^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 2537 (2012)	1-Mar-2012

J$^\pi$(^{155}Gd)=3/2$^-$. Configuration=ν3/2[521].

Additional information 1.

2010Je02: Measured Eγ for γ's from the 1408, 5$^-$ level using the ultra-high-resolution spectrometers GAMS4/5 and $T_{1/2}$ for the 5$^-$ level using GAMS4. Report no evidence for the proposed tetrahedral ($Y_3^{\pm 2}$) symmetry in ^{156}Gd.

1993Kl03: Level scheme studied using the (n,γ) and (n,e$^-$) reactions with thermal neutrons, "resonance-averaged" n-capture with a 2-keV neutron beam, and summed-coincidence measurements. γ radiation studied using the GAMS2/3 crystal spectrometers and a pair spectrometer. Coincidence measurements made using a spectrometer consisting of two 10%-efficient Ge(Li) detectors and two NaI(Tl) detectors 150 mm×100 mm^2. Conversion electrons measured using the BILL electron spectrometer. Measured lifetimes of a number of excited states using the two-axis double flat crystal spectrometer GAMS4 by analyzing the Doppler-broadened lineshapes of the emitted γ rays.

1982Ba28: γ's measured using a curved-crystal spectrometer and various Ge detectors. Conversion electrons measured using a $\pi\sqrt{2}$ magnetic electron spectrometer. Primary γ's measured following both thermal- and 2-keV "resonance-averaged" n-capture.

2000ApZZ: Measured lifetimes for several members of the γ-vibrational band and the first two excited K$^\pi$=0$^+$ bands using the two-axis double-flat crystal spectrometer GAMS4 by analyzing the Doppler-broadened lineshapes of the emitted γ rays.

1985HoZL: Low-energy γ's measured using the curved-crystal spectrometer GAMS1. Conversion electrons measured using the BILL electron spectrometer. Report≈17 new γ's connecting the first three excited bands.

Other (n,γ) studies are 1960Kn01, 1960Wa09, 1961Gr31, 1961Sc19, 1962Ca21, 1962Gr33, 1964No11, 1966Ne06, 1968Go38, 1968Gr32, 1968SpZZ, 1969BaZS, 1969Be17 1970Bo29, 1970Da25, 1970Mi09, 1972Si04, 1974Sc03, 1982Is05 and 2000BeZQ. (This latter study searched for "scissors M1 resonances" built on excited states.) For a brief description of the experimental methods, see the ENSDF file.

^{156}Gd Levels

α decay, with %α=1.3×10^{-7} *1*, to the 2$^+$ and 4$^+$ levels in ^{152}Sm, has been reported from the thermal-neutron capture state (1969Be17). This value was computed by the evaluator using σ(n,α)=82 μb *7*, measured by 1969Be17, and a value of 6.1×10^4 barns for the thermal-neutron capture cross section of ^{155}Gd.

Neutron resonance data are given by 1960Mo14, 1963Da18, and 1964St07. 31 neutron resonances below 1.5 keV have been reported (1973Mu14).

1993Kl03 attempt to identify (in their table 7) several levels with orbital M1-mode states and (γ,γ') states known from other studies. These levels are at 2402.5, 2784.6, 2972.3, 3007.6, 3050.5, 3068.6, 3157.7, 3216.3, 2538.190 and 3313.9. These authors point out various problems associated with these identifications. The evaluator has chosen not to list these levels and their proposed deexciting γ's in this evaluation.

E(level)[†‡#]	J$^\pi$[@]	$T_{1/2}$[&a]	Comments
0[b]	0$^+$		
88.968[b] *1*	2$^+$		
288.186[b] *1*	4$^+$		
584.712[b] *3*	6$^+$		
965.130[b] *6*	8$^+$		
1049.486[c] *2*	0$^+$	1.8 ps *+19−6*	$T_{1/2}$: From 1993Kl03. 2000ApZZ report 1.25 ps < $T_{1/2}$ < 3.3 ps.
1129.434[c] *2*	2$^+$	1.3 ps *+5−4*	$T_{1/2}$: From 2000ApZZ. These authors report 0.87 ps < $T_{1/2}$ < 1.8 ps.
1154.150[d] *2*	2$^+$	0.78 ps *+11−9*	$T_{1/2}$: From 1993Kl03. 2000ApZZ report 0.62 ps < $T_{1/2}$ < 0.97 ps.
1168.185[e] *7*	0$^+$	5 ps *+5−3*	$T_{1/2}$: From 2000ApZZ. These authors report 2.1 ps < $T_{1/2}$ < 10.2 ps.
1242.481[f] *4*	1$^-$	0.110 ps *+13−11*	
1248.000[d] *2*	3$^+$	0.58 ps *11*	$T_{1/2}$: From 2000ApZZ. These authors report 0.48 ps < $T_{1/2}$ < 0.69 ps.
1258.074[e] *3*	2$^+$	2.4 ps *+11−8*	$T_{1/2}$: From 2000ApZZ. These authors report 1.6 ps < $T_{1/2}$ < 3.5 ps.

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^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)

^{156}Gd Levels (continued)

E(level)[†‡#]	J^π[@]	$T_{1/2}$[&a]	Comments
1276.136[f] *2*	3^-	0.121 ps *+11−10*	
1297.819[c] *2*	4^+	1.6 ps *+8−5*	$T_{1/2}$: From 2000ApZZ. These authors report 1.0 ps < $T_{1/2}$ < 2.3 ps.
1319.656[f] *2*	2^-	>3.9 ps	
1355.418[d] *2*	4^+	0.54 ps *+15−12*	$T_{1/2}$: From 2000ApZZ. These authors report 0.42 ps < $T_{1/2}$ < 0.69 ps. 1993Kl03 report $T_{1/2}$=1.6 ps *+14−5*.
1366.462[h] *4*	1^-	24 fs *+6−2*	
1408.130[f] *5*	5^-	0.15 ps *+12−2*	$T_{1/2}$: Value from 2010Je02, measured using the GRID technique.
1462.297[e] *3*	4^+		
1468.503[f] *2*	4^-	>3.5 ps	
1506.860[d] *2*	5^+	0.4 ps *+8−3*	$T_{1/2}$: From 2000ApZZ. These authors report 0.14 ps < $T_{1/2}$ < 1.25 ps.
1510.591[g] *2*	4^+		
1538.853[h] *4*	3^-	20 fs *6*	
1540.178[c] *10*	6^+		
1622.530[g] *2*	5^+		
1643.648[d] *6*	6^+		
1705.796[f] *5*	6^-		
1715.188[i] *5*	0^+	2.6 ps *+23−12*	$T_{1/2}$: From 2000ApZZ. These authors report 1.4 ps < $T_{1/2}$ < 4.9 ps.
1753.649[g] *3*	6^+		
1771.087[i] *4*	2^+	0.42 ps *+14−9*	$T_{1/2}$: From 1993Kl03. 2000ApZZ report 0.09 ps < $T_{1/2}$ < 0.51 ps.
1780.482[j] *3*	2^-	0.7 ps *+16−3*	
1786.09? *24*			E(level): Populated only via a questionable primary γ.
1798.735?[h] *7*	(5^-)		
1827.839[k] *4*	2^+		
1851.238[l] *7*	0^+		
1851.802[j] *4*	3^-		
1861.062[m] *3*	4^+		
1893.390[i] *6*	4^+		$T_{1/2}$: 2000ApZZ report 0.00010 ps < $T_{1/2}$ < 0.31 ps.
1914.838[l] *5*	2^+		
1916.454[k] *4*	3^+		
1934.154[r] *5*	2^-		E(level): Only the 456, 567 and 614 γ's were used in the least-squares fit to obtain this level energy, since the other deexciting γ's have significant components of the transition from the other 1934 level.
1934.353 *5*	3^-	0.5 ps *+6−2*	E(level): Only the 153, 423, 578, 676 and 1646 γ's were used in the least-squares fit to obtain this level energy, since the other deexciting γ's have significant components of the transition from the other 1934 level.
1946.371 *6*	1^-	35 fs *+11−9*	
1952.361[j] *3*	4^-		
1952.394 *6*	0^-		E(level): Level not reported by 1993Kl03. J^π: Possible values are 0^-, 1^-, 2^-. 1993GrZU propose 0^-, based on the γ-deexcitation pattern and the population intensity in 2-keV n capture. Note that this depends heavily on all three of the deexciting γ's being pure multipoles. While the data are consistent with this, they do not rule out possible mixtures of other multipoles. 2005Gr21, by one of the authors of 1993GrZU, also propose J^π=0^-. J^π: For J^π=0^-, 1993GrZU propose conf=ν3/2[651]-ν3/2[521]. 2005Gr21, however, propose conf=π5/2[532]-π5/2[413], which the evaluator accepts (see the comment on this point in the Adopted Levels).
1962.036 *12*	1^-		
1962.060[m] *3*	5^+		
1965.114 *4*	4^-		
1965.950[n] *4*	1^+		
1995.458 *4*	4^-		

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^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)

^{156}Gd Levels (continued)

E(level)[†‡#]	J$^{\pi}$[@]	$T_{1/2}$[&a]	Comments
2003.747[n] *5*	2$^+$		
2010.341 *4*	4$^+$		
2016.949 *8*	5$^-$		
2020.590[k] *5*	4$^+$		
2024.946[r] *5*	3$^-$		
2026.660[o] *6*	1$^+$	65 fs *+19−14*	
2029.780 *4*	4$^-$		
2044.937[p] *5*	4$^-$		
2047.800 *6*	2$^+$		
2054.131[o] *6*	2$^+$	0.19 ps *+4−3*	
2070.287[n] *4*	3$^+$		
2103.406 *6*	3$^-$		The γ deexcitation pattern shown here differs in several ways from that reported in the ^{156}Tb ε decay. The evaluator has chosen to adopt the pattern from the ε decay.
2106.645[o] *5*	3$^+$		
2116.450[p] *5*	5$^-$		
2121.43 *3*	2$^-$		E(level): Proposed by 1995GrZY. Probably the same as the 2121.42 level seen in β^- decay.
2155.551[r] *7*	4$^-$		
2174.335 *5*	2$^+$		
2181.383 *25*	2$^+$		
2186.788[q] *13*	1$^+$		
2190.651 *5*	2$^+$		
2199.773[s] *12*	2$^-$		E(level): Level and conf proposed by 1995GrZY. In adopting this assignment, the evaluator has assumed that the strong (d,t) peak is to be associated with this level and not with the near-lying 2205.5 level. The placement of the γ's deexciting this level is also that of 1995GrZY.
2205.561 *6*	1$^-$		The γ-decay properties reported for this level differ somewhat from those reported in the ^{156}Eu β^- decay. The evaluator has chosen to adopt the γ-decay pattern from the β^- decay data.
2216.611[q] *5*	2$^+$		
2227.626 *9*	3$^-$		
2240.368 *4*	2$^+$,3$^+$		
2254.316 *4*	4$^+$		
2256.742[q] *7*	3$^+$		
2259.86 *7*	1$^-$		1993Kl03 report this level, but with only the 2259 γ and two lower-energy γ's deexciting it. The 2170 γ has been placed here, based on the occurrence of such a γ with the expected Iγ value in the ^{156}Eu β^- decay. A 138.7 γ is also observed to deexcite this level in ^{156}Eu β^- decay. This γ is of such a strength that it should have been seen in (n,γ), but neither 1982Ba28 nor 1993Kl03 report it. J$^{\pi}$: 1999GrZN (and 1995GrZY) propose J$^{\pi}$=1$^-$, in which case mult=E1 for the 2259 γ.
2270.015 *12*	1$^+$		E(level): Level and its decay modes are those suggested by 2000GrZY. The Iγ values of the 1027 and 1140 γ's are much larger than expected from the ^{156}Eu β^- decay. The Iγ values from this latter data set are those adopted.
2273.9 *13*			
2302.820 *7*	2$^+$		1993Kl03 report this level, but show no γ's deexciting it.
2316.498 *7*	1$^-$,2$^-$		E(level): Level and its decay modes are those proposed by 2000GrZY.
2323.215 *11*	2$^+$		
2349.634 *8*	3$^+$		Level and its decay modes are those proposed by 2000GrZY.
2360.35? *24*	1$^+$		Level tentatively proposed by 2000GrZY. Two of the γ's proposed to deexcite it are placed elsewhere in the level scheme.
2367.44 *4*	2$^+$		Level and its decay modes are those proposed by 2000GrZY.
2382.469 *11*	2$^+$		Decay modes are those proposed by 2000GrZY.
2403.21 *14*			2000GrZY propose levels at 2402.82, J$^{\pi}$=1$^+$, and 2402.8(?), J$^{\pi}$=(1$^-$). The proposed decay modes are problematic, however.

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^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)

^{156}Gd Levels (continued)

E(level)[†‡#]	Jπ[@]	Comments
2415.489 *24*	3+	The listed γ′s are some of those proposed by 2000GrZY to deexcite this level.
2428.37 *11*		
2436.95 *10*		
2446.16 *3*	2+	Decay modes are those proposed by 2000GrZY. Some of these γ′s are placed elsewhere in the level scheme by 1993Kl03.
2452.26 *10*		
2460.5 *4*		
2477.3 *11*		
2502.40 *7*		
2594.9 *15*		
2647.59 *13*		
2652.56 *8*		
2696.9 *10*		
2701.77 *11*		
2719.8 *8*		
2749.53 *7*		
2762.46 *8*		
2786.0 *7*	1+	
2789.5 *3*		
2817.8 *8*		
2830.80 *7*		
2840.21 *7*		
2851.0 *8*		
2874.72 *7*		
2888.57 *11*		
2909.5 *8*		
2928.78 *10*		
2947.86 *7*		
2962.69 *10*		
2987.80 *9*		
3007.35 *11*		
3024.66 *10*		
3033.6 *8*		
3050.79 *7*		
3105.57 *10*		
3109.73 *16*		
3118.01 *10*		
3165.6 *9*		
3180.54 *9*		
3186.02 *11*		
3190.46 *8*		
3207.8 *10*		
3229.16 *9*		
3266.42 *8*		
3276.10 *7*		
3284.97 *9*		
3297.6 *7*		
3356.46 *16*		
3361.42 *15*		
3366.56 *11*		
3370.62 *11*		
3379.27 *10*		
3423.34 *11*		
3427.90 *9*		
3434.55 *10*		
3443.19 *6*		
3461.54 *8*		

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^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)

^{156}Gd Levels (continued)

E(level)[†‡#]	J$^{\pi}$[@]	Comments
3477.2 *8*		
3483.74 *10*		
3496.15 *11*		
3509.4 *8*		
3535.4 *8*		
3552.5 *5*		
3595.2 *6*		
3636.3 *9*		
3678.1 *8*		
3692.8 *8*		
3723.9 *9*		
3811.1 *8*		
3823.1 *10*		
3865.8 *7*		
3968.4 *9*		
3978.0 *8*		
4009.2 *6*		
4121.0 *10*		
8536.39 *7*	2$^-$	%α=1.3×10^{-7} *1* %α: From σ(n,α) (1969Be17) and σ(n,γ). The decay is reported to take place to the first 2$^+$ and 4$^+$ levels in ^{152}Sm. E(level): From the S(n) value of 2011AuZZ, which is the same as that listed by 2003Au03. 1982Is05 report the energy of the thermal-neutron capture state, S(n), to be 8536.39 *12*. 1982Ba28 report S(n)=8535.8 *5*. J$^{\pi}$: s-wave n capture in ^{155}Gd populates ^{156}Gd states having J$^{\pi}$=1$^-$,2$^-$. The thermal-neutron capture cross section is dominated by a resonance at E(n)=0.0268 eV having J$^{\pi}$=2$^-$ (1982Ba28).

