12.0–18.9	1971Ca1
^{148}Nd	4	13.34 *38*	5.41 *70*	0.623 *184*	15.79 *11*	4.57 *56*	0.552 *165*	1.175 *247*	10.8–18.6	1971Ca1
^{150}Nd	4	12.49 *9*	3.93 *29*	0.556 *55*	16.23 *7*	4.85 *34*	0.696 *65*	1.252 *85*	10.8–18.6	1971Ca1
^{144}Sm	4	15.37 *2*	4.53 *7*	1.274 *15*				1.274 *15*	12.1–18.9	1974Ca5
^{148}Sm	4	14.91 *1*	5.15 *6*	1.260 *10*				1.260 *10*	12.1–18.9	1974Ca5
^{150}Sm	4	14.76 *3*	6.01 *12*	1.340 *20*				1.340 *20*	12.1–18.9	1974Ca5
^{152}Sm	4	12.56 *4*	3.53 *13*	0.511 *25*	15.97 *3*	4.77 *14*	0.704 *30*	1.215 *39*	10.9–18.8	1974Ca5
^{154}Sm	0	12.31 *29*	3.27 *104*	0.483 *217*	15.95 *36*	5.53 *176*	0.729 *305*	1.212 *374*	10.9–18.6	1981Gur
	4	12.42 *4*	3.43 *16*	0.495 *30*	16.20 *4*	5.29 *22*	0.716 *39*	1.211 *49*	11.0–18.6	1974Ca5
^{153}Eu	4	12.47 *5*	3.26 *18*	0.416 *31*	16.07 *5*	5.48 *21*	0.769 *42*	1.185 *52*	10.9–18.7	1969Be8
^{156}Gd	0	12.63 *24*	3.61 *80*	0.632 *177*	15.97 *23*	4.10 *105*	0.537 *191*	1.169 *260*	10.9–18.7	1981Gur
^{160}Gd	3a	12.47 *14*	3.85 *49*	0.678 *101*	16.26 *11*	4.69 *48*	0.700 *104*	1.378 *145*	10.9–18.8	2003Var
	3b	12.42 *16*	3.71 *67*	0.638 *142*	16.25 *16*	5.07 *88*	0.764 *177*	1.402 *227*	10.9–18.8	2003Var
	4	12.34 *6*	3.13 *24*	0.502 *43*	16.16 *6*	4.99 *29*	0.717 *54*	1.219 *69*	10.9–18.7	1969Be8
^{159}Tb	4	12.55 *5*	3.23 *15*	0.452 *33*	16.16 *5*	5.74 *22*	1.059 *50*	1.511 *60*	11.1–19.0	1976Gor
	4	12.33 *5*	3.04 *18*	0.414 *31*	15.85 *6*	4.60 *29*	0.631 *46*	1.045 *55*	10.8–18.7	1964Br1
	4	12.22 *6*	3.37 *28*	0.497 *48*	16.05 *6*	4.79 *29*	0.737 *57*	1.234 *75*	11.0–18.7	1968Be5
^{165}Ho	0	12.47 *13*	2.84 *59*	0.445 *100*	15.59 *18*	3.78 *72*	0.520 *120*	0.965 *156*	11.1–18.7	1981Gur
	4	12.38 *2*	2.92 *9*	0.453 *17*	15.98 *3*	4.66 *14*	0.692 *23*	1.145 *29*	10.9–18.7	1969Be8
	4	12.11 *4*	2.81 *19*	0.489 *38*	15.78 *5*	4.83 *24*	0.856 *50*	1.345 *63*	11.0–18.7	1968Be5
^{168}Er	0	12.33 *36*	4.18 *140*	0.698 *281*	15.65 *20*	3.58 *96*	0.516 *225*	1.214 *360*	10.9–18.8	1981Gur
^{174}Yb	0	12.73 *25*	3.95 *69*	0.909 *211*	15.80 *18*	3.18 *81*	0.496 *186*	1.405 *281*	10.9–18.7	1981Gur
^{175}Lu	4	12.44 *9*	2.99 *30*	0.456 *59*	15.65 *9*	4.32 *34*	0.699 *71*	1.155 *92*	11.0–18.7	1969Be6

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Table 2 (*continued*)

Nucl	Id	$E_{r,1}$ (MeV)	$\Gamma_{r,1}$ (MeV)	$S_{r,1}$	$E_{r,2}$ (MeV)	$\Gamma_{r,2}$ (MeV)	$S_{r,2}$	S	$\epsilon_{\min} - \epsilon_{\max}$ (MeV)	Ref.
