nearly as well although with different $B$-values. A model dependence of a factor of two has therefore to be considered in addition to the experimental error given in the Table 1.

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## The Mössbauer Effect of the 60.0 keV Transition in $^{155}$Gd and the 54.5 keV Transition in $^{157}$Gd

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Using the Mössbauer technique the lifetimes of the 60.0 keV level in $^{155}$Gd and the 54.5 keV level in $^{157}$Gd have been measured.

$^{155}$Gd and $^{157}$Gd are strongly deformed nuclei with a similar structure differing in only two neutrons. Therefore a comparison is very interesting. While on $^{155}$Gd many experiments have been done [1], only a few papers on $^{157}$Gd have been published [2–4]. Here we give our first results of lifetime measurements of the first excited rotational states in these nuclei.

Whereas Mössbauer measurements have been performed in $^{157}$Gd using the 64.0 keV transition [3, 4], the ME of the first excited state has been observed for the first time. This was only possible by using a $\gamma$-detector with a high energy resolution.

The $^{157}$Gd activity ($T_{1/2} = 15$ h) was produced at the Darmstadt Electron Linear Accelerator by means of the reaction $^{158}$Gd$(\gamma,p)^{157}$Eu. The $^{157}$Eu was separated and imbedded in a $Gd_2O_3$ matrix. For the absorber we used enriched $^{157}Gd_2O_3$ (69.6%). The thickness was 47 mg $^{157}$Gd/cm$^2$.

The temperature of source and absorber was 4.2 °K. Using a Ge(Li)-detector with an energy resolution of better than 1.7 keV any background of the 64.0 keV transition and the X-rays could be avoided. The experimental details have been described elsewhere [4].

The observed spectrum is shown in Figure 1. As known from other measurements [4] the hyperfine interaction is very small in comparison with the linewidth. Therefore a single Lorentzian was fitted to the data. The experimental linewidth was found to be

$$\Gamma(54.5) = (73.5 \pm 1.5) \text{ mm/sec}.$$

For the correction of the line broadening due to the absorber thickness we used the theoretical conversion coefficients of Hager and Seltzer [5] and the mixing ratio $\delta$(E2/M1) from the Tables of Lederer et al. [6]. The interpolated value turned out to be $\alpha_{th}(54.5) = 12.60$. With a Debye temperature of $\Theta = 220$ °K [7] and an assumed error of 10% we got the Debye-Waller factor $f(54.5) = 0.43 \pm 0.03$. Therewith the linewidth was corrected [8] by the factor 1.91, and the lifetime $\tau(54.5) = (187 \pm 12)$ psec * was found. As a test for this correction we estimated the maximum absorption (center of the resonance) as $(33.5 \pm 2.3)$%, which is in very good agreement with the experimental value of $(32 \pm 4)$%.

The lifetime of the 60.0 keV level in $^{155}$Gd has been estimated from Coulomb excitation data [9] to be $\tau(60.0) = 140$ psec, while Krusche et al. [10] reported $(350 \pm 90)$ psec. From a Mössbauer experiment [11] a larger value of $(2.7 \pm 0.7)$ nsec was obtained. Because of this discrepancy the lifetime was re-measured and analysed in the way described before.

The $^{155}$Eu activity produced by means of the reaction $^{154}$Sm$(n,\gamma)^{155}$Sm$(\beta^-)^{155}$Eu ($T_{1/2} = 1.7$ y) was separated and imbedded in a $CeO_2$ matrix. 13 mg $^{155}$Gd/cm$^2$ of enriched $^{155}Gd_2O_3$ (94.4%) were used as an absorber. The experimental linewidth was found to be

$$\Gamma(60.0) = (36.2 \pm 4.6) \text{ mm/sec}.$$

* The error includes also an assumed error for $\alpha_{th}$ of 10%.

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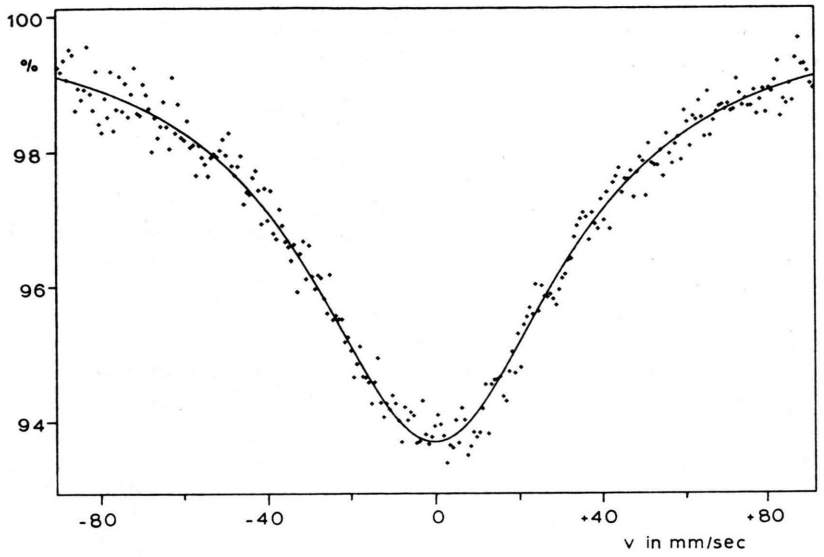


Fig. 1. Mössbauer spectrum of the 54.5 MeV transition in $^{157}Gd$ at 4.2 °K with a least squares fitted Lorentzian. Source: $^{157}Eu$ in $Gd_2O_3$, absorber: $^{157}Gd_2O_3$.

With $\alpha_{th}(60.0) = 9.55$ and $f(60.0) = 0.36 \pm 0.03$ we got a correction factor 1.24 and a lifetime

$$\tau(60.0) = (224 \pm 29) \text{ psec.}$$

The rather large value determined by BALABANOV et al. [11] using a Na(Tl)-detector is due to the very high background of the 86.5 keV transition; this second excited state has a lifetime of $\tau(86.5) = (9.16 \pm 0.13)$ nsec [10] and a comparable large Mössbauer cross section.

The errors of the available values are still too large for a detailed discussion of the relevant theoretical parameters, but further experiments will be done to improve the accuracy.

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## Über den Schwellenwert der Pumpenergie von Flüssigkeitslasern im quasistationären Betrieb

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*Threshold Pump Intensity of Flash Lamp Pumped Liquid Lasers*

Laser parameters of flash lamp pumped dye lasers are interpreted on the base of a simplified term scheme. The obtained formular contain the fluorescence characteristics of the liquid solutions.

Über die Deutung der Wirkungsweise von Flüssigkeitslasern im quasistationären Betrieb sind mehrere Mitteilungen erschienen [1]. In gegenwärtiger Arbeit wird der Verstärkungskoeffizient und die Schwellenenergie des Pumpens auf die Lumineszenzcharakteristiken zurückgeführt. Auf Grund des in Abb. 1 dargestellten vereinfachten Termschemas läßt sich die Besetzungsdichte $n_i$ der Elektronenenergieniveaus bei langsamer Änderung der Pumpintensität wie folgt ausdrücken:

$$n_1 + n_2 + n_3 = n\,,$$

$$\mathrm{d}n_1/\mathrm{d}t = -n_1 U_p(\nu) + n_3 A_{31} + n_3 U_l(\nu) + n_2 P_{21} = 0, \quad (1)$$

$$\mathrm{d}n_2/\mathrm{d}t = n_3 P_{32} - n_2 P_{21} = 0\,.$$