† Levels reported by 1982Ba28 only and based solely on primary γ's whose existence was regarded as questionable are generally not listed here. For such data, see 1982Ba28.

‡ From a least-squares fit to the γ energies. In this fit, the reported energy for the neutron-capture level is maintained. For those 8 γ transitions whose absolute Eγ values were determined with high precision using the GAMS4 spectrometer, the evaluator has increased the uncertainties, for this fit, by including an absolute error of 2 ppm, according to the comment of 1993Kl03, and taking none of these Eγ values to have an uncertainty less than 1 eV. The level energies are quoted only to the nearest 1 eV, with an uncertainty of 1 eV, even though the least-squares fit gives more precise values in several instances.

Several levels are directly populated by primary γ transitions following 1.9-keV n capture (1982Ba28), but for which no decay modes are given. These data are not included here. They are given separately in the ^{155}Gd(n,γ) E=1.9- and 58-keV data sets.

@ From the adopted values.

& Measured from the Doppler-broadened lineshapes of the γ radiation emitted following thermal-neutron capture using the two-axis double-flat crystal spectrometer, GAMS4 (1993Kl03,2000ApZZ). For a detailed discussion of this technique, see 1992Ro22. 2000ApZZ report only lower and upper limits for the level lifetimes, but not the values themselves. 1993Kl03 point out that their (the GAMS4-based) lifetimes appear larger than those from other techniques, especially those from nuclear resonance fluorescence, and that the discrepancy increases as the level energy decreases. 1993Kl03 discuss some possible explanations for this.

a Values from 1993Kl03, unless noted otherwise. In using the data from 2000ApZZ, the evaluator has inferred lifetime (half-life) values using the geometric mean of their reported upper and lower limits, leading to asymmetric uncertainties in some cases.

b Band(A): K$^{\pi}$=0$^+$ g.s. band.

c Band(B): First excited K$^{\pi}$=0$^+$ band.

d Band(C): K$^{\pi}$=2$^+$ γ-vibrational band.

e Band(D): K$^{\pi}$=0$^+$ band.

f Band(E): K$^{\pi}$=1$^-$ octupole vibrational band. Previously suggested as a possible example of tetrahedral ($Y_3^{\pm 2}$) symmetry, but the data of 2010Je02 do not support this.

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^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)

^{156}Gd Levels (continued)

[g] Band(F): $K^\pi=4^+$ band. Dominant conf=π5/2[413]+π3/2[411]. Probable hexadecapole vibration.
[h] Band(G): $K^\pi=0^-$ octupole-vibrational band.
[i] Band(H): $K^\pi=0^+$ band.
[j] Band(I): $K^\pi=2^-$ octupole-vibrational band.
[k] Band(J): $K^\pi=2^+$ band.
[l] Band(K): $K^\pi=0^+$ band.
[m] Band(L): $K^\pi=4^+$ band. Dominant conf=ν5/2[523]+ν3/2[521].
[n] Band(M): $K^\pi=1^+$ band.
[o] Band(N): $K^\pi=1^+$ band.
[p] Band(O): $K^\pi=4^-$ band. Dominant conf=ν3/2[521]+ν5/2[642].
[q] Band(P): $K^\pi=1^+$ band.
[r] Band(Q): $K^\pi=2^-$ band.
[s] Band(R): Probable $K^\pi=2^-$ bandhead. Conf=ν3/2[521]+ν1/2[400].

γ(^{156}Gd)

Iγ normalization: Additional information 4.
For the primary γ′s from 1.9-keV neutron capture, see 1982Ba28, 1993Kl03 and 1999GrZN.

Eγ[†‡#@&]	Iγ[ab]	Ei(level)	J^{π}_{i}	E_f	J^{π}_{f}	Mult.[cde]	δ[f]	$I_{(\gamma+ce)}$	Comments
57.62[i] *2*	0.007[i] *4*	1355.418	4+	1297.819	4+				
79.878[i] *9*	0.012[i] *5*	1129.434	2+	1049.486	0+	[E2]			
88.970 *1*	209×10^{1} *31*	88.968	2+	0	0+	E2			Eγ: From 1993Kl03, 1982Ba28. Others: 88.967 *2* (1961Sc19); 88.974 *11* (1960Wa09). All are curved-crystal measurements. Iγ: From 1993Kl03. 1982Ba28 report Iγ=1980 *100*.
101.000[g] *2*	0.60[g] *7*	1962.060	5+	1861.062	4+				Placement is that of 1993Kl03.
103.89[i] *2*	0.015[i] *5*	1258.074	2+	1154.150	2+				
104.55[i] *4*	0.004[i] *2*	1154.150	2+	1049.486	0+				
107.41[i] *1*	0.05[i] *1*	1355.418	4+	1248.000	3+				
111.941 *1*	17.3 *7*	1622.530	5+	1510.591	4+	M1+E2	0.29 *1*		Eγ: From 1993Kl03, 1982Ba28. Other: 111.938 *6* (1961Sc19). All are curved-crystal measurements.
115.668[g] *2*	0.70[g] *5*	1622.530	5+	1506.860	5+	M1+E2	0.22 *1*		
118.56[ip] *4*	<0.025[i]	1248.000	3+	1129.434	2+				
118.71[i] *3*	[i]	1168.185	0+	1049.486	0+	E0		0.21	
[x]129.429 *6*	0.22 *5*					M1			
131.116 *2*	0.62 *4*	1753.649	6+	1622.530	5+	M1+E2	+0.40 *+43−19*		
131.983 *12*	0.019 *3*	1408.130	5−	1276.136	3−	[E2]			Eγ: From 2010Je02. γ not reported in earlier studies. From the energy difference of the 5− and 3− levels connected by this γ, Eγ=131.9894 *19* is computed (2010Je02). Iγ: From 2010Je02.
[x]136.008 *3*	0.39 *3*					M1+E2			
143.672[ng] *11*	0.09[ng] *3*	1297.819	4+	1154.150	2+				Eγ: Placement is that of 1985HoZL. γ was observed by 1982Ba28 but was not placed by them.
143.672[ng] *11*	0.09[ng] *3*	1995.458	4−	1851.802	3−				This placement is that of 1993Kl03.
[x]144.360[g] *4*	0.30[g] *4*								
147.671[n] *4*	0.28[n] *3*	2174.335	2+	2026.660	1+	M1+E2			
147.671[n] *4*	0.28[n] *3*	2254.316	4+	2106.645	3+	M1+E2			
148.846 *2*	1.04 *5*	1468.503	4−	1319.656	2−	E2			
151.43[i] *1*	0.07[i] *2*	1506.860	5+	1355.418	4+				
153.882[ng] *10*	0.17[ng] *3*	1934.353	3−	1780.482	2−				Eγ: From 1982Ba28. The placement is from the level scheme of 1993Kl03, although these authors do not show this γ in their line list.
153.882[ng] *10*	0.17[ng] *3*	2070.287	3+	1916.454	3+				Eγ: From 1982Ba28. The placement is from the level scheme of 1993Kl03, although these authors do not show this γ in their line list.

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	δ [f]	Comments
155.168 4	9.0 4	1510.591	4+	1355.418	4+	M1+E2	0.48 2	
x155.673[g] 12	0.12[g] 3							
x157.213[g] 3	0.53[g] 4							
158.533 7	0.22 3	2010.341	4+	1851.802	3−			
164.006[n] 15	0.13[n] 4	2174.335	2+	2010.341	4+			Mult.: 1993Kl03 report mult=E2?, but γ is multiply placed.
164.006[n] 15	0.13[n] 4	2190.651	2+	2026.660	1+			Mult.: 1993Kl03 report mult=E2?, but γ is multiply placed.
164.469 6	0.25 4	1462.297	4+	1297.819	4+			
x166.650 9	0.21 4							
168.382 3	1.08 9	1297.819	4+	1129.434	2+	E2		
168.703[g] 18	0.14[g] 2	2029.780	4−	1861.062	4+			
168.804[n] 6	0.29[n] 5	2020.590	4+	1851.802	3−			
168.804[n] 6	0.29[n] 5	2216.611	2+	2047.800	2+			
x170.175 9	0.20 4							
170.678 4	0.36 4	1468.503	4−	1297.819	4+			
171.870 11	0.18 4	1952.361	4−	1780.482	2−	E2		
x173.756 10	0.18 4					E2		
x174.713 3	1.02 6					E1		
x178.115 5	0.64 10					M1		
x184.393 20	0.15 5					E2(+M1)		
186.869[n] 14	0.13[n] 3	2103.406	3−	1916.454	3+			1993Kl03 report α(K)exp=0.51 12, which is larger than that for an M1. Since this placement requires a parity change, the implied E0 component may be associated with the other proposed placement.
186.869[n] 14	0.13[n] 3	2190.651	2+	2003.747	2+			1993Kl03 report α(K)exp=0.51 12, which is larger than that for an M1, suggesting an E0 component. Note, γ is multiply placed.
x187.443 3	1.30 7					E1		
x188.013 14	0.18 4							
189.960 15	0.18 4	2216.611	2+	2026.660	1+	E2(+M1)		
190.215 3	1.24 6	1319.656	2−	1129.434	2+	E1		E_γ: 1993Kl03 propose that this γ as doubly placed, with the second placement being from the 2106 level. However, the γ branching of this level is consistent with that observed in ^{156}Eu β^- decay and the multipolarity is not consistent with that second placement. The evaluator has thus chosen not to adopt the placement from the 2106 level.
x191.248 10	0.22 4					M1		
192.371 4	1.06 7	1468.503	4−	1276.136	3−			
193.001 13	0.20 5	1242.481	1−	1049.486	0+			
x196.488[g] 16	0.15[g] 4							
x197.567[g] 9	0.41[g] 5							
199.21900[h] 1	316×10^1 19	288.186	4+	88.968	2+	E2		E_γ: Others: 199.2193 10 (1982Ba28, after adjustment of their energy scale); 199.216 5 (1961Sc19); 199.24 5 (1960Wa09). All are curved-crystal measurements. I_γ: From 1993Kl03. 1982Ba28 report Iγ=2842 200.
201.269 4	0.63 4	1355.418	4+	1154.150	2+			

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	δ [f]	Comments
[x]202.033[g] *18*	0.20[g] *5*							
204.225 *3*	1.14 *11*	1462.297	4^+	1258.074	2^+	E2		
[x]204.898 *8*	0.23 *3*					[l]		
[x]205.466 *2*	16.7 *7*					E1		
[x]207.297 *16*	0.17 *4*					E2(+M1)		
208.399 *4*	0.47 *4*	1962.060	5^+	1753.649	6^+	M1		
208.54[ip]	<0.008[i]	1258.074	2^+	1049.486	0^+			
[x]209.337[g] *7*	0.35[g] *4*							
212.771 *13*	0.21 *3*	1510.591	4^+	1297.819	4^+	M1+E2	0.49 *4*	
[x]215.89 *3*	0.13 *5*					E2		
[x]219.520 *6*	0.28 *4*					E2(+M1)		
219.788 *7*	0.29 *3*	2240.368	2^+,3^+	2020.590	4^+	E2+M1		
[x]220.227 *9*	0.21 *3*					M1		
[x]220.72[g] *3*	0.18[g] *7*							
221.889 *12*	0.22 *4*	2020.590	4^+	1798.735?	(5^-)			E_γ: γ from 1982Ba28 but not placed by them. Placement is that of 1993Kl03.
224.707 *5*	0.37 *3*	2190.651	2^+	1965.950	1^+	M1		
225.88[i] *4*	0.04[i] *1*	1355.418	4^+	1129.434	2^+	[E2]		
[x]227.348 *8*	0.202 *22*					E2		
[x]227.37 *3*	0.15 *4*					E2(+M1)		
[x]228.331[j] *23*	0.14 *6*					E2		
[x]229.727 *8*	0.23 *3*							
230.983 *20*	0.14 *4*	2029.780	4^-	1798.735?	(5^-)			
232.255[p] *12*	0.172 *17*	1771.087	2^+	1538.853	3^-			
[x]232.770[j] *12*	0.19 *5*					E2		
237.04 *4*	0.20 *7*	1366.462	1^-	1129.434	2^+			
237.283 *5*	0.66 *4*	1705.796	6^-	1468.503	4^-			Mult.: From α(K)exp=0.059 *4*, 1993Kl03 deduce mult=E2. From α(K)exp=0.23 *9*, 1982Ba28 deduce mult=M1.
[x]238.063 *4*	0.76 *5*					E1		
238.529 *3*	2.76 *11*	1861.062	4^+	1622.530	5^+	M1+E2		
239.204[g] *20*	0.12[g] *3*	2010.341	4^+	1771.087	2^+			E_γ: γ not reported by 1993Kl03 in their line list, but placed here by them in their level scheme table.
243.047[g] *13*	0.19[g] *2*	1753.649	6^+	1510.591	4^+			
[x]243.654 *11*	0.17 *3*					M1		
243.980 *5*	0.82 *4*	2254.316	4^+	2010.341	4^+	M1+E2		
244.92 *3*	0.12 *3*	2240.368	2^+,3^+	1995.458	4^-			
246.494 *15*	0.155 *24*	1952.361	4^-	1705.796	6^-			
246.874[g] *15*	0.42[g] *6*	1962.036	1^-	1715.188	0^+			E_γ: 1982Ba28 tentatively place this γ from the 1753 level.
[x]248.342 *3*	7.6 *3*					E1		
[x]249.082[g] *6*	1.02[g] *7*							
249.334[g] *14*	0.21[g] *3*	2029.780	4^-	1780.482	2^-			E_γ: Placement is that of 1993Kl03.
252.991[n] *17*	0.22[n] *4*	2256.742	3^+	2003.747	2^+	M1		

From ENSDF

$^{156}_{64}$Gd$_{92}$-9

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	δ [f]	Comments
252.991[n] *17*	0.22[n] *4*	2323.215	2^+	2070.287	3^+	M1		
255.039[j] *16*	0.19 *10*	2302.820	2^+	2047.800	2^+			Additional information 2. Placement is that of the evaluator. 1993Kl03 place this γ from a 2259.7 level, but the final state implied by such a placement is not otherwise observed.
[x]257.079 *12*	0.28 *5*					M1		
258.4[p]		1798.735?	(5^-)	1540.178	6^+			In their level scheme, 1993Kl03 place this γ from the 1798 level, but do not show it in their line list. 1982Ba28 also do not report this γ.
258.860[n] *4*	1.15[n] *6*	1506.860	5^+	1248.000	3^+	E2		
258.860[n] *4*	1.15[n] *6*	2254.316	4^+	1995.458	4^-			Mult.: 1982Ba28 and 1993Kl03 report mult=E2, but placement requires a parity change. Note, γ is multiply placed.
262.589 *3*	31.9 *12*	1510.591	4^+	1248.000	3^+	E2+M1	+8.4 *10*	
[x]263.320[g] *14*	0.21[g] *3*							
[x]264.037 *11*	0.34 *4*					E2		I_γ: 1993Kl03 report ΔIγ=0, most probably a misprint.
266.60 *3*	0.260	2181.383	2^+	1914.838	2^+	E2(+M1)		
267.113 *10*	1.67 *10*	1622.530	5^+	1355.418	4^+	E2		
[x]267.491 *9*	0.38 *4*					M1		
269.087 *21*	0.21 *4*	2323.215	2^+	2054.131	2^+	M1		
[x]272.569[g] *17*	0.29[g] *4*							
273.635 *20*	0.25 *5*	2054.131	2^+	1780.482	2^-			
275.957[j] *21*	0.12 *4*	2382.469	2^+	2106.645	3^+	M1+E2		
276.711 *6*	0.41 *3*	2047.800	2^+	1771.087	2^+	M1[l]		
[x]279.776 *7*	0.58 *5*							
[x]280.223 *10*	0.38 *6*					M1		
[x]280.285[j] *10*	0.52 *6*							
[x]280.434[j] *19*	0.79 *15*					M1(+E2)		
[x]282.918 *6*	0.65 *4*					M1		
[x]283.82 *6*	0.34 *9*					E2		1982Ba28 report Eγ=283.60 *5* and Iγ=0.19 *7*.
[x]285.297[g] *19*	0.20[g] *3*							
288.031 *4*	1.92 *10*	2240.368	$2^+,3^+$	1952.361	4^-	E1		See the comment in the Adopted Gammas data set regarding the final level populated by this γ.
288.28 *3*	0.37 *8*	1643.648	6^+	1355.418	4^+	E2		
[x]289.051 *3*	3.84 *11*					M1		
290.789 *12*	0.32 *6*	2256.742	3^+	1965.950	1^+	[E2]		I_γ: 1982Ba28 report Iγ=0.46 *6*. Mult.: ce data indicate mult=M1, but placement requires E2.
291.355 *10*	0.40 *5*	1753.649	6^+	1462.297	4^+	E2		
[x]292.13 *3*	0.28 *4*					M1+E2		
[x]293.709 *20*	0.18 *3*							
[x]294.395 *18*	0.23 *7*							I_γ: 1982Ba28 report Iγ=0.33 *4*.
296.532 *3*	253 *5*	584.712	6^+	288.186	4^+	E2		I_γ: From 1993Kl03. 1982Ba28 report Iγ=269 *11*.
297.74[g] *4*	0.27[g] *7*	1705.796	6^-	1408.130	5^-			
[x]301.962[g] *16*	0.42[g] *5*							