^{176}Hf	4	12.46 *4*	3.13 *13*	0.585 *31*	15.86 *5*	4.44 *18*	0.677 *38*	1.262 *49*	10.9–17.9	1977Gor
^{178}Hf	0	12.59 *22*	4.95 *68*	1.126 *190*	15.65 *16*	3.00 *61*	0.401 *128*	1.527 *229*	10.8–18.6	1981Gur
	4	12.57 *5*	3.26 *17*	0.643 *39*	15.91 *5*	3.71 *19*	0.564 *40*	1.207 *56*	11.0–17.9	1977Gor
^{180}Hf	0	12.74 *31*	4.93 *88*	1.089 *256*	15.59 *18*	3.04 *79*	0.407 *177*	1.496 *311*	10.8–18.7	1981Gur
	4	12.56 *4*	2.96 *12*	0.584 *26*	15.86 *3*	3.51 *13*	0.558 *27*	1.142 *37*	11.0–17.9	1977Gor
^{181}Ta	0	12.36 *39*	3.41 *110*	0.638 *331*	15.26 *40*	4.71 *111*	0.774 *356*	1.412 *486*	10.8–18.6	1981Gur
	3a	12.52 *11*	3.23 *23*	0.582 *62*	15.47 *10*	3.89 *27*	0.680 *67*	1.262 *91*	10.0–18.8	2003Var
	3b	12.45 *17*	3.08 *50*	0.536 *124*	15.43 *16*	4.17 *71*	0.742 *165*	1.278 *206*	10.0–18.8	2003Var
	4	12.43 *6*	2.90 *22*	0.518 *50*	15.42 *6*	4.03 *21*	0.743 *56*	1.261 *75*	11.0–18.7	1968Be5
	4	12.52 *8*	1.90 *41*	0.164 *69*	15.06 *20*	5.83 *72*	0.917 *140*	1.081 *156*	10.8–18.7	1963Br1
^{182}W	0	13.08 *34*	7.29 *100*	1.655 *268*	15.20 *21*	1.53 *123*	0.091 *90*	1.746 *283*	11.0–18.8	1981Gur
	4	12.80 *5*	3.17 *12*	0.629 *35*	15.71 *5*	4.14 *14*	0.704 *39*	1.333 *52*	10.8–18.6	1978Gor
^{184}W	0	12.27 *45*	5.17 *188*	1.144 *513*	15.10 *17*	3.15 *143*	0.347 *301*	1.491 *595*	11.0–17.6	1981Gur
^{186}W	0	13.01 *48*	6.25 *93*	1.400 *392*	14.81 *30*	2.84 *186*	0.205 *255*	1.605 *468*	10.9–18.7	1981Gur
	4	12.74 *5*	2.94 *12*	0.484 *38*	15.25 *6*	4.61 *17*	0.755 *47*	1.239 *60*	10.9–18.7	1969Be8
	4	12.73 *7*	3.06 *16*	0.557 *51*	15.34 *6*	4.33 *17*	0.785 *58*	1.342 *77*	11.0–17.8	1978Gor
^{186}Os	7	13.27 *13*	3.65 *26*	0.756 *95*	15.39 *8*	2.80 *31*	0.394 *83*	1.150 *126*	11.1–18.7	1979Be4
^{188}Os	9	13.12 *7*	3.61 *12*	0.739 *59*	15.17 *6*	3.55 *19*	0.597 *61*	1.336 *85*	10.8–18.7	1979Be4
^{189}Os	9	12.93 *7*	3.39 *12*	0.657 *53*	14.86 *5*	3.19 *16*	0.582 *55*	1.239 *76*	10.8–18.7	1979Be4
^{190}Os	9	13.04 *10*	3.62 *14*	0.694 *85*	14.75 *8*	3.51 *20*	0.549 *85*	1.243 *120*	10.8–18.7	1979Be4
^{192}Os	9	13.04 *10*	3.62 *14*	0.690 *85*	14.75 *8*	3.51 *20*	0.545 *84*	1.235 *120*	10.8–18.7	1979Be4
