^{160}Dy(γ,γ′) 1988We10

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 176, 1 (2021)	1-May-2021

Additional information 1.

Enriched (67.1% ^{160}Dy) sample, placed between Al sheets, was irradiated in a bremsstrahlung beam of 4.1-MeV endpoint energy. Scattered radiation was detected at angles of 100°, 130°, and 150° using Ge detectors. Collective J=1 states in the region of excitation from 2.2 MeV to above ≈3 MeV were studied. Measure $\Gamma^2_{\gamma 0}/\Gamma$ for 4 excited states and deduce $\Gamma_{\gamma 0}$ and BM1↑ or BE1↑ values for these states.

1991Zi01 summarize data on high-resolution photon scattering experiments involving ΔK=0 dipole transitions to states below ≈2.2 MeV in a number of doubly even rare-earth nuclei. In this survey, they give information on the 1489 level, not reported in the work of 1988We10.

1990Gr16, working from previously published data (1974Al27,1974Al28), conclude that the states found by 1988We10 to be excited in (γ,γ′) are also populated in the ε decay of the $J^\pi=2^-$ isomer of ^{160}Ho ($T_{1/2}$=5.02 h). For the two lowest lying of these states, 1990Gr16 report the same pattern of decay gammas as 1988We10, although the energies are somewhat lower. From the 3061 level, however, they also place a 2095.5 γ, which has an implied B(M1) much larger than expected from RUL. However, a subsequent study (2002Ad34) of this decay scheme gives a considerably different picture of the decay of the most of the (γ,γ′) levels. The evaluator has taken the results of this latter study in this analysis.

1989Su15 give a theoretical treatment of the microscopic structure of the dipole modes in the doubly even isotopes of Dy from A=160 to A=164.

^{160}Dy Levels

E(level)	J^π[†]	$T_{1/2}$	$\Gamma^2_{\gamma 0}/\Gamma$ (meV)[‡]	Comments
0.0	0^+			
86.788	2^+			
1489	1^-	6.8 fs *8*	9.4 *15*	B(E1)↑=2.18 *22* $T_{1/2}$: calculated by the evaluator from the $\Gamma_{\gamma 0}$ value for this level and the listed γ branching. $\Gamma^2_{\gamma 0}/\Gamma$ (meV): computed by the evaluator from the $\Gamma_{\gamma 0}$ value of 1991Zi01 and the listed relative Iγ values.
2822	1^+	3.1 fs *4*	59 *7*	B(M1)↑=1.09 *13* The ε decay data of 2002Ad34 do not indicate any γ decay from this level to levels above the first excited state. $T_{1/2}$: calculated by the evaluator from the $\Gamma_{\gamma 0}$ value for this level and the listed γ branching.
2864	1^+		61 *7*	The ε decay data of 2002Ad34 indicate that the intensities of the 2777 and 2864 γ′s represent only about 17% of the decays of this level. Thus, the $\Gamma_{\gamma 0}$ and BM1↑ values deduced for this level by 1988We10 are most likely incorrect. The evaluator has not deduced τ or B(M1)-related information for this level and its deexciting γ′s.
2877	1^-		8.4 *17*	The ε decay data of 2002Ad34 indicate that the intensities of the 2790 and 2877 γ′s represent only about 12% of the decays of this level. Thus, the $\Gamma_{\gamma 0}$ and BE1↑ values deduced for this level by 1988We10 are most likely incorrect. The evaluator has not deduced τ or B(E1)-related information for this level and its deexciting γ′s.
3061	1^+		19 *3*	The ε decay data of 2002Ad34 indicate that the intensities of the 2974 and 3061 γ′s represent only about 5% of the decays of this level. Further their decay data give a quite different ratio for the intensities of the two γ′s to the g.s.

Continued on next page (footnotes at end of table)

^{160}Dy(γ,γ') 1988We10 (continued)

^{160}Dy Levels (continued)

E(level)	J^π[†]	$T_{1/2}$	$\Gamma^2_{\gamma 0}/\Gamma$ (meV)[‡]	Comments
				band. Thus, the $\Gamma_{\gamma 0}$ and BM1↑ values deduced for this level by 1988We10 are most likely incorrect. The evaluator has not attempted to deduce τ or B(M1)-related information for this level and its deexciting γ's.