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	Comments
^{x}303.97[g] *6*	0.27[g] *10*						
304.660 *7*	2.08 *13*	2103.406	3^-	1798.735?	(5^-)	[E2]	Mult.: The ce data indicate mult=M1(+E2), but placement requires E2.
^{x}307.252 *8*	1.16 *24*						I_γ: 1982Ba28 report Iγ=0.39 *5* for a 307.229 γ.
^{x}308.085 *15*	0.39 *12*					E1	
312.002 *14*	0.32 *5*	1780.482	2^-	1468.503	4^-		Mult.: 1982Ba28,1993Kl03 report mult=M1, but placement requires E2.
^{x}312.700[gp] *25*	0.26[g] *6*						
^{x}315.618[g] *14*	0.47[g] *5*					M1	
^{x}315.645 *11*	0.52 *8*					M1	
^{x}316.627 *15*	0.35 *5*					M1+E2	
317.567 *13*	0.46 *6*	2270.015	1^+	1952.394	0^-	E1	Mult.: From α(K)exp=0.06 *3*, 1982Ba28 deduce mult=E2,M1. From α(K)exp=0.0091 *22*, 1993Kl03 deduce mult=E1. Placement requires E1.
^{x}319.924[g] *15*	0.37[g] *5*					M1	
319.961[j] *9*	0.83 *8*	2254.316	4^+	1934.353	3^-	E1	
322.576 *9*	0.88 *8*	2174.335	2^+	1851.802	3^-	E1	
323.242 *9*	0.88 *8*	2216.611	2^+	1893.390	4^+	(E2)	
^{x}324.328 *9*	0.80 *7*					M1+E2	
328.215 *19*	0.27 *7*	2382.469	2^+	2054.131	2^+	M1(+E2)	
^{x}329.300 *7*	0.40 *19*						
^{x}329.404[j] *13*	0.10 *5*					M1(+E2)	
330.3[p]	0.08 *4*	2181.383	2^+	1851.238	0^+		E_γ: γ not shown in the line lists of either 1993Kl03 or 1982Ba28. Placement is that shown in the level-scheme table of 1993Kl03. I_γ: Computed by the evaluator from the relative γ branching in the level-scheme table of 1993Kl03.
332.867[g] *17*	0.53[g] *6*	1462.297	4^+	1129.434	2^+	[E2]	Mult.: The ce data indicate mult=M1(+E2), but the placement requires E2.
339.533 *6*	5.8 *4*	1962.060	5^+	1622.530	5^+	M1	γ placed from a 2446 level by 2000GrZY.
^{x}340.94[g] *3*	0.31[g] *6*						
342.57[g] *3*	0.30[g] *6*	1965.114	4^-	1622.530	5^+		
^{x}342.58[g] *3*	0.30[g] *6*						
^{x}343.32[g] *6*	0.17[g] *7*						
^{x}345.53[g] *6*	0.25[g] *10*						
^{x}346.46[g] *5*	0.27[g] *7*						
348.726 *7*	2.76 *14*	1715.188	0^+	1366.462	1^-	E1	I_γ: From 1982Ba28.
^{x}350.06[g] *10*	0.4[g] *3*						
350.474 *5*	45 *2*	1861.062	4^+	1510.591	4^+	M1(+E2)	
^{x}352.61[g] *9*	0.20[g] *9*						
356.446[n] *5*	68[n] *3*	1510.591	4^+	1154.150	2^+	E2	
356.446[n] *5*	68[n] *3*	2302.820	2^+	1946.371	1^-		Additional information 3. Placement is that of the evaluator. 1993Kl03 place this γ from a 2259.7 level, but the final state implied by such a placement is not otherwise observed. Note that this γ is multiply placed.
^{x}358.15[g] *3*	0.37[g] *8*					E2	
^{x}358.896[g] *25*	0.44[g] *7*					M1(+E2)	

$^{156}_{64}$Gd$_{92}$-11

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	Comments
[x]359.10[gp] *4*	1.2[g] *6*					E1	
[x]359.345 *6*	3.1 *3*					E1	
[x]359.990[g] *25*	0.32[g] *6*						
[x]361.203 *19*	0.94 *15*					E1	
[x]361.99 *3*	0.74 *7*					E1	
[x]362.045[g] *18*	0.50[g] *6*					M1(+E2)	
362.799[n] *8*	1.16[n] *8*	2116.450	5^-	1753.649	6^+	E1	Mult.: 1993Kl03 report mult=E2,E1. 1982Ba28 report E1. Placement requires a parity change.
362.799[n] *8*	1.16[n] *8*	2190.651	2^+	1827.839	2^+	E2,E1	Mult.: From 1993Kl03. 1982Ba28 report E1, but γ is multiply placed. This placement requires no parity change.
[x]365.034 *17*	0.47 *8*						
365.56 *3*	0.36 *4*	1827.839	2^+	1462.297	4^+		Mult.: Placement requires E2.
366.726 *7*	1.01 *7*	2010.341	4^+	1643.648	6^+	E2	
[x]367.730 *15*	0.34 *8*					M1(+E2)	
370.213 *16*	0.52 *7*	2316.498	$1^-,2^-$	1946.371	1^-	M1+E2	
372.931 *10*	0.60 *6*	1995.458	4^-	1622.530	5^+	E1	
374.51 *3*	0.39 *8*	1622.530	5^+	1248.000	3^+	E2	I_γ: From 1982Ba28.
[x]375.513 *13*	0.73 *8*					E1	
375.992 *11*	0.52 *6*	1914.838	2^+	1538.853	3^-	E1	
376.916 *7*	0.86 *5*	2020.590	4^+	1643.648	6^+	E2	
[x]379.537 *10*	1.77 *11*					E1	
380.417 *5*	3.22 *19*	965.130	8^+	584.712	6^+	E2	
381.155 *5*	3.4 *1*	1510.591	4^+	1129.434	2^+	E2	
382.337 *11*	0.7 *1*	2316.498	$1^-,2^-$	1934.154	2^-	M1(+E2)	
384.702 *20*	0.7 *1*	1538.853	3^-	1154.150	2^+		Mult.: 1993Kl03 report mult=E2, but this is not consistent with their placement.
[x]386.987 *8*	0.91 *9*					M1	
387.839 *9*	0.51 *4*	2010.341	4^+	1622.530	5^+	M1	
393.243 *10*	0.79 *10*	2254.316	4^+	1861.062	4^+	E2(+M1)	
[x]393.344[j] *13*	1.29 *12*						
393.821 *10*	1.25 *10*	2174.335	2^+	1780.482	2^-	E1	
394.433 *8*	0.76 *6*	2016.949	5^-	1622.530	5^+	E1	
395.642[j] *13*	0.93 *17*	2256.742	3^+	1861.062	4^+	E2	
[x]397.607 *6*	2.05 *8*					E1	
[x]398.356 *6*	3.34 *15*						
[x]401.145[j] *18*	0.46 *6*						
[x]401.936 *6*	1.45 *10*					M1	
404.634[g] *16*	1.6[g] *1*	1771.087	2^+	1366.462	1^-	(E1)	
[x]406.072 *10*	0.81 *15*					M1+E2	
407.251 *5*	9.5 *4*	2029.780	4^-	1622.530	5^+	E1	
408.33 *4*	0.16 *5*	2323.215	2^+	1914.838	2^+	M1(+E2)	
[x]408.738[j] *20*	0.32 *6*					E2	
409.640 *10*	0.71 *15*	1916.454	3^+	1506.860	5^+	E2	
[x]412.408 *11*	0.57 *7*					E1	

$^{156}_{64}Gd_{92}$-12

γ(^{156}Gd) (continued)

Eγ[†‡#@&]	Iγ[ab]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[cde]	Comments
x413.052[j] 14	0.44 7					M1	
413.540 14	0.39 6	1952.361	4−	1538.853	3−	M1	
x414.121 8	1.41 10					M1	
x414.942 14	0.39 7					E2	
x415.583[j] 21	0.24 5					E2	
416.73[j] 3	0.16 5	2382.469	2+	1965.950	1+	E2	
419.287[j] 14	0.30 6	2199.773	2−	1780.482	2−		
419.597 14	0.32 6	2190.651	2+	1771.087	2+	M1+E2	2000GrZY place this γ from a 2446 level.
x420.021 10	0.83 7					E1	
x422.031[j] 9	0.68 6					M1	
422.411 5	4.40 17	2044.937	4−	1622.530	5+	E1	
423.777[g] 16	0.36[g] 6	1934.353	3−	1510.591	4+	[E1]	Mult.: From α(K)exp=0.029 17, 1982Ba28 assign mult=E2,M1. Placement (from 1993Kl03) requires E1.
426.231 18	1.02 10	1965.114	4−	1538.853	3−	M1	Placement is that of 1993Kl03.
x427.260 6	2.34 11					E1	
428.972[n] 23	0.24[n] 6	2227.626	3−	1798.735?	(5−)	[l]	Mult.: 1982Ba28 report mult=M1. 1993Kl03 report M1(E2). α(K)exp from 1993Kl03 is much larger than that for M1. Note, γ is multiply placed.
428.972[n] 23	0.24[n] 6	2256.742	3+	1827.839	2+	M1	
x430.184 18	0.55 13					M1	
431.122 13	0.58 6	1893.390	4+	1462.297	4+	M1	
x431.602[j] 12	0.56 7					M1	
434.478 6	3.2 1	2205.561	1−	1771.087	2+	E1	
x441.144 6	1.7 1						
x441.790 12	0.66 8						
441.790 12	0.66 8	1952.361	4−	1510.591	4+		Mult.: 1993Kl03 report mult=E2, but their placement requires E1.
443.238[p] 24	0.59 11	1798.735?	(5−)	1355.418	4+		
443.62 9	0.39 10	1851.802	3−	1408.130	5−	[E2]	γ placed from a 2360, 1+, level by 2000GrZY. If the present placement is correct, mult=E2. The ce data indicate M1(+E2).
445.524[n] 5	9.1[n] 4	1952.361	4−	1506.860	5+	E1	
445.524[n] 5	9.1[n] 4	2216.611	2+	1771.087	2+		Mult.: Reported as E1 by 1982Ba28 and 1993Kl03, but γ is multiply placed. This placement requires no parity change.
x446.889[j] 22	0.34 7					E2+M1	
x448.570 17	0.87 9					E2+M1	
449.71[j] 3	0.23 6	2155.551	4−	1705.796	6−	E2	Mult.: The ce data indicate mult=M1, but placement requires E2.
x450.333 20	0.45 7					E2	γ placed from a 2402.8 level by 2000GrZY, but that placement requires a parity change.
451.483 6	3.0 1	1962.060	5+	1510.591	4+	M1(+E2)	
x452.960 15	0.40 7					E1	
453.00 11	0.46 15	1861.062	4+	1408.130	5−		Eγ,Iγ, from 1982Ba28. These authors do not place this γ in their level-scheme table. 1993Kl03 place a 453.0 γ from this level, but do not show it in their line list.
454.505 11	2.52 10	1965.114	4−	1510.591	4+	E1	Mult.: 1982Ba28 report mult=E2.
456.603 6	4.2 2	1995.458	4−	1538.853	3−	M1	

$^{156}_{64}$Gd$_{92}$-13

γ(^{156}Gd) (continued)

E$_γ$[†‡#@&]	I$_γ$[ab]	E$_i$(level)	J^π_i	E$_f$	J^π_f	Mult.[cde]	Comments
458.245 *6*	4.90 *19*	1965.114	4$^-$	1506.860	5$^+$	E1	
459.843 *5*	15.7 *6*	2240.368	2$^+$,3$^+$	1780.482	2$^-$	E1	
460.817 *7*	2.4 *2*	1780.482	2$^-$	1319.656	2$^-$	M1+E2	
461.95[j] *5*	0.69 *12*	2323.215	2$^+$	1861.062	4$^+$		Mult.: From α(K)exp, mult=E1(E2) (1993Kl03). Placement indicates no parity change.
^{x}463.15[j] *4*	0.70 *11*					E1	
^{x}464.696[j] *16*	1.39 *16*						
464.86 *4*	1.9 *5*	2316.498	1$^-$,2$^-$	1851.802	3$^-$	E2,M1	
465.631[j] *9*	0.96 *11*	1934.154	2$^-$	1468.503	4$^-$	E2	
466.4[p]	0.45 *7*	2181.383	2$^+$	1715.188	0$^+$		E$_γ$: γ not shown in the line lists of either 1993Kl03 or 1982Ba28. Placement is that shown in the level-scheme table of 1993Kl03. I$_γ$: Computed by the evaluator from the relative γ branching in the level-scheme table of 1993Kl03.
^{x}469.081 *14*	0.90 *12*						
470.164 *9*	1.88 *19*	2010.341	4$^+$	1540.178	6$^+$	[E2]	Mult.: ce data indicate mult=M1, but placement requires E2.
472.699 *5*	26.9 *18*	1715.188	0$^+$	1242.481	1$^-$	E1	
^{x}474.803[j] *15*	1.35 *13*					E1	
^{x}476.91[g] *13*	0.90[g] *33*					M1,E2	
^{x}478.465[j] *19*	1.23 *17*					E2	
^{x}478.925 *7*	3.3 *1*					M1	
^{x}481.318 *21*	1.0 *3*					E1,E2	
^{x}483.598 *10*	1.86 *13*					M1	
484.801 *8*	7.6 *6*	1851.238	0$^+$	1366.462	1$^-$	E1	Placement is that of 1982Ba28.
485.273 *11*	2.4 *4*	1893.390	4$^+$	1408.130	5$^-$	E1	
486.093 *7*	5.2 *3*	2024.946	3$^-$	1538.853	3$^-$	M1	
^{x}486.594[j] *14*	1.36 *13*					E1	
488.601 *10*	3.5 *3*	2316.498	1$^-$,2$^-$	1827.839	2$^+$	E1	
^{x}489.037[j] *20*	0.92 *11*					E1	
490.366 *8*	3.29 *19*	2205.561	1$^-$	1715.188	0$^+$	E1	
490.91 *3*	0.72 *10*	2029.780	4$^-$	1538.853	3$^-$	M1	
493.918 *6*	6.7 *7*	2116.450	5$^-$	1622.530	5$^+$	E1	
494.941 *6*	11.4 *5*	1771.087	2$^+$	1276.136	3$^-$	E1	
496.401 *7*	18.6 *11*	1851.802	3$^-$	1355.418	4$^+$	E1	
498.97[j] *4*	0.71 *10*	2270.015	1$^+$	1771.087	2$^+$	M1	
^{x}499.735 *7*	9.9 *5*					M1	
502.884 *12*	1.7 *2*	1965.114	4$^-$	1462.297	4$^+$	E1	Placement is that of 1982Ba28.
504.301 *15*	1.6 *2*	1780.482	2$^-$	1276.136	3$^-$		Mult.: From α(K)exp=0.011 *2*, 1993Kl03 deduce mult=E2. From α(K)exp=0.021 *9*, 1982Ba28 deduce M1.
506.063 *18*	1.3 *2*	2044.937	4$^-$	1538.853	3$^-$	E2,M1	I$_γ$: γ not seen in ε decay, but it should have been.
^{x}508.074 *13*	1.54 *18*					E1	
508.94 *3*	0.57 *13*	2047.800	2$^+$	1538.853	3$^-$	E1	γ placed from a 2360, 1$^+$, level by 2000GrZY.
513.020 *13*	3.7 *4*	1771.087	2$^+$	1258.074	2$^+$	M1	