^{191}Ir	4	13.16 *15*	3.75 *25*	0.894 *155*	15.24 *22*	3.69 *97*	0.359 *171*	1.253 *231*	11.0–16.8	1978Gor
^{193}Ir	4	12.85 *8*	1.64 *37*	0.149 *64*	14.18 *16*	5.94 *37*	1.322 *65*	1.471 *91*	11.0–16.8	1978Gor
^{194}Pt	4	13.66 *7*	4.29 *13*	1.203 *69*	16.70 *42*	4.55 *264*	0.088 *81*	1.291 *106*	11.0–17.8	1978Gor
^{195}Pt	4	13.28 *12*	3.71 *22*	0.964 *126*	15.44 *24*	3.56 *96*	0.273 *132*	1.237 *183*	11.0–17.8	1978Gor
^{196}Pt	4	13.38 *7*	2.87 *39*	0.376 *149*	14.18 *19*	6.94 *71*	1.067 *130*	1.443 *198*	11.0–17.8	1978Gor
^{197}Au	0	13.72 *7*	5.43 *30*	1.570 *69*				1.570 *69*	11.1–17.0	1981Gur
	4	13.81 *2*	4.79 *8*	1.410 *19*				1.410 *19*	11.0–16.8	1970Ve1
	4	13.88 *3*	4.09 *9*	1.231 *22*				1.231 *22*	11.1–16.8	1962Fu2
	8	13.86 *3*	4.94 *15*	1.354 *34*				1.354 *34*	12.1–16.9	1987Ber
^{206}Pb	4	13.61 *1*	4.01 *5*	1.072 *9*				1.072 *9*	10.0–17.0	1964Ha2
^{207}Pb	4	13.57 *2*	4.22 *6*	1.042 *10*				1.042 *10*	10.0–17.0	1964Ha2
^{208}Pb	3a	13.34 *3*	3.64 *8*	1.270 *15*				1.270 *15*	10.9–18.8	2003Var
	3b	13.43 *7*	3.83 *18*	1.301 *44*				1.301 *44*	10.9–18.8	2003Var
	4	13.52 *2*	4.67 *5*	1.473 *14*				1.473 *14*	10.2–16.8	1970Ve1
	4	13.50 *1*	4.15 *5*	1.048 *9*				1.048 *9*	10.0–17.0	1964Ha2
	12	13.79 *2*	4.49 *6*	1.488 *19*				1.488 *19*	10.0–14.9	1972Yo
^{nat}Pb	8	13.64 *2*	3.74 *9*	1.209 *24*				1.209 *24*	12.1–16.9	1987Ber
^{209}Bi	0	13.87 *8*	5.04 *31*	1.559 *70*				1.559 *70*	10.9–18.3	1976Gur
	4	13.49 *1*	4.28 *5*	1.132 *8*				1.132 *8*	10.0–17.0	1964Ha2
	12	13.66 *2*	4.17 *5*	1.387 *13*				1.387 *13*	10.0–14.8	1972Yo
^{232}Th	0	11.00 *51*	3.42 *223*	0.469 *387*	13.94 *21*	4.26 *82*	0.690 *291*	1.159 *484*	11.0–18.3	1976Gur
	4	12.61 *67*	7.84 *152*	1.429 *434*	14.30 *16*	1.90 *153*	0.114 *146*	1.543 *458*	9.2–16.3	1973Ve1
	10	11.23 *3*	3.36 *7*	0.586 *25*	14.12 *3*	4.35 *17*	0.799 *37*	1.385 *45*	9.4–17.8	1980Ca1
^{233}U	11	11.14 *3*	2.51 *7*	0.472 *28*	14.20 *3*	5.17 *9*	2.172 *44*	2.644 *52*	9.4–17.8	1986Be2
^{234}U	11	11.18 *6*	2.60 *21*	0.713 *74*	14.39 *4*	4.20 *22*	1.575 *92*	2.288 *118*	9.4–17.8	1986Be2
^{235}U	0	11.11 *14*	1.34 *68*	0.184 *108*	13.64 *18*	4.67 *49*	0.900 *122*	1.084 *163*	11.0–18.4	1976Gur