[†] From adopted values.
[‡] Note that the Γ-related tabular data in 1988We10 should be expressed in meV and not MeV.

$\gamma(^{160}$Dy)

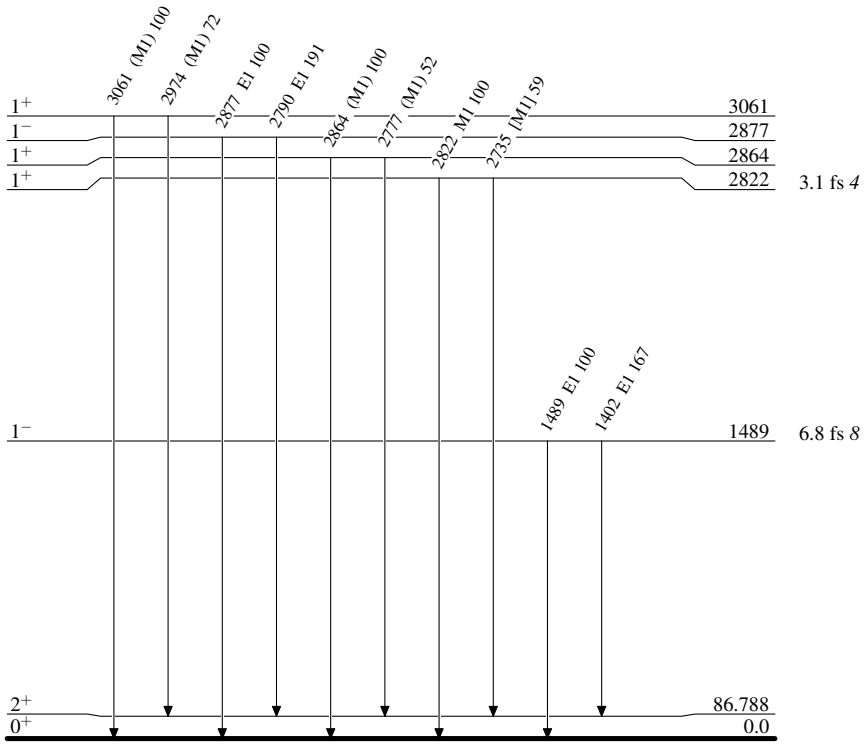
E_i(level)	J^π_i	E_γ	I_γ[‡]	E_f	J^π_f	Mult.[#]	Comments
1489	1^-	1402	167 *17*	86.788	2^+	E1	E_γ: from 1991Zi01. I_γ: weighted average of 179 *21* (2002Ad34, ε decay) and 144 *30* (1991Zi01, B(E1) ratio).
		1489	100	0.0	0^+	E1	E_γ: from 1991Zi01.
2822	1^+	2735[†]	59 *5*	86.788	2^+	[M1]	
		2822	100	0.0	0^+	M1	
2864	1^+	2777[†]	52 *5*	86.788	2^+	(M1)	I_γ: 2002Ad34, ε decay, report Iγ(2777γ)/Iγ(2864γ)=0.46 *12*.
		2864	100	0.0	0^+	(M1)	
2877	1^-	2790[†]	191 *40*	86.788	2^+	E1	I_γ: 2002Ad34, ε decay, report Iγ(2790γ)/Iγ(2877γ)=1.5 *3*.
		2877	100	0.0	0^+	E1	
3061	1^+	2974[†]	72 *13*	86.788	2^+	(M1)	I_γ: 2002Ad34, ε decay, report Iγ(2974γ)/Iγ(3061γ)=9 *4*.
		3061	100	0.0	0^+	(M1)	I_γ: observed peak contains a small contribution from ^{162}Dy(γ,γ').

[†] From level-energy difference. 1988We10 do not list an Eγ value for this transition.
[‡] Unless otherwise noted, the relative intensities of the two γ rays deexciting each level were obtained from the reported ratio of the decay widths of the level to the first 2^+ state and the g.s.
[#] From observed γ-intensity ratio for scattering at 100° and 130°, authors conclude that the γ transitions are of dipole character and hence that the excited states have J=1. This information also permits excitations with ΔK=1 to be distinguished from those with ΔK=0. γ transitions having ΔK=0 are considered by the authors to be E1.

^{160}Dy(γ,γ′) **1988We10**

Level Scheme

Intensities: Relative photon branching from each level



$^{160}_{66}Dy_{94}$