$^{156}_{64}$Gd$_{92}$-14

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	$I_{(\gamma+ce)}$	Comments
[x]514.54 *3*	0.72 *12*					[l]		
[x]515.03[g] *15*	0.86[g] *28*							1982Ba28 place this γ from the 2054.1 level. 1993Kl03 do not report this γ.
[x]516.98[g] *4*	1.8[g] *2*					E1		
[x]517.04[g] *6*	2.4[g] *3*					E1		
519.162 *13*	2.12 *12*	2029.780	4^-	1510.591	4^+	E1		
[x]520.503[j] *21*	9.5 *12*					E1		
[x]520.700[j] *10*	6.0 *4*					E1		
522.351 *11*	3.5 *3*	1780.482	2^-	1258.074	2^+	E1		Mult.: From α(K)exp<0.0062, 1982Ba28 deduce mult=E1. From α(K)exp=0.0137 *10*, 1993Kl03 deduce E2(+M1).
522.918 *11*	3.9 *3*	2029.780	4^-	1506.860	5^+	E1		
[x]525.83 *3*	1.15 *15*					E1		
526.951 *7*	23.4 *12*	1995.458	4^-	1468.503	4^-	M1		
528.626 *22*	1.29 *11*	1771.087	2^+	1242.481	1^-	E1		
529.74 *4*	0.63 *10*	2446.16	2^+	1916.454	3^+	M1(+E2)		
531.4[p]	0.79 *11*	2070.287	3^+	1538.853	3^-			Placement is from the level scheme of 1993Kl03. However, neither these authors or 1982Ba28 show this γ in their line lists.
532.483 *5*	35 *4*	1780.482	2^-	1248.000	3^+	E1		
534.349 *7*	39.3 *16*	2044.937	4^-	1510.591	4^+	E1		
[x]535.53 *3*	0.85 *11*							
[x]536.08[j] *3*	0.87 *12*					[l]		
[x]537.56 *3*	1.72 *22*					[l]		
537.953 *15*	5.9 *3*	1893.390	4^+	1355.418	4^+	E2+M1		
[x]541.05[j] *6*	0.40 *9*					M1(+E2)		
[x]542.14 *3*	0.74 *8*					M1+E2		
543.541 *7*	3.53 *23*	2054.131	2^+	1510.591	4^+			
544.208 *16*	1.66 *19*	1952.361	4^-	1408.130	5^-			Mult.: 1993Kl03 report mult=E1, but their placement is not consistent with this.
[x]544.50[j] *3*	0.78 *14*					M1(+E2)		
[x]545.46[j] *3*	0.58 *8*					E2		
547.20 *19*		1715.188	0^+	1168.185	0^+	E0	0.030 *8*	$I_{(\gamma+ce)}$: From 1982Ba28. From 1993Kl03, the evaluator deduces I(γ+ce)=0.0105 *15*.
[x]547.21 *3*	0.61 *9*							I_γ,Mult.: 1993Kl03 report α(K)exp=0.015 *2*, from which mult=M1(+E2) is deduced, but do not place it. 1982Ba28 report Iγ<0.65, α(K)exp>0.040, assign mult=E0, and place it between 0^+ levels at 1715 and 1168. Such a transition is not reported in ^{156}Eu β^- decay.
548.030 *21*	0.96 *11*	2010.341	4^+	1462.297	4^+	M1,E2[l]		
548.392[n] *17*	2.77[n] *13*	1914.838	2^+	1366.462	1^-	E1		Mult.: For the total peak, 1982Ba28 report E1. 1993Kl03 report E2 and comment that it is not consistent with this placement.
548.392[n] *17*	2.77[n] *13*	2016.949	5^-	1468.503	4^-			Mult.: For the total peak, 1982Ba28 report E1 and 1993Kl03 report E2.
[x]549.753[j] *24*	0.81 *10*					E2		
[x]551.097 *20*	0.88 *9*					E2		
552.16[nj] *3*	0.37[n] *8*	2020.590	4^+	1468.503	4^-	[E1]		Mult.: The ce data indicate mult=M1, but placement requires E1.

$^{156}_{64}$Gd$_{92}$-15

γ(^{156}Gd) (continued)

Eγ[†‡#@&]	Iγ[ab]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[cde]	Comments
552.16[nj] 3	0.37[n] 8	2323.215	2+	1771.087	2+	M1	
554.003 9	1.45 10	1851.802	3−	1297.819	4+	E1	
x554.98[j] 6	0.84 15					M1(+E2)	
556.440 12	1.39 9	2024.946	3−	1468.503	4−	E2	
557.016 21	1.2 3	1965.114	4−	1408.130	5−	E2+M1	
x557.832[j] 18	0.70 9					E2+M1	
x558.385 7	7.4 4					E2	
x559.72 10	1.36 27						Eγ: 1982Ba28 show this γ as doubly placed, from the 1914 level and a 2066 level. 1993Kl03 do not report this γ and this latter level.
561.023[n] 15	4.81[n] 19	1715.188	0+	1154.150	2+	E2,M1	1993Kl03 place some of this γ here. However, such a γ should have been seen in ^{156}Eu β− decay, and it was not.
561.023 15	4.81 19	1916.454	3+	1355.418	4+	E2	γ shown doubly placed by 1993Kl03, the other placement being from the 1715 level. As such, a 561 γ should have been seen in ^{156}Eu β− decay. Since it is not, the evaluator has not adopted that placement and shows the full intensity of this γ from this level. Iγ: From 1993Kl03.
x563.64[j] 7	0.55 8					E2(+M1)	
x566.499 14	1.2 2					M1	
567.692[o] 5	28[o] 1	1934.154	2−	1366.462	1−	M1	
567.692[o] 5	0.24[ok] 8	1934.353	3−	1366.462	1−	[E2]	
569.771 7	4.2 1	1827.839	2+	1258.074	2+	M1+E2	
x572.619 20	1.12 25					E2	
x574.18 3	1.02 14					[l]	
575.736 24	2.2 2	1851.802	3−	1276.136	3−	E2(+M1)	
578.934 8	5.3 4	1934.353	3−	1355.418	4+	E1	
579.828 7	14.6 8	1827.839	2+	1248.000	3+	E2(+M1)	
582.591 17	1.29 10	2044.937	4−	1462.297	4+		Mult.: 1993Kl03 report mult=E2, but this placement requires a parity change. Note that a 582.6 γ was seen in ε decay, but its Iγ value is much smaller than that implied by the one listed here.
585.008 19	1.85 20	1861.062	4+	1276.136	3−	E1	
585.830[o] 15	1.1[o] 3	1715.188	0+	1129.434	2+	[E2]	Iγ: Undivided Iγ for this γ is 2.68 18 (1993Kl03). The split of this intensity was deduced by the evaluator from comparison of the relative Iγ values of the 585.8, 472.6 and 709.9 γ′s in the ^{156}Eu β− decay and (n,γ). Mult.: α(K)exp=0.0112 9 (1993Kl03) suggests mult=M1+E2 for the composite peak. This placement requires mult=E2 for this component. See the comment regarding mult for the other peak component.
585.830[o] 15	1.6[o] 3	1952.394	0−	1366.462	1−	M1	Iγ: Undivided Iγ for this γ is 2.68 18 (1993Kl03). The split of this intensity was deduced by the evaluator from comparison of the relative Iγ values of the 585.8, 472.6 and 709.9 γ′s in ^{156}Eu β− decay and in (n,γ). Mult.: From α(K)exp=0.0112 9 (1993Kl03) for the composite peak and assuming mult=E2, as required, for the other placement, the evaluator deduces α(K)exp≈0.014 for this component of the doublet. This is that expected for mult=M1.

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	Comments
[x]586.90[j] *4*	1.06 *21*					E1	
587.24[j] *3*	1.9 *3*	1995.458	4^-	1408.130	5^-		
587.55[j] *4*	1.4 *3*	2415.489	3^+	1827.839	2^+	M1(+E2)	
591.782 *24*	1.12 *11*	2054.131	2^+	1462.297	4^+	[E2]	
[x]593.45[g] *10*	1.9[g] *5*					E2,M1	
593.71 *3*	1.7 *2*	1851.802	3^-	1258.074	2^+	E1	
[x]594.580 *19*	1.6 *2*					M1	
595.58 *4*	0.67 *8*	1893.390	4^+	1297.819	4^+	M1	
596.952 *6*	11.5 *6*	1952.361	4^-	1355.418	4^+	E1	
599.501 *13*	5.6 *2*	1965.950	1^+	1366.462	1^-	E1	
[x]599.998[j] *21*	1.00 *10*						
601.788 *6*	10.3 *5*	2070.287	3^+	1468.503	4^-	E1	
603.801 *6*	27.3 *18*	1851.802	3^-	1248.000	3^+	E1	
605.862 *14*	5.0 *3*	2116.450	5^-	1510.591	4^+	E1	
[x]608.459 *12*	8.5 *8*					E1	
608.722 *13*	7.2 *7*	1851.238	0^+	1242.481	1^-	E1	
609.652 *12*	8.8 *5*	1965.114	4^-	1355.418	4^+	E1	
613.07 *6*	1.2 *2*	1861.062	4^+	1248.000	3^+	E2	
614.511[o] *9*	55[ok] *1*	1934.154	2^-	1319.656	2^-	M1	E_γ: 1982Ba28 show this as doubly placed, the other placement being from the other 1934 level. I_γ: Total intensity of this γ is 57 *4*. The listed value is the difference between this total and that of the other placement.
614.511[o] *9*	2.3[ok] *1*	1934.353	3^-	1319.656	2^-	M1	E_γ: 1982Ba28 show this as doubly placed, the other placement being from the other 1934 level. I_γ: From Iγ(614γ)/Iγ(1646γ) from ^{156}Tb ε decay and Iγ(1646γ). 1982Ba28 show the remainder of this Iγ deexciting the lower 1934 level.
616.79[n] *3*	2.6[n] *7*	2024.946	3^-	1408.130	5^-	E2	E_γ: Placement is that of 1993Kl03.
616.79[n] *3*	2.6[n] *7*	2155.551	4^-	1538.853	3^-	E2(+M1)	E_γ: Placement is that of 1993Kl03.
617.24 *3*	1.4 *3*	1893.390	4^+	1276.136	3^-		
618.632 *12*	3.1 *4*	1916.454	3^+	1297.819	4^+		
621.77 *3*	1.8 *4*	2029.780	4^-	1408.130	5^-	M1	Mult.: From α(K)exp=0.0141 *14* (1993Kl03). These authors report mult=E2?. 1982Ba28 report α(K)exp<0.0041 and assign mult=E1.
626.321 *5*	112 *7*	1780.482	2^-	1154.150	2^+	E1	
[x]628.37[j] *4*	0.90 *18*					M1(+E2)	
[x]629.229 *10*	7.8 *4*					M1+E2	
631.79[j] *4*	0.93 *17*	2254.316	4^+	1622.530	5^+	M1	
632.719[o] *9*	3.0[o] *3*	1952.361	4^-	1319.656	2^-	E2	E_γ: γ observed but not placed by 1982Ba28. I_γ: Difference between the total Iγ(632.7γ)=4.18 *16* and that placed from the other 1952 level.
632.719[o] *9*	1.1[o] *2*	1952.394	0^-	1319.656	2^-	E2	E_γ: γ reported but not placed by 1982Ba28. 1993Kl03 place this γ entirely from the other 1952 level. I_γ: From Iγ(632.79γ)/Iγ(709.9γ) in ^{156}Eu β^- decay and Iγ(709.0γ) in (n,γ).

$^{156}_{64}Gd_{92}$-17

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	$I_{(\gamma+ce)}$	Comments
634.22[j] 5	0.66 17	2256.742	3+	1622.530	5+	[E2]		Mult.: The ce data allow mult=M1,E2, but the placement requires E2.
635.470 17	1.72 13	2174.335	2+	1538.853	3−	E1		γ placed from a 2415, 1+, level by 2000GrZY.
x636.111 19	1.34 17							
x638.06[g] 12	2.2[g] 11							Placed from the 2106 level by 1982Ba28.
638.687 7	7.5 9	1914.838	2+	1276.136	3−	E1		
641.090[j] 21	0.75 10	2103.406	3−	1462.297	4+	[E1]		Mult.: The ce data indicate mult=E2,E1, but placement requires E1.
644.371 15	1.8 4	2106.645	3+	1462.297	4+	M1		Mult.: From 1993Kl03. 1982Ba28 report mult=E1, but placement indicates no parity change.
646.293 10	18.3 20	1965.950	1+	1319.656	2−	E1		
x647.632 15	3.3 5					E1		
x648.132[j] 19	2.3 3					M1		
648.64[j] 6	0.87 21	2155.551	4−	1506.860	5+			Mult.: 1993Kl03 report mult=E2,(M1), but placement requires a parity change.
650.978 12	6.3 3	1780.482	2−	1129.434	2+	E1		
x651.95 4	1.17 21					E2		
654.915 9	5.3 3	2010.341	4+	1355.418	4+	M1		
656.725 17	3.7 2	1914.838	2+	1258.074	2+	E2+E0,M1[l]		
658.400[n] 19	≤6.0[n]	1916.454	3+	1258.074	2+	M1		I_γ: Of the total Iγ (=8.0 11) of this γ, 2.0 units are assigned to the decay of the 1934.353 level. The remainder is assigned by the evaluator to the decay of this level and the 1934.154 level (J^π=2−). Note, however, that this latter component is likely to be small, based on the decay of the two 1934 levels as observed in the ^{156}Tb ε decay, where the 1916 level is not populated. Mult.: From 1982Ba28 and from ^{156}Tb ε decay. 1993Kl03 report E2.
658.400[n] 19	≤6.0[nk]	1934.154	2−	1276.136	3−	M1		E_γ: 1982Ba28 show this as triply placed, the other placements being from the 1916 level and the other 1934 level. I_γ: Total intensity is 8.0 11. After allocation of 2.0 units to the decay of the 1934.353 level, the remainder is to be allocated between the other two placements of this peak. Note that the fraction of this Iγ value associated with the decay of this (the 1934.154, 2−) level is likely to be small, based on the ^{156}Tb ε decay, where the 1916 level is not populated.
658.400[o] 19	2.0[o] 1	1934.353	3−	1276.136	3−	M1		E_γ: 1982Ba28 show this as triply placed, the other placements being from the 1916 level and the other 1934 level. From the ^{156}Tb ε decay (where the 1916 level is not populated), it is expected that the portion of this peak associated with the decay of the other 1934 level is small. I_γ: From Iγ(658γ)/Iγ(1646γ) in ^{156}Tb ε decay and Iγ(1646γ). Mult.: From 1982Ba28 and from ^{156}Tb ε decay. 1993Kl03 report E2.
664.37[j] 7	1.01 12	1962.060	5+	1297.819	4+	E2		
x665.721 17	1.90 11					[l]		
665.721[p] 17		1715.188	0+	1049.486	0+	[E0]	0.042 6	E_γ: This placement is that of 1982Ba28. I_γ: This placement requires mult=E0 and, hence, Iγ must be zero here. The