^{236}U	10	11.11 *4*	3.20 *11*	0.499 *29*	14.06 *5*	4.34 *16*	0.727 *37*	1.226 *47*	9.4–17.8	1980Ca1
^{238}U	0	11.28 *18*	2.26 *103*	0.326 *169*	14.34 *19*	4.60 *56*	0.761 *152*	1.087 *227*	11.1–18.8	1976Gur
	4	11.10 *5*	3.20 *15*	0.503 *33*	14.20 *5*	4.15 *20*	0.647 *40*	1.150 *52*	9.1–17.8	1973Ve1
^{237}Np	10	11.21 *37*	3.59 *98*	0.494 *209*	14.32 *26*	4.46 *125*	0.710 *265*	1.204 *337*	9.2–16.6	1973Ve1
	10	11.09 *7*	2.68 *16*	0.452 *45*	14.26 *8*	4.32 *30*	1.000 *70*	1.452 *83*	9.4–17.8	1986Be2
^{239}Pu	0	11.12 *56*	3.72 *283*	0.489 *494*	14.22 *33*	5.13 *117*	0.754 *417*	1.243 *646*	11.0–18.7	1976Gur
	10	11.41 *16*	3.05 *24*	0.515 *111*	14.05 *24*	4.23 *72*	0.641 *150*	1.156 *187*	9.1–17.8	1986Be2

Table 3
References to experimental and evaluated cross section data taken from EXFOR.

Nucl	Id	Reaction	Ref.	EXFOR
^{10}B	5	γ, sn	1987Ahs	M0207002
^{12}C	0	γ, abs	1963Bur	M0160002
	0	γ, abs	1969Bez	L0064002
	1	γ, abs	1975Ahr	M0372004
	3	γ, abs	2002Ish	M0648002
	3	γ, abs	2003Var	M0656002
^{13}C	3	γ, abs	2002Ish	M0648003
^{14}C	3	γ, abs	2002Ish	M0648004
^{14}N	0	γ, abs	1969Bez	L0064003
	3	γ, abs	2002Ish	M0648005
^{15}N	1	γ, abs	1989Bat	M0264003
	3	γ, abs	2002Ish	M0648006
^{nat}O	2	γ, abs	1985Ahr	M0188006
^{16}O	0	γ, abs	1969Bez	L0064004
	0	γ, abs	1975Ahr	M0372005
	3	γ, abs	2002Ish	M0648007
^{17}O	3	γ, abs	2002Ish	M0648008
^{18}O	3	γ, abs	2002Ish	M0648009
^{19}F	3	γ, abs	2002Ish	M0648010
^{23}Na	0	γ, abs	1981Ish	M0043025
	3	γ, abs	2002Ish	M0648011
^{24}Mg	3	γ, abs	2002Ish	M0648012
	3	γ, abs	2003Var	M0656003
^{25}Mg	3	γ, asb	2002Ish	M0648013
^{26}Mg	3	γ, abs	2003Var	M0656004
^{27}Al	1	γ, abs	1975Ahr	M0372006
	3	γ, abs	2002Ish	M0648015
	2	γ, abs	1985Ahr	M0188007
^{nat}Si	0	γ, abs	1975Ahr	M0372007
^{28}Si	3	γ, abs	2003Var	M0656005
^{29}Si	3	γ, abs	2002Ish	M0648017
^{30}Si	3	γ, abs	2002Ish	M0648018
^{32}S	3	γ, abs	2002Ish	M0648019
^{34}S	3	γ, abs	1986Ass	M0510006
	3	γ, abs	2003Var	M0656006
^{nat}S	13	γ, xn	1965Wyc	L0122009
^{40}Ar	3	γ, abs	2002Ish	M0648021
^{nat}Ar	1	γ, abs	1960Fas	M0214004
^{nat}K	4	γ, sn	1974Ve1	L0039036
^{nat}Ca	1	γ, abs	1975Ahr	M0372008
	2	γ, abs	1985Ahr	M0188017
^{40}Ca	3	γ, abs	2003Er	M0653002
^{42}Ca	3	γ, abs	2003Er	M0653003