$^{156}_{64}$Gd$_{92}$-18

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	$I_{(\gamma+ce)}$	Comments
								remaining intensity is not placed in the level scheme. $I_{(\gamma+ce)}$: Value deduced by the evaluator from I(ce(K))=0.057 *2* (1993Kl03), after subtracting for the contribution from the 665.7 γ. For this latter contribution, the evaluator has assumed mult=M1, for which α(K)=0.0105. 1982Ba28 report I(ce(K))=0.089 *13*.
666.834 *11*	3.36 *16*	1914.838	2$^+$	1248.000	3$^+$	M1+E2		
668.391 *9*	3.8 *3*	1916.454	3$^+$	1248.000	3$^+$	E0+E2,M1[l]	4.1 *6*	
^{x}670.250 *6*	20.2 *8*					M1		1993Kl03 place this γ from the 1946.3 level. This placement would require mult=E2. 1982Ba28 report this γ, but do not place it. This γ is not reported in the ^{156}Eu β^- decay, where it should have been seen. The very large B(E2)(W.u.) value(5.4×10^2 *20*) implied by the placement of 1993Kl03 (assuming mult=E2) is problematic. The evaluator has chosen to list this γ as unplaced.
^{x}671.320 *10*	3.71 *18*					E2		Mult.: Listed as E1 by 1993Kl03, but that is not consistent with their α(K)exp value.
672.407 *19*	3.21 *19*	1914.838	2$^+$	1242.481	1$^-$			Mult.: 1993Kl03 report mult=E2, but placement requires E1.
673.684 *7*	18.5 *8*	1827.839	2$^+$	1154.150	2$^+$	E0+(E2+M1)[l]		
674.358 *8*	9.1 *5*	2029.780	4$^-$	1355.418	4$^+$	E1		
676.220[o] *15*	1.62[o] *18*	1934.353	3$^-$	1258.074	2$^+$	E1		I_γ: Total intensity of this γ is 2.51 *15* (1993Kl03). The listed intensity is what remains after allocating 0.89 units to the decay of the 4$^-$, 1952 level.
676.220[o] *15*	0.89[o] *23*	1952.361	4$^-$	1276.136	3$^-$			I_γ: Total intensity of this γ is 2.51 *15* (1993Kl03). The listed intensity split was obtained from Iγ(676)/Iγ(1646), from ^{156}Tb ε decay, and Iγ(1646) from (n,γ).
^{x}679.71[j] *3*	0.64 *19*					M1		
^{x}681.294 *12*	3.3 *3*					E1		
684.049 *14*	6.6 *5*	2003.747	2$^+$	1319.656	2$^-$	E1		
686.313[o] *9*	1.3[ok] *4*	1934.154	2$^-$	1248.000	3$^+$	E1		I_γ: Total Iγ=6.1 *4* for this γ. The remainder is associated with the decay of the other 1934 level.
686.313[o] *9*	4.8[ok] *1*	1934.353	3$^-$	1248.000	3$^+$	E1		I_γ: From Iγ(686γ)/Iγ(1646γ) from ^{156}Tb ε decay and Iγ(1646γ). 1982Ba28 show the remainder of this Iγ deexciting the lower 1934 level.
687.055 *9*	10.1 *7*	2155.551	4$^-$	1468.503	4$^-$	M1		
688.231 *24*	2.4 *3*	1946.371	1$^-$	1258.074	2$^+$	E1		
688.910 *23*	2.5 *3*	1965.114	4$^-$	1276.136	3$^-$	E2		
691.832[o] *19*	3.5[ok] *5*	1934.154	2$^-$	1242.481	1$^-$	E2		I_γ: Total Iγ=5.9 *5* for this γ. The remainder is associated with the decay of the other 1934 level.
691.832[o] *19*	2.4[ok] *1*	1934.353	3$^-$	1242.481	1$^-$	E2		I_γ: From Iγ(691γ)/Iγ(1646γ) in ^{156}Tb ε decay and Iγ(1646γ). 1982Ba28 show the remainder of this Iγ deexciting the lower 1934 level.
^{x}693.623[j] *16*	5.5 *4*							
697.024 *18*	5.1 *4*	1851.238	0$^+$	1154.150	2$^+$	[E2]		Mult.: From ce data, mult=E2+M1, but placement requires E2.
697.651 *8*	29.9 *18*	1851.802	3$^-$	1154.150	2$^+$	E1		I_γ: From the Iγ values of the 496, 603 and 697.6 γ's in ^{156}Tb ε decay,

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	Comments
							one expects Iγ(697γ)=34 in (n,γ). Thus, it is expected that all the intensity of this γ is associated with the decay of this level. 1993Kl03 show this γ as doubly placed, the other placement being from the 1995 level.
697.651[p] *8*		1995.458	4⁻	1297.819	4⁺	E1	E_γ: 1993Kl03 place a portion of this γ peak from this level. However, in light of the smaller than expected intensity of this γ from the 1851.8 level, this placement is questionable. I_γ: Most likely, very little of the intensity of this γ is associated with the decay of this level (see the comment on the Iγ value for the other placement of this transition). The evaluator has assigned Iγ=0 for this placement and has shown it as questionable.
698.407 *7*	26.6 *14*	1827.839	2⁺	1129.434	2⁺	E2(+M1)	
701.49 *3*	3.1 *3*	2240.368	2⁺,3⁺	1538.853	3⁻	E1	
[x]703.844[j] *14*	5.4 *6*					E2	
704.384 *9*	32 *3*	1952.361	4⁻	1248.000	3⁺	E1	
[x]705.377 *20*	11.1 *10*					[l]	
706.93[o] *4*	0.8[o] *3*	1861.062	4⁺	1154.150	2⁺	[E2]	I_γ: Total Iγ for this γ is 1.5 *3*. The listed value is that remaining after allocation of 0.75 *6* units to the other placement. Mult.: From ce data, mult=M1(+E2), but placement requires E2. Note that this γ is multiply placed.
706.93[o] *4*	0.75[o] *6*	2026.660	1⁺	1319.656	2⁻		I_γ: Computed from Iγ(706.9γ)/Iγ(2026.7γ), from ^{156}Eu β^- decay, and Iγ(2026.7γ). Mult.: 1993Kl03 report mult=M1(E2), but placement requires a parity change.
709.942 *9*	26 *3*	1952.394	0⁻	1242.481	1⁻	M1	
[x]711.7[g] *4*	6.4[g] *21*						E_γ: 1982Ba28 place this γ from a 2066 level. 1993Kl03 find no evidence for such a level.
712.548[j] *23*	2.5 *3*	2010.341	4⁺	1297.819	4⁺	M1+E2	
713.102 *8*	11.0 *10*	1297.819	4⁺	584.712	6⁺	E2	
714.04[j] *4*	1.5 *6*	1962.060	5⁺	1248.000	3⁺	[E2]	Mult.: The ce data indicate mult=M1, but placement requires E2.
714.855 *9*	7.5 *3*	2070.287	3⁺	1355.418	4⁺	M1	
[x]715.498 *9*	9.5 *4*					[l]	
717.124 *6*	38.4 *15*	1965.114	4⁻	1248.000	3⁺	E1	
[x]717.68[j] *5*	2.7 *5*					E2(+M1)	
721.739 *22*	3.1 *3*	1851.238	0⁺	1129.434	2⁺	E2	
722.410 *18*	8.1 *7*	1851.802	3⁻	1129.434	2⁺	E1	
722.82[j] *3*	3.2 *5*	2020.590	4⁺	1297.819	4⁺	E2	
723.482 *9*	14.7 *7*	1965.950	1⁺	1242.481	1⁻	E1	
[x]725.71 *3*	4.1 *4*						
727.111 *8*	33.9 *20*	2349.634	3⁺	1622.530	5⁺	E2	E_γ: γ placed from the 2024.9, 3⁻ level by 1993Kl03, but that placement requires a parity change.
727.647 *18*	36 *5*	2003.747	2⁺	1276.136	3⁻	E1	
[x]728.069 *17*	10 *3*						
[x]730.59 *3*	3.0 *2*					M1(+E2)	
734.435 *21*	3.7 *4*	2054.131	2⁺	1319.656	2⁻	[E1]	
[x]735.755 *15*	4.2 *3*					E2+M1	

$^{156}_{64}$Gd$_{92}$-20

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	Comments
[x]738.68[j] *4*	2.1 *3*					M1	
740.76 *4*	1.9 *4*	2016.949	5^-	1276.136	3^-	E2	
743.694 *13*	6.3 *6*	2254.316	4^+	1510.591	4^+	M1	
[x]745.732 *14*	16.2 *10*					E1	
747.405 *10*	12.8 *6*	2155.551	4^-	1408.130	5^-	E2	
748.058[j] *12*	10.9 *10*	2103.406	3^-	1355.418	4^+	E1	
748.797 *9*	32.1 *21*	2024.946	3^-	1276.136	3^-	M1	
750.608 *10*	15.5 *12*	2070.287	3^+	1319.656	2^-	E1	
753.79[j] *4*	1.8 *5*	2029.780	4^-	1276.136	3^-	M1	
755.779 *13*	15.6 *12*	2003.747	2^+	1248.000	3^+	M1+E2	
756.25 *4*	3.5 *4*	2054.131	2^+	1297.819	4^+		
761.275 *8*	29.9 *14*	2003.747	2^+	1242.481	1^-	E1	
762.324[n] *8*	20.7[n] *14*	1916.454	3^+	1154.150	2^+	E2(+M1)	
762.324[n] *8*	20.7[n] *14*	2010.341	4^+	1248.000	3^+	E2(+M1)	
[x]763.652[j] *14*	5.4 *4*					E1	
765.279[j] *19*	3.10 *21*	2227.626	3^-	1462.297	4^+	E1	
766.891 *12*	7.2 *7*	2024.946	3^-	1258.074	2^+	E1	
[x]768.59[o] *3*	1.8[o] *5*						I_γ: Total Iγ for this γ is 2.8 *5*. The listed value is that remaining after allocating 1.01 *7* units to the other placement.
768.59[o] *3*	1.01[o] *7*	2026.660	1^+	1258.074	2^+	[l]	I_γ: Computed from Iγ(768.5γ)/Iγ(2026.7γ), from ^{156}Eu β^- decay, and Iγ(2026.7). Mult.: 1993Kl03 report α(K)exp=0.018 *3*, which is much larger than that for M1.
[x]769.610 *18*	10.1 *6*					E1	
778.288 *9*	30.0 *21*	1827.839	2^+	1049.486	0^+	E2	Placement is that of 1982Ba28.
780.25[og] *4*	29[ogk] *3*	1934.154	2^-	1154.150	2^+	E1	E_γ: See the comment on the other placement of this γ. I_γ: Total intensity is 54.6 *27* (1982Ba28). Listed value is the residual after accounting for the decay of the other 1934 level.
780.25[og] *4*	26.1[ogk] *2*	1934.353	3^-	1154.150	2^+	E1	E_γ: From 1982Ba28. 1993Kl03 do not report this γ, even though its intensity is such that it should have been seen by them. Such a γ is placed from this level in the ^{156}Tb ε decay. I_γ: From Iγ(780γ)/Iγ(1646γ) in ^{156}Tb ε decay and Iγ(1646γ). 1982Ba28 show the remainder of this Iγ deexciting the lower 1934 level and possibly a 2056 level. This latter level, however, has not been confirmed in later studies.
[x]780.845 *12*	15.4 *8*					E1	
782.461 *14*	11.5 *18*	2024.946	3^-	1242.481	1^-	E2	
787.003[n] *10*	24.5[n] *15*	1916.454	3^+	1129.434	2^+	E2,E1	
787.003[n] *10*	24.5[n] *15*	2106.645	3^+	1319.656	2^-	[E1]	Mult.: The ce data indicate mult=E2,E1, but placement requires a parity change. Note, γ is multiply placed.
788.35[j] *4*	2.2 *3*	2256.742	3^+	1468.503	4^-		Mult.: Placement requires E1.
[x]789.92 *3*	7.0 *5*					E1	
791.99[j] *5*	1.3 *4*	2254.316	4^+	1462.297	4^+	M1	
793.87 *9*	3.3 *3*	1962.036	1^-	1168.185	0^+	E1	
794.49[j] *4*	2.3 *5*	2256.742	3^+	1462.297	4^+		

$^{156}_{64}$Gd$_{92}$-21

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	δ[f]	α[m]	Comments
796.017 *24*	8.0 *6*	2054.131	2^+	1258.074	2^+	M1			
^{x}796.63[j] *3*	2.7 *6*					E1			
^{x}797.41[j] *3*	1.9 *5*					M1			
^{x}801.88 *4*	5.9 *7*					M1(+E2)			
^{x}802.55[j] *4*	2.2 *3*					M1			
805.096[o] *20*	1.8[ok] *4*	1934.154	2^-	1129.434	2^+	E1			I_γ: Total intensity is 4.4 *4*. Listed value is the residual after accounting for the decay of the other 1934 level.
805.096[o] *20*	2.6[ok] *1*	1934.353	3^-	1129.434	2^+	E1			I_γ: From Iγ(805γ)/Iγ(1646γ) in ^{156}Tb ε decay and Iγ(1646γ). 1982Ba28 show the remainder of this Iγ deexciting the lower 1934 level.
^{x}808.29 *3*	4.8 *7*					E1			
811.810 *8*	27.9 *14*	1965.950	1^+	1154.150	2^+	M1+E2	−0.055 *20*		
^{x}815.00[j] *9*	1.6 *5*					E2			
^{x}816.272 *7*	47.5 *17*					E1			
822.278 *9*	10.8 *17*	2070.287	3^+	1248.000	3^+	M1			
823.421 *8*	27.1 *14*	1408.130	5^-	584.712	6^+	E1			
826.01 *13*	8.8 *12*	2181.383	2^+	1355.418	4^+	[E2]		0.00418	E_γ,I_γ,Mult.: From 1982Ba28. This placement is from the level scheme of 1993Kl03, but they do not show this γ in their line list. 1982Ba28 do not place it. ce data indicate mult=E2+M1, but placement requires E2.
833.30[j] *3*	5.94 *23*	2199.773	2^-	1366.462	1^-	E2			
^{x}839.537[j] *16*	7.5 *4*					E1			
841.241 *7*	116 *5*	1129.434	2^+	288.186	4^+	E2			
^{x}846.090 *23*	3.6 *4*					E1			
848.61[j] *3*	3.5 *6*	2106.645	3^+	1258.074	2^+	M1			
849.563 *9*	13.6 *7*	2003.747	2^+	1154.150	2^+	M1+E2			
^{x}853.37[j] *10*	2.7 *7*								
855.445 *18*	6.1 *4*	2103.406	3^-	1248.000	3^+	[E1]			Mult.: The ce data indicate mult=E2,E1, but placement requires E1.
856.161 *18*	8.1 *15*	2010.341	4^+	1154.150	2^+	E2			
858.51[oj] *6*	2.38[o] *14*	2026.660	1^+	1168.185	0^+	M1			I_γ: Computed from Iγ(858.5γ)/Iγ(2026.7γ), from ^{156}Eu β^- decay, and Iγ(2026.7). Mult.: 1993Kl03 report mult=E2(M1), but γ is multiply placed.
858.51[oj] *6*	1.7[o] *12*	2106.645	3^+	1248.000	3^+	M1			I_γ: Total Iγ for this γ is 4.1 *12*. The listed value is that remaining after allocating 2.38 *14* units to the other placement. Mult.: 1993Kl03 report mult=E2(M1), but γ is multiply placed.
^{x}859.055 *12*	15.4 *6*					E1			
861.06 *3*	4.3 *3*	2103.406	3^-	1242.481	1^-	E2			
865.968 *21*	26.9 *13*	1154.150	2^+	288.186	4^+	E2			I_γ: From 1993Kl03.
867.139 *24*	10.7 *5*	2186.788	1^+	1319.656	2^-	E1			
^{x}869.44[j] *7*	2.4 *4*					M1			

$^{156}_{64}$Gd$_{92}$-22

γ(^{156}Gd) (continued)

Eγ[†‡#@&]	Iγ[ab]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[cde]	Comments
[x]871.159 *13*	12.3 *9*					E1	
874.20[j] *4*	3.1 *3*	2003.747	2+	1129.434	2+	M1	
877.559 *8*	60.6 *24*	1462.297	4+	584.712	6+	E2	
[x]878.68[j] *4*	6.6 *8*					M1(+E2)	
879.42 *4*	7.3 *14*	2155.551	4−	1276.136	3−	E2,M1	
880.77[j] *8*	3.8 *7*	2010.341	4+	1129.434	2+	E2	
[x]883.40[j] *4*	3.28 *23*					[l]	
887.43[j] *5*	3.05 *24*	2349.634	3+	1462.297	4+	M1	
893.57[j] *7*	1.99 *19*	2047.800	2+	1154.150	2+	M1+E2	
[x]895.917 *16*	8.7 *4*					E1	
897.11[j] *5*	3.8 *5*	2216.611	2+	1319.656	2−	E1	Iγ: γ shown as doubly placed by 1993Kl03, the other placement being from the 2026, 1+ level. However, no 897 γ is reported from this level in the β− decay.
898.175 *12*	17.2 *9*	2174.335	2+	1276.136	3−	E1	
901.39 *3*	6.1 *4*	2256.742	3+	1355.418	4+	M1	
[x]902.11[j] *3*	5.3 *3*					E2	
[x]904.909 *16*	8.3 *11*					E2	
[x]909.17[j] *7*	2.0 *4*						
912.603 *22*	9.9 *17*	1962.036	1−	1049.486	0+	E1	
[x]914.07[j] *10*	8.5 *22*					M1	
914.60 *10*	9.9 *22*	2190.651	2+	1276.136	3−		Mult.: 1982Ba28 report mult=M1,E2. 1993Kl03 report mult=E1?. Placement requires E1.
916.243 *11*	17.1 *11*	2174.335	2+	1258.074	2+	E2+M1	
922.183 *10*	30.6 *9*	1506.860	5+	584.712	6+	E2	
[x]922.95[j] *3*	8.5 *10*						
[x]924.27[j] *4*	2.8 *3*					E2	
925.917 *11*	22.6 *9*	1510.591	4+	584.712	6+	E2	Eγ: 1982Ba28 report Eγ=926.26 *13* for this γ. Iγ: From 1993Kl03.
[x]927.173 *12*	18.1 *7*					E1	
[x]928.44[j] *4*	3.3 *4*					E2+M1	
931.855 *14*	14.0 *9*	2174.335	2+	1242.481	1−	E1	
[x]933.063[j] *21*	7.2 *4*					E1	
[x]936.85[j] *9*	5.7 *6*						
937.05[j] *4*	5.5 *14*	2256.742	3+	1319.656	2−		
[x]938.48 *3*	7.0 *5*					E1	
[x]940.664 *14*	10.0 *4*					E1	Placed from the 2216 level by 1982Ba28, but 1993Kl03 do not show it there.
942.621 *12*	13.2 *7*	2190.651	2+	1248.000	3+	M1	
944.305 *16*	14 *2*	2186.788	1+	1242.481	1−	E1	
[x]945.30[j] *6*	2.4 *13*						
947.04 *3*	13.8 *12*	2415.489	3+	1468.503	4−		Mult.: From α(K)exp, mult=M1+E2, but placement requires E1.
948.19[j] *5*	3.5 *12*	2190.651	2+	1242.481	1−		
949.268 *13*	23.6 *11*	2103.406	3−	1154.150	2+	E1	
[x]953.01 *3*	10.8 *14*					E1	
955.57[j] *9*	4.1 *7*	1540.178	6+	584.712	6+	[l]	

From ENSDF

$^{156}_{64}$Gd$_{92}$-23

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	δ[f]	$I_{(\gamma+ce)}$	Comments
[x]959.56[j] *5*	30 *10*					[l]			
959.820 *9*	173 *13*	1248.000	3+	288.186	4+	E2+M1	−12 *+3−5*		I_γ: From 1993Kl03.
960.50771[h] *25*	138 *9*	1049.486	0+	88.968	2+	E2			I_γ: From 1993Kl03.
[x]963.59[j] *8*	7 *3*					(E1)			
968.64[j] *3*	11 *3*	2216.611	2+	1248.000	3+	E2			
969.865 *8*	248 *12*	1258.074	2+	288.186	4+	E2			
[x]973.46[j] *4*	5.7 *13*					M1(+E2)			
974.091 *15*	23.3 *12*	2216.611	2+	1242.481	1−				Mult.: 1982Ba28 and 1993Kl03 report mult=E2, but placement requires a parity change.
979.608 *20*	13.3 *8*	2227.626	3−	1248.000	3+	E1			
982.35[j] *4*	4.5 *5*	2240.368	2+,3+	1258.074	2+				
[x]984.49[j] *3*	13.5 *8*					E1			
987.9440 *5*	205 *10*	1276.136	3−	288.186	4+	E1			E_γ: From 2010Je02. 1993Kl03 report Eγ=987.948 *8*.
992.329 *19*	12.0 *12*	2240.368	2+,3+	1248.000	3+	E2			
993.98[jp] *6*	4.8 *6*	2360.35?	1+	1366.462	1−				
996.92[j] *4*	5.4 *5*	2316.498	1−,2−	1319.656	2−	M1			
[x]998.47 *3*	9.1 *20*					E2+M1			
[x]1001.40[j] *15*	2.8 *10*								
1006.220 *18*	12 *2*	2174.335	2+	1168.185	0+	[E2]			Mult.: 1993Kl03 report mult=E2+M1, 1982Ba28 report E1. Placement requires E2.
1008.8	15 *2*	2256.742	3+	1248.000	3+				E_γ: γ not reported by 1982Ba28 or 1993Kl03, but shown with this placement in the level-scheme table of 1993Kl03. I_γ: Computed by the evaluator from the listed branching in the decay-scheme table of 1993Kl03, and Iγ(901.4γ).
1009.619 *11*	87 *5*	1297.819	4+	288.186	4+	E0+E2,M1[l]		93 *5*	
[x]1016.34[j] *5*	4.0 *12*					E1			
[x]1020.68[j] *6*	3.1 *9*					E2(+M1)			
[x]1024.32[j] *4*	6.0 *7*					E1			
[x]1027.11[j] *4*	9.1 *8*					E1			
1027.90[j] *6*	7.6 *7*	2270.015	1+	1242.481	1−	E1			E_γ: It is possible that the 1027.11 γ is actually the one that deexcites this level. Either Iγ value is much larger than that expected based on the decay γ's from this level in ^{156}Eu β^- decay.
[x]1030.06[j] *10*	2.1 *4*					[l]			
[x]1032.386 *10*	47 *2*					E1			
1036.527 *15*	37.5 *21*	2190.651	2+	1154.150	2+	M1,E2			Mult.: 1993Kl03 report mult=M1, while 1982Ba28 report E2.
1037.812[j] *24*	13.1 *11*	1622.530	5+	584.712	6+	E2+M1	−7 *+3−21*		
1040.470 *8*	297 *14*	1129.434	2+	88.968	2+	E2+E0(+M1)		301 *15*	
1045.72 *3*	10.5 *17*	2199.773	2−	1154.150	2+	E1			
[x]1047.76[j] *9*	2.7 *5*					M1			

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	δ[f]	$I_{(\gamma+ce)}$	Comments
1049.46 *8*		1049.486	0^+	0	0^+	E0		0.84 *7*	I_γ: Measured Iγ is <7.4 (1982Ba28).
1051.63 *3*	12.5 *14*	2349.634	3^+	1297.819	4^+				
1059.08[j] *4*	9.3 *14*	1643.648	6^+	584.712	6^+	E2			
[x]1060.31[j] *4*	10.0 *18*					E2			E_γ: 1982Ba28 place this γ from a 1644 level, tentatively assigned as the 6^+ member of the γ-vibrational band. In (α,2nγ) and in (n,γ) (1993Kl03), however, this 6^+ state is located at 1643 and deexcited by a 1059 γ. I_γ: From 1993Kl03. 1982Ba28 report Iγ=20 *5*.
1065.1781[h] *2*	564 *21*	1154.150	2^+	88.968	2^+	E2+M1	−16 *5*		
1067.2325[h] *2*	232 *13*	1355.418	4^+	288.186	4^+	E2+M1	−4.0 *+9−16*		
1073.475 *12*	36 *6*	2227.626	3^-	1154.150	2^+	E1			
1079.226 *8*	118 *7*	1168.185	0^+	88.968	2^+	E2			
1080.60[j] *4*	12.6 *24*	2323.215	2^+	1242.481	1^-	E1			
[x]1083.62[j] *6*	3.8 *5*					E2+M1			
[x]1086.299[j] *22*	10.2 *8*					E1			
[x]1091.42[j] *3*	8.9 *7*					[l]			
[x]1092.98 *3*	9.6 *7*								
1100.21 *5*	5.5 *7*	2254.316	4^+	1154.150	2^+	E2			
[x]1102.46 *3*	8.0 *11*					M1+E2			
[x]1104.74[j] *4*	5.5 *6*					E1			
1106.292 *19*	18 *3*	2382.469	2^+	1276.136	3^-	E1			
1109.27 *6*	5.9 *8*	2367.44	2^+	1258.074	2^+	E0+(M1,E2)			
1119.9335 *14*	90 *7*	1408.130	5^-	288.186	4^+	E1			E_γ: From 2010Je02. 1993Kl03 report Eγ=1119.933 *11*.
1121.11[j] *8*	10 *3*	1705.796	6^-	584.712	6^+	E1			
1125.07[j] *5*	6.9 *6*	2174.335	2^+	1049.486	0^+	E2			
1129.419 *9*	84 *5*	1129.434	2^+	0	0^+	E2			
[x]1137.56[j] *9*	4.3 *7*								γ placed from the 2186 level by 1993Kl03. However, this γ was not seen in ^{156}Eu β^- decay, and it should have been.
1140.96 *3*	11.3 *9*	2270.015	1^+	1129.434	2^+				I_γ: 1982Ba28 report Iγ<9. Mult.: From α(K)exp=0.00058 *6*, 1993Kl03 deduce mult=E1. From α(K)exp>0.0024, 1982Ba28 conclude mult=E2,M1. Placement requires no parity change.
[x]1144.18[j] *5*	6.4 *7*					E2			
1153.478 *14*	232 *20*	1242.481	1^-	88.968	2^+	E1			I_γ: From 1993Kl03.
1154.1467[h] *2*	50×10^1 *3*	1154.150	2^+	0	0^+	E2			
1155.9[p]	27 *3*	2205.561	1^-	1049.486	0^+				γ not shown in the line lists of either 1993Kl03 or 1982Ba28. However, it is shown in the tabular level scheme of 1993Kl03.
1159.031 *8*	68×10^1 *3*	1248.000	3^+	88.968	2^+	E2+M1	−11.8 *+6−7*		

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	δ[f]	$I_{(\gamma+ce)}$	Comments
1162.42[j] *9*	4 *2*	2316.498	1⁻,2⁻	1154.150	2⁺	E1			
[x]1163.74[j] *3*	10.1 *22*					E1			
[x]1166.19[j] *8*	9 *3*					E1			
1168.0 *4*		1168.185	0⁺	0	0⁺	E0		0.08 *3*	
1169.087 *10*	180 *10*	1258.074	2⁺	88.968	2⁺	E2+M1(+E0)	+0.38 *6*		I_γ: From 1993Kl03. Some studies [e.g., (α,2nγ) and 1982Ba28 in (n,γ)] propose that this γ is multiply placed, in particular that it may also deexcite the 1753.8, 6⁺ K=4 level. However, the relative Iγ values of the 969.8 and 1169.0 γ′s from the data of 1993Kl03 agree well with those from the ^{156}Eu β^- decay, where the 1169 peak is clearly a single γ. Further, the 1169 γ may have an E0 component, which is not expected for a placement from the 1753.8 level, for which ΔK=4. The evaluator has concluded that the 1169 γ in (n,γ) is a single transition whose placement is from this 1258.0 level.
1174.188 *11*	144 *13*	1462.297	4⁺	288.186	4⁺	M1(+E2,E0)			
1180.3119[h] *15*	249 *21*	1468.503	4⁻	288.186	4⁺	E1			
1187.1631[h] *2*	454 *25*	1276.136	3⁻	88.968	2⁺	E1			
1193.80[j] *4*	8.0 *9*	2323.215	2⁺	1129.434	2⁺	E2			
1199.21[j] *6*	5.4 *10*	2367.44	2⁺	1168.185	0⁺	[E2]			Mult.: The ce data indicate mult=E1, but the placement requires E2.
[x]1203.40[j] *5*	6.4 *16*					E1			
1208.870 *10*	97 *3*	1297.819	4⁺	88.968	2⁺	E2			
[x]1210.74[j] *4*	17.5 *12*								
[x]1214.59[j] *9*	5.5 *7*					E1			
1218.705 *13*	86 *5*	1506.860	5⁺	288.186	4⁺	E2			
1222.427 *10*	194 *13*	1510.591	4⁺	288.186	4⁺	E2+M1	−1.7 *2*		
1230.6857[h] *3*	556 *27*	1319.656	2⁻	88.968	2⁺	E1			
[x]1238.30 *6*	18.8 *18*								1982Ba28 report Iγ=35 *14*. Mult.: From α(K)exp=0.00134 *16*, 1993Kl03 report mult=E2. From α(K)exp=0.0006 *4*, 1982Ba28 deduce mult=E1.
1242.481 *10*	285 *15*	1242.481	1⁻	0	0⁺	E1			
1250.655 *11*	157 *10*	1538.853	3⁻	288.186	4⁺	E1			
[x]1252.56[j] *10*	10 *3*					E1			
[x]1254.56[j] *14*	6.7 *14*					E1			
1258.087 *14*	68 *3*	1258.074	2⁺	0	0⁺	E2			
[x]1264.05[j] *19*	6.2 *13*								
1266.446 *12*	93 *4*	1355.418	4⁺	88.968	2⁺	E2			
1273.85[j] *7*	12 *2*	2323.215	2⁺	1049.486	0⁺				
[x]1275.66 *7*	14.4 *18*					M1			
1277.482 *10*	255 *13*	1366.462	1⁻	88.968	2⁺	E1			