^{44}Ca	3	γ, abs	2003Er	M0653004
^{48}Ca	0	γ, abs	1987O'k	M0636010
	3	γ, abs	2003Er	M0653005
^{46}Ti	3	γ, abs	2002Ish	M0648026
^{48}Ti	3	γ, abs	2002Ish	M0648027
^{51}V	3	γ, abs	2003Var	M0656007
	4	γ, sn	1962Fu1	L0001008
^{52}Cr	3	γ, abs	2002Ish	M0648028
^{55}Mn	4	γ, sn	1979Al2	L0028011
^{nat}Fe	0	γ, abs	1969Dob	M0540002
	13	γ, xn	1967Cos	L0114003
^{54}Fe	0	γ, abs	1978Nor	M0507004
^{59}Co	1	γ, abs	1965Wyc	L0122011
	8	γ, sn	1979Al2	L0028008, L0028009
^{58}Ni	3	γ, abs	2002Ish	M0648029
	3	γ, abs	2003Var	M0656008
	4	γ, sn	1974Fu3	L0034002
^{60}Ni	3	γ, abs	2003Var	M0656009
	4	γ, sn	1974Fu3	L0034008
	4	γ, sn	1970Gor	M0597003
^{63}Cu	3	γ, abs	2003Var	M0656010
	6	γ, sn	1968Su1	L0013002, L0013003
	4	γ, sn	1964Fu1	L0006012
^{65}Cu	3	γ, abs	2003Var	M0656011
	4	γ, sn	1964Fu1	L0006013
^{64}Zn	8	γ, sn	1976Ca1	L0043002, L0043003
^{65}Zn	1	γ, abs	2003Rod	M0652007
^{70}Ge	0	γ, abs	1975Mcc	M0496004
	8	γ, sn	1976Ca1	L0043008, L0043009
^{72}Ge	0	γ, abs	1975Mcc	M0496010

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Table 3 (*continued*)

Nucl	Id	Reaction	Ref.	EXFOR
	8	γ, sn	1976Ca1	L0043011, L0043012
^{74}Ge	0	γ, abs	1975Mcc	M0496013
	8	γ, sn	1976Ca1	L0043014, L0043015
^{76}Ge	0	γ, abs	1975Mcc	M0496007
	8	γ, sn	1976Ca1	L0043017, L0043018
^{75}As	4	γ, sn	1969Be1	L0014012
	8	γ, sn	1976Ca1	L0043020, L0043021
^{76}Se	0	γ, abs	1978Gur	M0023002
	8	γ, sn	1976Ca1	L0043023, L0043024
^{78}Se	8	γ, sn	1976Ca1	L0043026, L0043027
^{80}Se	8	γ, sn	1976Ca1	L0043029, L0043030
^{82}Se	0	γ, abs	1978Gur	M0023003
	8	γ, sn	1976Ca1	L0043032, L0043033
^{89}Y	3	γ, abs	2003Var	M0656012
	4	γ, sn	1971Le1	L0027019
	4	γ, sn	1967Be2	L0011018
	12	γ, 1n	1972Yo	L0059002
^{90}Zr	3	γ, abs	2003Var	M0656013
	4	γ, sn	1967Be2	L0011019
	8	γ, sn	1971Le1	L0027012, L0027013
^{91}Zr	4	γ, sn	1967Be2	L0011020
^{92}Zr	4	γ, sn	1967Be2	L0011021
^{94}Zr	4	γ, sn	1967Be2	L0011022
^{nat}Zr	8	γ, sn	1987Ber	L0057002, L0057003
^{93}Nb	8	γ, sn	1971Le1	L0027015, L0027016
^{92}Mo	3	γ, abs	2003Var	M0656014
	4	γ, sn	1974Be3	L0032020
^{94}Mo	4	γ, sn	1974Be3	L0032005
^{96}Mo	4	γ, sn	1974Be3	L0032022
^{98}Mo	4	γ, sn	1974Be3	L0032023
^{100}Mo	9	γ, sn	1974Be3	L0032017, L0032018, L0032019