$^{156}_{64}$Gd$_{92}$-26

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	δ [f]	$I_{(\gamma+ce)}$	Comments
1291.90[j] *8*	6.1 *8*	2446.16	2^+	1154.150	2^+	(M1)			
^{x}1294.52[j] *10*	5.4 *7*								
^{x}1306.87 *3*	13.2 *11*					M1+E2			
^{x}1311.90[j] *21*	4.7 *10*					E1			
^{x}1320.61[j] *8*	5.1 *9*					E2			
^{x}1332.20 *8*	11.0 *11*					E1			I_γ: 1982Ba28 report Iγ=53 *13*.
1334.461 *23*	38.5 *19*	1622.530	5^+	288.186	4^+	E2+M1	−3.6 *3*		
^{x}1349.20 *4*	9.8 *6*					E1			
1366.478 *11*	139 *8*	1366.462	1^-	0	0^+	E1			
1373.331 *23*	23.4 *13*	1462.297	4^+	88.968	2^+	E2			
^{x}1398.95 *7*	5.4 *4*					E2			
^{x}1404.40 *3*	21 *9*					M1			
1421.594 *15*	83 *6*	1510.591	4^+	88.968	2^+	E2			
^{x}1428.80[j] *8*	11.2 *11*					E1			
1432.30 *5*	11.3 *9*	2016.949	5^-	584.712	6^+	E1			
1449.897 *11*	146 *9*	1538.853	3^-	88.968	2^+	E1			
^{x}1457.2[j] *3*	8 *3*					E1			
^{x}1468.16 *11*	6.9 *8*					E1			
^{x}1480.329 *21*	30.8 *18*					E1			
^{x}1492.76 *10*	11.5 *11*					E2			
^{x}1518.31 *8*	8.5 *25*								Mult.: From α(K)exp=0.00068 *8*, 1993Kl03 report mult=E2,E1. From α(K)exp=0.0018 *7*, 1982Ba28 report mult=M1.
^{x}1522.29[j] *12*	10.5 *11*								
^{x}1522.81[j] *10*	7.1 *14*								
^{x}1530.36 *12*	7.2 *9*					E2			
^{x}1554.05[j] *12*	7.1 *16*					E1			
^{x}1595.93[j] *10*	8.7 *9*					E2			
1605.208 *19*	58 *2*	1893.390	4^+	288.186	4^+	E2+M1			
^{x}1612.97 *10*	7.5 *7*								Mult.: From α(K)exp=0.00025 *4*, 1993Kl03 report mult=E1. From α(K)exp=0.0011 *4*, 1982Ba28 report mult=E2,M1.
1625.19 *21*	9.3 *13*	1715.188	0^+	88.968	2^+				
1628.21 *4*	33 *3*	1916.454	3^+	288.186	4^+	M1,E2			
^{x}1642.5[j] *3*	8 *4*					E1			
1646.184 *18*	42 *4*	1934.353	3^-	288.186	4^+	E1			
^{x}1667.39[j] *15*	8.2 *19*					E1			
^{x}1671.76[j] *8*	10.7 *12*					E1			
1682.174 *15*	157 *6*	1771.087	2^+	88.968	2^+	M1			
^{x}1698.89[j] *17*	10.0 *20*					E1			
1707.24[j] *11*	15.0 *21*	1995.458	4^-	288.186	4^+	E1			
1715.1[o] *5*	[o]	1715.188	0^+	0	0^+	E0		0.049 *6*	I_γ: 1982Ba28 and 1993Kl03 report Iγ<21 and 3.3 *18*, respectively, for this transition. Since this placement involves 0^+ states, the γ intensity presumably is all associated with the other placement.

$^{156}_{64}Gd_{92}$-27

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[cde]	δ[f]	$I_{(\gamma+ce)}$	Comments
1715.1[o] *5*	3.3[o] *18*	2003.747	2+	288.186	4+	[E2][l]			Eγ: Placement is that proposed by 1993Kl03. Iγ: From 1993Kl03. 1982Ba28 report Iγ<21. Mult.: Other placement is E0. This placement requires mult=E2.
1722.12 *7*	20.7 *20*	2010.341	4+	288.186	4+	E2+M1			
x1723.77 *4*	33.4 *23*					E1			
1728.56 *7*	15.4 *13*	2016.949	5−	288.186	4+	E1			
1732.37 *6*	28.2 *16*	2020.590	4+	288.186	4+	M1,E2			
1738.94 *3*	36.8 *18*	1827.839	2+	88.968	2+	M1,E2			
x1753.09 *18*	11 *3*					E1			
1756.75 *3*	35.2 *17*	2044.937	4−	288.186	4+	E1			Iγ: γ not seen in ε decay, but it should have been.
1762.58 *5*	34.5 *16*	1851.238	0+	88.968	2+				Placement is that of 1982Ba28. Mult.: 1982Ba28 report mult=E2,M1. 1993Kl03 report mult=E1. This placement requires mult=E2.
1765.97 *5*	19.3 *13*	2054.131	2+	288.186	4+	[E2]			
x1777.30[j] *19*	10 *3*								
x1780.10[j] *14*	17 *4*								
1781.96 *6*	17 *3*	2070.287	3+	288.186	4+	E2(+M1)			
1814.77 *13*	10.2 *16*	2103.406	3−	288.186	4+	E1			
1818.41 *3*	50.8 *20*	2106.645	3+	288.186	4+	M1(+E2)			
1826.02 *3*	60 *6*	1914.838	2+	88.968	2+	M1			
1827.74 *4*	42 *2*	1916.454	3+	88.968	2+	M1(+E2)			Iγ: 1982Ba28 report Iγ=29 *2* and show this γ as multiply placed.
1845.474[o] *24*	12[ok] *4*	1934.154	2−	88.968	2+	E1			Iγ: Total Iγ=58 *2* for this γ. Listed value is that remaining after accounting for the decay of the other 1934 level.
1845.474[o] *24*	46[ok] *3*	1934.353	3−	88.968	2+	E1			Iγ: From Iγ(1845γ)/Iγ(1646γ) in ^{156}Tb ε decay and Iγ(1646γ). 1982Ba28 show the remainder of this Iγ deexciting the lower 1934 level.
1851.4 *4*		1851.238	0+	0	0+	E0		0.2 *1*	Iγ: Measured value is Iγ=<8, but γ is an E0.
x1852.00 *17*	7.5 *15*					[l]			Iγ: From 1993Kl03. 1982Ba28 report Iγ<8 and suggest that mult may be E0.
1857.408 *23*	49.0 *19*	1946.371	1−	88.968	2+	E1			
1872.93 *3*	42.8 *17*	1962.036	1−	88.968	2+	E1			
1876.55[j] *21*	5.8 *14*	1965.950	1+	88.968	2+				
x1881.27 *8*	12.6 *11*					E2			
x1888.06 *8*	11.6 *11*					M1			
1893.09[j] *8*	11.8 *11*	2181.383	2+	288.186	4+	E2			
1902.67 *5*	20.4 *12*	2190.651	2+	288.186	4+	[E2]			Mult.: 1982Ba28 report mult=M1,E2, 1993Kl03 report mult=M1, but placement requires E2.
x1909.35[j] *18*	6.2 *13*					(E1)			
x1915.44 *4*	23.6 *15*					E1			
x1922.82 *3*	39 *1*					E1			
1931.97[j] *16*	6.7 *12*	2020.590	4+	88.968	2+	[E2]			Mult.: The ce data indicate mult=M1,E2, but placement requires E2.
1937.57 *5*	32 *3*	2026.660	1+	88.968	2+	M1+E2	−0.60 *4*		

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	δ [f]	Comments
1946.16 *4*	32 *3*	1946.371	1$^-$	0	0$^+$	E1		
[x]1955.82 *5*	25.5 *15*					E1		
1958.87 *4*	41 *3*	2047.800	2$^+$	88.968	2$^+$	M1		
1961.78 *5*	24 *3*	1962.036	1$^-$	0	0$^+$	E1		
1965.123 *20*	108 *7*	2054.131	2$^+$	88.968	2$^+$	M1		
1981.46 *4*	30.4 *15*	2070.287	3$^+$	88.968	2$^+$	E2+M1		
2014.16 *4*	26.8 *13*	2103.406	3$^-$	88.968	2$^+$	E1		
2017.73 *3*	68 *2*	2106.645	3$^+$	88.968	2$^+$	M1		
2026.70 *3*	38 *2*	2026.660	1$^+$	0	0$^+$	M1		
2032.45 *3*	35.5 *17*	2121.43	2$^-$	88.968	2$^+$	E1		
2047.90 *12*	12 *3*	2047.800	2$^+$	0	0$^+$	E2		Mult.: From 1993Kl03. 1982Ba28 report mult=E1. Placement requires E2.
[x]2050.78 *10*	16 *4*					E2,M1		
2054.03 *10*	10.5 *10*	2054.131	2$^+$	0	0$^+$	E2		
[x]2058.19 *6*	17 *1*							Mult.: From α(K)exp=0.00089 *7*, 1993Kl03 report mult=M1. From α(K)exp=0.00056, 1982Ba28 report mult=E1,E2.
2061.45 *5*	23 *2*	2349.634	3$^+$	288.186	4$^+$	M1		Mult.: From α(K)exp=0.00078 *6*, 1993Kl03 report mult=M1. From α(K)exp<=0.00052, 1982Ba28 report mult=E1,E2. Placement requires no parity change.
[x]2071.70[j] *14*	6.7 *10*					E2		
2079.21[j] *13*	6.9 *10*	2367.44	2$^+$	288.186	4$^+$	E2		
[x]2088.28 *5*	18.6 *16*					E1		
2092.28[j] *5*	16.2 *11*	2181.383	2$^+$	88.968	2$^+$			Mult.: 1993Kl03 report mult=E1(E2), but placement indicates no parity change.
2097.79 *4*	20 *3*	2186.788	1$^+$	88.968	2$^+$	M1+E2	−1.1 *4*	
2101.47[j] *10*	9.7 *10*	2190.651	2$^+$	88.968	2$^+$	M1		
2110.66 *4*	22.8 *13*	2199.773	2$^-$	88.968	2$^+$	E1		
[x]2114.15 *8*	9.5 *15*					E1		
2127.59 *3*	53 *7*	2216.611	2$^+$	88.968	2$^+$	E2		Mult.: 1993Kl03 report mult=M1(E2), while 1982Ba28 report E2.
[x]2136.1[g] *4*	8[g] *2*					M1		
[x]2139.30 *8*	13.0 *10*							
[x]2148.47 *7*	15 *3*					M1		
2152.14 *13*	40 *4*	2240.368	2$^+$,3$^+$	88.968	2$^+$			Mult.: Mult=E1 from 1982Ba28, 1993Kl03. Placement requires no parity change.
[x]2154.31[j] *21*	16 *3*					E2		
2167.57 *7*	14 *1*	2256.742	3$^+$	88.968	2$^+$	M1,E2		
2170.85 *7*	14 *1*	2259.86	1$^-$	88.968	2$^+$	E1		
2180.60 *5*	20.4 *12*	2270.015	1$^+$	88.968	2$^+$	M1+E2	−0.65 *+8−6*	δ: From ^{156}Eu β^- decay.
2186.61 *6*	17.7 *12*	2186.788	1$^+$	0	0$^+$	M1		Mult.: From α(K)exp=0.00088 *7* (1993Kl03), evaluator infers mult=M1. 1993Kl03 report M1(E2). 1982Ba28 report α(K)exp=0.00043 *14*, suggesting E2,E1.
2190.44 *4*	24.5 *15*	2190.651	2$^+$	0	0$^+$	[E2]		Mult.: The ce data indicate mult=M1(+E2), but the placement requires E2.
[x]2202.20 *11*	8.3 *10*							
2205.23 *8*	12.2 *12*	2205.561	1$^-$	0	0$^+$	E1		

$^{156}_{64}$Gd$_{92}$-29

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	Comments
^{x}2211.39 *4*	44.4 *22*					E2,M1	
^{x}2213.89 *4*	37.4 *22*					E2,M1	
^{x}2218.70[j] *13*	7.1 *9*					E1	
^{x}2221.97[j] *13*	6.6 *9*						
2227.86 *5*	23.4 *14*	2316.498	$1^-,2^-$	88.968	2^+	E1	
2234.01 *5*	22.5 *14*	2323.215	2^+	88.968	2^+	M1	
^{x}2240.16[j] *10*	8.8 *10*						
^{x}2251.15[j] *16*	5.0 *9*					E1	
^{x}2254.94[j] *10*	7.8 *9*					M1	
2259.91[j] *13*	6.0 *9*	2259.86	1^-	0	0^+	[E1]	Mult.: The ce data indicate mult=M1. If $J^\pi=1^-$ for the 2259 level, then this γ must involve a parity change.
^{x}2265.37[j] *7*	12.4 *10*					M1	
2269.17 *11*	9.6 *10*	2270.015	1^+	0	0^+		2000GrZY do not place this γ here. The evaluator places it based on the decay of this level as seen in ^{156}Eu β^- decay.
2271.74[jp] *10*	11.3 *11*	2360.35?	1^+	88.968	2^+	M1	
^{x}2275.38[j] *16*	5.7 *9*						
2278.47[j] *8*	12.4 *10*	2367.44	2^+	88.968	2^+		
^{x}2284.00[j] *8*	11.0 *10*					M1	
2293.26 *5*	22.8 *13*	2382.469	2^+	88.968	2^+		Mult.: From α(K)exp=0.00062 *4*, 1993Kl03 deduce mult=M1(E2). 1982Ba28, from α(K)exp=0.00030 *7*, deduce E1. Placement requires no parity change.
^{x}2302.67[j] *7*	13.3 *10*					E1	
^{x}2308.72[j] *7*	12.7 *10*					M1	
^{x}2317.08[j] *20*	5.7 *9*						
^{x}2319.75[j] *13*	8.9 *10*					M1	
2322.88[j] *16*	5.4 *8*	2323.215	2^+	0	0^+		
2326.48 *10*	8.5 *9*	2415.489	3^+	88.968	2^+	M1	
^{x}2329.8[j] *4*	2.3 *8*					M1,E2	
^{x}2334.06[j] *10*	8.2 *9*					E2	
^{x}2339.3[j] *4*	1.7 *8*						
^{x}2352.63 *22*	3.3 *8*						Mult.: α(K)exp is much larger than that for an M1 transition (1993Kl03).
2357.16 *5*	22.7 *13*	2446.16	2^+	88.968	2^+	M1	
^{x}2362.51 *5*	37.3 *18*					E2	
2367.58 *7*	13.2 *10*	2367.44	2^+	0	0^+	[E2]	Mult.: The ce data allow mult=M1,E2, but the placement requires E2.
^{x}2378.58 *15*	15.0 *12*					E1	
^{x}2390.02 *10*	16.7 *11*					E2	
^{x}2407.42 *13*	5.6 *7*					E2	
^{x}2412.89 *4*	25.3 *15*						
^{x}2419.98 *8*	15.0 *10*						
^{x}2424.54 *14*	5.3 *8*						
^{x}2428.85 *6*	18.4 *11*						
^{x}2434.71 *8*	9.4 *9*					M1,E2	
^{x}2439.87 *12*	6.4 *8*						

$^{156}_{64}$Gd$_{92}$-30

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)

γ(^{156}Gd) (continued)