^{103}Rh	3	γ, abs	2003Var	M0656015
	4	γ, sn	1974Le1	L0035041
^{107}Ag	4	γ, sn	1969Ish	M0524002
	4	γ, sn	1969Be1	L0014013
^{109}Ag	4	γ, sn	1969Ish	M0524003
^{115}In	4	γ, sn	1969Fu1	L0017029
	4	γ, sn	1974Le1	L0035045
^{116}Sn	4	γ, sn	1974Le1	L0035046
	4	γ, sn	1969Fu1	L0017030
^{117}Sn	4	γ, sn	1974Le1	L0035047
	4	γ, sn	1969Fu1	L0017031
^{118}Sn	4	γ, sn	1974Le1	L0035048
^{118}Sn	4	γ, sn	1969Fu1	L0017032
^{119}Sn	4	γ, sn	1969Fu1	L0017033
^{120}Sn	4	γ, sn	1974Le1	L0035049
	4	γ, sn	1969Fu1	L0017034
^{124}Sn	3	γ, abs	2003Var	M0656016
	4	γ, sn	1974Le1	L0035050
	4	γ, sn	1969Fu1	L0017035
^{124}Te	6	γ, sn	1976Le2	L0042004, L0042002
^{126}Te	6	γ, sn	1976Le2	L0042007, L0042005
^{128}Te	6	γ, sn	1976Le2	L0042010, L0042008
^{130}Te	6	γ, sn	1976Le2	L0042013, L0042011
^{127}I	4	γ, sn	1969Be6	L0015022
	4	γ, sn	1989Ras	M0511002
	4	γ, sn	1966Br1	L0009009
	8	γ, sn	1987Ber	L0057005, L0057006
^{133}Cs	4	γ, sn	1974Le1	L0035053
	4	γ, sn	1969Be1	L0014014
^{138}Ba	4	γ, sn	1970Be8	L0019008
^{139}La	4	γ, sn	1971Be4	L0024017
^{140}Ce	6	γ, sn	1976Le2	L0042016, L0042014
^{142}Ce	6	γ, sn	1976Le2	L0042019, L0042017
^{141}Pr	4	γ, sn	1966Br1	L0009010
	4	γ, sn	1972De1	M0398002
	4	γ, sn	1987Ber	L0057015
	12	γ, 1n	1970Su1	L0020002
	12	γ, 1n	1971Be4	L0024011
	12	γ, 1n	1972Yo	L0059003
^{142}Nd	3	γ, abs	2003Var	M0656017
	4	γ, sn	1971Ca1	L0025023
^{143}Nd	4	γ, sn	1971Ca1	L0025024

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Table 3 (*continued*)

Nucl	Id	Reaction	Ref.	EXFOR
^{144}Nd	4	γ, sn	1971Ca1	L0025025
^{145}Nd	4	γ, sn	1971Ca1	L0025026
^{146}Nd	4	γ, sn	1971Ca1	L0025027
^{148}Nd	4	γ, sn	1971Ca1	L0025028
^{150}Nd	4	γ, sn	1971Ca1	L0025029
^{144}Sm	4	γ, sn	1974Ca5	L0033017
^{148}Sm	4	γ, sn	1974Ca5	L0033018
^{150}Sm	4	γ, sn	1974Ca5	L0033019
^{152}Sm	4	γ, sn	1974Ca5	L0033020
^{154}Sm	0	γ, abs	1981Gur	M0073002
	4	γ, sn	1974Ca5	L0033021
^{153}Eu	4	γ, sn	1969Be8	L0016018
^{156}Gd	0	γ, abs	1981Gur	M0073003
^{160}Gd	3	γ, abs	2003Var	M0656018
	4	γ, sn	1969Be8	L0016019
^{159}Tb	4	γ, sn	1976Gor	M0057002
	4	γ, sn	1964Br1	L0005006
	4	γ, sn	1968Be5	L0012019
	12	γ, 1n	1968Be5	L0012007
^{165}Ho	0	γ, abs	1981Gur	M0073004
	4	γ, sn	1969Be8	L0016020
	4	γ, sn	1968Be5	L0012020
^{168}Er	0	γ, abs	1981Gur	M0073005
^{174}Yb	0	γ, abs	1981Gur	M0073006
^{175}Lu	4	γ, sn	1969Be6	L0015026
^{176}Hf	4	γ, sn	1977Gor	M0007002
^{178}Hf	0	γ, abs	1981Gur	M0073007
	4	γ, sn	1977Gor	M0007003
^{180}Hf	0	γ, abs	1981Gur	M0073008
	4	γ, sn	1977Gor	M0007004
^{181}Ta	0	γ, abs	1981Gur	M0073009
	3	γ, abs	2003Var	M0656019
	4	γ, sn	1968Be5	L0012021
	4	γ, sn	1963Br1	L0003005
^{182}W	0	γ, abs	1981Gur	M0073010
	4	γ, sn	1978Gor	M0025002
^{184}W	0	γ, abs	1981Gur	M0073011
	4	γ, sn	1978Gor	M0025003
^{186}W	0	γ, abs	1981Gur	M0073012
	4	γ, sn	1969Be8	L0016021
	4	γ, sn	1978Gor	M0025004
^{186}Os	7	γ, sn	1979Be4	L0046004, L0046002
^{188}Os	9	γ, sn	1979Be4	L0046005, L0046006, L0046007
^{189}Os	9	γ, sn	1979Be4	L0046009, L0046010, L0046011
^{190}Os	9	γ, sn	1979Be4	L0046013, L0046014, L0046015
^{192}Os	9	γ, sn	1979Be4	L0046017, L0046018, L0046019
^{191}Ir	4	γ, sn	1978Gor	M0008002
^{193}Ir	4	γ, sn	1978Gor	M0008003
^{194}Pt	4	γ, sn	1978Gor	M0008004
^{195}Pt	4	γ, sn	1978Gor	M0008005
^{196}Pt	4	γ, sn	1978Gor	M0008006
^{198}Pt	4	γ, sn	1978Gor	M0008007
^{197}Au	0	γ, abs	1981Gur	M0073013
	4	γ, sn	1970Ve1	L0021010
	4	γ, sn	1962Fu2	L0002005
	8	γ, sn	1987Ber	L0057009, L0057010
^{206}Pb	4	γ, sn	1964Ha2	L0007014
^{207}Pb	4	γ, sn	1964Ha2	L0007015
^{208}Pb	3	γ, abs	2003Var	M0656020
	4	γ, sn	1970Ve1	L0021011
	4	γ, sn	1964Ha2	L0007016
	12	γ, 1n	1972Yo	L0059004
^{nat}Pb	8	γ, sn	1987Ber	L0057012, L0057013
^{209}Bi	0	γ, abs	1976Gur	M0056008
	4	γ, sn	1964Ha2	L0007017
	12	γ, 1n	1972Yo	L0059005
^{232}Th	0	γ, abs	1976Gur	M0090002
	4	γ, sn	1973Ve1	L0031014
	10	γ, sn	1980Ca1	L0050002, L0050003, L0050004
^{233}U	11	γ, sn	1986Be2	L0058004, L0058003, L0058002
^{234}U	11	γ, sn	1986Be2	L0058007, L0058006, L0058005
^{235}U	0	γ, abs	1976Gur	M0090003
^{236}U	10	γ, sn	1980Ca1	L0050010, L0050011, L0050012

(*continued on next page*)

Table 3 (*continued*)

Nucl	Id	Reaction	Ref.	EXFOR
^{238}U	0	γ, abs	1976Gur	M0090004
	4	γ, sn	1973Ve1	L0031015
^{237}Np	10	γ, sn	1973Ve1	L0031007, L0031008, L0031009
	10	γ, sn	1986Be2	L0058008, L0058009, L0058010
^{239}Pu	0	γ, abs	1976Gur	M0090005
	10	γ, sn	1986Be2	L0058012, L0058013, L0058014

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