E$_\gamma$[†‡#@&]	I$_\gamma$[ab]	E$_i$(level)	Mult.[cde]
^{x}2444.28 *21*	7.9 *10*		
^{x}2449.72 *11*	9.2 *9*		
^{x}2459.58 *9*	8.8 *8*		M1,E2
^{x}2465.54 *10*	7.2 *8*		E2,M1
^{x}2470.1 *4*	1.6 *7*		
^{x}2474.49 *14*	5.0 *8*		M1
^{x}2479.35 *10*	7.5 *8*		E2,M1
^{x}2484.31 *15*	4.8 *7*		
^{x}2489.12 *15*	6.6 *8*		
^{x}2494.08 *7*	15.8 *11*		E1
^{x}2499.93 *9*	8.1 *8*		M1
^{x}2509.45 *6*	21.6 *12*		
^{x}2513.46 *15*	5.8 *8*		E1
^{x}2516.46 *17*	4.9 *7*		M1,E2
^{x}2525.13 *10*	9.2 *8*		
^{x}2528.25 *9*	9.5 *9*		
^{x}2533.05 *16*	4.4 *7*		M1,E2
^{x}2538.48 *11*	6.4 *7*		
^{x}2544.77 *17*	4.3 *7*		
^{x}2548.31 *17*	4.4 *7*		
^{x}2554.15 *20*	3.7 *7*		
^{x}2558.54 *10*	18.3 *12*		
^{x}2563.02 *9*	9.0 *8*		M1,E2
^{x}2567.54 *13*	5.4 *7*		
^{x}2571.92 *11*	7.0 *8*		
^{x}2576.30 *6*	30.7 *15*		E1
^{x}2583.44 *23*	3.0 *7*		E2,M1
^{x}2587.58 *9*	8.2 *7*		
^{x}2592.34 *6*	13.7 *10*		E2,M1
^{x}2597.76 *13*	6.8 *8*		M1,E2
^{x}2600.46 *9*	11.6 *9*		E2,M1
^{x}2604.55 *13*	6.3 *8*		
^{x}2607.84 *18*	4.5 *7*		
^{x}2612.00 *5*	16.3 *10*		M1,E2
^{x}2621.1 *3*	9.7 *10*		
^{x}2629.45 *8*	9.7 *8*		M1,E2
^{x}2633.10 *13*	5.9 *7*		E1
^{x}2639.56 *10*	8.2 *7*		M1,E2
^{x}2643.00 *12*	6.6 *7*		M1,E2
^{x}2648.98 *10*	14.7 *10*		E1
^{x}2655.28 *7*	13.3 *9*		
^{x}2658.45 *21*	4.6 *8*		
^{x}2661.6 *5*	2.1 *15*		
^{x}2664.0 *5*	8.4 *17*		
^{x}2672.70 *6*	17.4 *10*		M1,E2
^{x}2677.16 *12*	5.8 *7*		
^{x}2684.18 *12*	6.2 *7*		E1
^{x}2687.74 *9*	9.0 *8*		E2,M1
^{x}2695.67 *13*	6.2 *8*		M1,E2
^{x}2698.80 *18*	4.3 *7*		M1,E2
^{x}2705.72 *9*	17.6 *12*		E2,M1
^{x}2710.33 *12*	6.0 *7*		E2,M1
^{x}2715.40 *10*	7.3 *7*		
^{x}2727.31 *8*	9.3 *7*		E1
^{x}2731.59 *11*	6.3 *7*		
^{x}2737.84 *8*	10.7 *9*		M1,E2
^{x}2742.29 *7*	25.0 *15*		
^{x}2750.58 *4*	24.2 *12*		E2,M1
^{x}2754.70 *11*	6.5 *7*		E1
^{x}2759.17 *12*	9.3 *8*		
^{x}2764.84 *7*	20.3 *12*		E1
^{x}2774.07 *21*	4.4 *8*		M1,E2
^{x}2776.77 *22*	4.2 *8*		M1,E2
^{x}2784.78 *8*	19.4 *11*		E1
^{x}2789.93 *9*	9.2 *7*		M1,E2
^{x}2793.37 *8*	9.9 *8*		E2,M1
^{x}2799.51 *8*	9.8 *8*		
^{x}2804.92 *7*	10.7 *8*		E2,M1
^{x}2809.60 *10*	7.5 *7*		E1
^{x}2818.37 *6*	16.6 *10*		E1
^{x}2822.04 *6*	14.6 *9*		E1
^{x}2829.43 *8*	9.4 *8*		
^{x}2833.31 *10*	7.8 *7*		E2,M1
^{x}2839.37 *6*	16.5 *10*		M1,E2
^{x}2842.74 *10*	8.0 *7*		
^{x}2854.10 *11*	6.5 *7*		E2,M1
^{x}2858.59 *8*	9.0 *7*		M1,E2
^{x}2864.18 *12*	5.6 *6*		E2,M1
^{x}2871.19 *13*	5.0 *7*		
^{x}2879.45 *10*	7.5 *7*		
^{x}2883.16 *7*	12.4 *9*		E2,M1
^{x}2888.33 *9*	7.8 *7*		
^{x}2893.97 *19*	3.8 *6*		
^{x}2897.67 *8*	11.3 *8*		
^{x}2901.13 *10*	7.3 *7*		
^{x}2909.79 *7*	12.6 *9*		M1,E2
^{x}2913.5 *3*	2.7 *6*		
^{x}2918.65 *8*	8.8 *7*		M1,E2
^{x}2925.3 *4*	1.6 *6*		
^{x}2934.96 *7*	11.5 *8*		M1,E2
^{x}2941.14 *13*	5.1 *6*		
^{x}2953.14 *9*	7.8 *7*		M1,E2
^{x}2964.70 *24*	2.8 *6*		
^{x}2973.3 *3*	3.2 *7*		M1,E2
^{x}2976.43 *17*	5.8 *7*		M1,E2
^{x}2979.71 *14*	5.9 *7*		M1,E2
^{x}2986.94 *6*	14.7 *9*		E2,M1
^{x}2995.69 *15*	5.6 *7*		
^{x}2999.19 *10*	7.3 *7*		E1
^{x}3008.12 *20*	3.2 *6*		M1,E2
^{x}3016.14 *11*	15.7 *11*		E1
^{x}3021.58 *11*	6.1 *7*		
^{x}3027.92 *5*	14.8 *9*		E2,M1
^{x}3033.07 *12*	5.3 *6*		E1
^{x}3046.55 *14*	5.3 *6*		
^{x}3050.56 *9*	12.4 *9*		
^{x}3057.42 *18*	4.1 *6*		
^{x}3060.99 *10*	7.0 *6*		
^{x}3072.22 *9*	9.8 *8*		E1
^{x}3076.06 *8*	10.2 *7*		
^{x}3089.73 *7*	11.7 *8*		M1,E2
^{x}3096.41 *8*	18.3 *11*		
^{x}3100.98 *6*	13.2 *8*		E2,M1
^{x}3107.27 *9*	20.0 *12*		E1
^{x}3115.97 *8*	8.8 *7*		E2,M1
^{x}3130.73 *14*	5.1 *6*		
^{x}3138.36 *11*	20.2 *12*		
^{x}3144.00 *16*	4.2 *6*		M1,E2
^{x}3151.18 *10*	8.5 *8*		
^{x}3154.24 *15*	6.6 *7*		E2,M1
^{x}3157.83 *12*	6.3 *6*		E2,M1
^{x}3166.65 *11*	7.1 *6*		
^{x}3170.03 *9*	10.1 *7*		
^{x}3175.49 *11*	14.3 *10*		E1
^{x}3185.97 *8*	9.1 *6*		E2,M1
^{x}3190.78 *16*	4.0 *6*		
^{x}3198.20 *13*	9.7 *8*		
^{x}3205.74 *13*	11.9 *8*		
^{x}3216.31 *9*	13.2 *9*		
^{x}3224.62 *10*	6.7 *6*		E1
^{x}3238.3 *4*	3.5 *12*		
^{x}3240.5 *4*	3.2 *11*		

$^{156}_{64}$Gd$_{92}$-31

γ(^{156}Gd) (continued)

E_γ[†‡#@&]	I_γ[ab]	E_i(level)	J^π_i	E_f	Mult.[cde]	Comments
[x]3251.3 *3*	2.6 *5*				M1,E2	
[x]3271.40 *11*	6.0 *6*				E1	
[x]3275.51 *10*	6.8 *6*					
[x]3289.21 *10*	8.3 *7*				M1,E2	
[x]3292.7 *3*	2.8 *6*					
[x]3297.99 *22*	10.2 *10*				E1	
[x]3302.88 *19*	11.5 *10*					
[x]3308.63 *13*	5.1 *6*					
[x]3313.92 *13*	4.8 *5*				E2,M1	
[x]3319.04 *14*	4.4 *5*					
[x]3353.05 *10*	9.3 *8*				E1	
[x]3356.09 *11*	8.1 *7*					
[x]3361.32 *9*	7.3 *6*				E2,M1	
[x]3380.11 *22*	2.9 *5*				E1	
[x]3386.25 *12*	11.3 *8*				E1	
[x]3400.78 *14*	9.4 *8*				E1	
[x]3405.6 *3*	3.9 *10*					
[x]3413.79 *15*	4.1 *5*					
[x]3464.51 *6*	12.0 *7*				E1	
[x]3476.92 *16*	4.6 *6*				E2,M1	
[x]3480.6 *3*	2.8 *5*					
[x]3488.30 *9*	8.4 *6*					
[x]3556.28 *10*	7.0 *6*				E1	
4415.3[g] *10*	18[g] *4*	8536.39	2⁻	4121.0		
4527.1[g] *6*	38[g] *8*	8536.39	2⁻	4009.2	(E1)	
4558.3[g] *8*	19[g] *3*	8536.39	2⁻	3978.0	E1	
4567.9[g] *9*	21[g] *4*	8536.39	2⁻	3968.4		
4670.5[g] *7*	18[g] *4*	8536.39	2⁻	3865.8		
4713.2[g] *10*	16[g] *4*	8536.39	2⁻	3823.1	(E1)	
4725.2[g] *8*	28[g] *4*	8536.39	2⁻	3811.1		
4812.4[g] *9*	14[g] *3*	8536.39	2⁻	3723.9		
4843.5[g] *8*	20[g] *3*	8536.39	2⁻	3692.8	E1	
4858.2[g] *8*	19[g] *3*	8536.39	2⁻	3678.1	E1	
4900.0[g] *9*	25[g] *5*	8536.39	2⁻	3636.3	E1	
4941.1[g] *6*	26[g] *4*	8536.39	2⁻	3595.2	E1	
4983.8[g] *5*	31[g] *3*	8536.39	2⁻	3552.5	E1	
5000.9[g] *8*	18[g] *4*	8536.39	2⁻	3535.4	E1	
5026.9[g] *8*	10.5[g] *21*	8536.39	2⁻	3509.4		E_γ: Reported as 2026.9 by 1982Ba28, probably a misprint.
5040.15 *10*	8.6 *6*	8536.39	2⁻	3496.15		
5052.56 *9*	11.5 *7*	8536.39	2⁻	3483.74		
5059.1[g] *8*	18[g] *4*	8536.39	2⁻	3477.2	M1,E2	
5074.76 *7*	12 *4*	8536.39	2⁻	3461.54		

$^{156}_{64}$Gd$_{92}$-32

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [cde]	Comments
5093.11 *5*	30 *4*	8536.39	2⁻	3443.19		M1,E2	
5101.75 *9*	11.6 *7*	8536.39	2⁻	3434.55			
5108.40 *8*	19 *1*	8536.39	2⁻	3427.90		M1,E2	
5112.96 *10*	11.2 *8*	8536.39	2⁻	3423.34			
5157.03 *9*	11.3 *7*	8536.39	2⁻	3379.27			
5165.68 *10*	13.3 *9*	8536.39	2⁻	3370.62			
5169.74 *13*	11.7 *8*	8536.39	2⁻	3366.56			
5174.88 *14*	9.1 *7*	8536.39	2⁻	3361.42			
5179.84 *15*	9.3 *7*	8536.39	2⁻	3356.46			
5238.5[g] *7*	7.4[g] *15*	8536.39	2⁻	3297.6			
5251.33 *8*	12 *3*	8536.39	2⁻	3284.97		E1	
5260.20 *6*	16 *5*	8536.39	2⁻	3276.10		(M1)	
5269.88 *7*	17.4 *20*	8536.39	2⁻	3266.42		E1	
5307.13 *8*	14 *1*	8536.39	2⁻	3229.16		(M1)	
5328.5[g] *10*	13[g] *3*	8536.39	2⁻	3207.8			
5345.83 *7*	29 *3*	8536.39	2⁻	3190.46		(M1)	
5350.27 *10*	17.0 *10*	8536.39	2⁻	3186.02		E1	
5355.75 *8*	16.7 *10*	8536.39	2⁻	3180.54		E1	
5370.7[g] *9*	9[g] *5*	8536.39	2⁻	3165.6			
5418.28 *9*	11.4 *8*	8536.39	2⁻	3118.01		E1	
5426.56 *15*	8.9 *8*	8536.39	2⁻	3109.73		E1	
5430.72 *9*	18.9 *11*	8536.39	2⁻	3105.57			
5485.50 *6*	21.5 *13*	8536.39	2⁻	3050.79		E1	
5502.7[g] *8*	11.0[g] *16*	8536.39	2⁻	3033.6			
5511.63 *9*	10.8 *15*	8536.39	2⁻	3024.66		(M1,E2)	
5528.94 *10*	10.6 *7*	8536.39	2⁻	3007.35			
5548.48 *8*	16.3 *10*	8536.39	2⁻	2987.80			Mult.: 1993Kl03 report α(K)exp=9.7×10^{-5} 11 and mult=(M1,E2). 1982Ba28 report α(K)exp=4.4×10^{-5} 2 and deduce mult=E1.
5573.59 *9*	12.9 *10*	8536.39	2⁻	2962.69			Mult.: 1993Kl03 report α(K)exp=8.6×10^{-5} 14 and mult=(M1). 1982Ba28 report α(K)exp<8.9×10^{-5} and deduce mult=(E1).
5588.42 *6*	35.1 *17*	8536.39	2⁻	2947.86		E1	
5607.50 *9*	12 *3*	8536.39	2⁻	2928.78			
5626.8[g] *8*	11.2[g] *22*	8536.39	2⁻	2909.5			
5647.71 *10*	12.4 *8*	8536.39	2⁻	2888.57		E1	
5661.56 *6*	45 *4*	8536.39	2⁻	2874.72		E1	
5685.3[g] *8*	10.3[g] *15*	8536.39	2⁻	2851.0			
5696.07 *6*	41.3 *25*	8536.39	2⁻	2840.21		E1	
5705.48 *6*	26 *3*	8536.39	2⁻	2830.80			
5718.5[g] *8*	5.1[g] *10*	8536.39	2⁻	2817.8			
5746.8 *3*	4.1 *7*	8536.39	2⁻	2789.5			
5750.3[g] *7*	6.5[g] *13*	8536.39	2⁻	2786.0	1⁺		
5773.82 *7*	18.5 *19*	8536.39	2⁻	2762.46		M1	

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]	Comments
5786.74 6	33.4 17	8536.39	2^-	2749.53			Mult.: 1993Kl03 report α(K)exp=5.9×10^{-5} 5 and mult=E1. 1982Ba28 report α(K)exp=8.9×10^{-5} 11 and deduce mult=M1,E2.
5816.5[g] 8	7.2[g] 11	8536.39	2^-	2719.8			
5834.50 10	10.8 14	8536.39	2^-	2701.77			
5839.4 10	1.0 5	8536.39	2^-	2696.9			1993Kl03 report α(K)exp=9×10^{-4} 5, which is much larger than that for M1 or E2. 1982Ba28 do not report this γ.
5883.71 7	37.1 17	8536.39	2^-	2652.56		E1	
5888.68 12	13.5 9	8536.39	2^-	2647.59		E1	
5941.4[g] 15	3.2[g] 16	8536.39	2^-	2594.9			
6033.86 6	55 2	8536.39	2^-	2502.40		E1	
6059.0[g] 11	4.1[g] 12	8536.39	2^-	2477.3			
6075.8 4	2.7 5	8536.39	2^-	2460.5			1993Kl03 report α(K)exp=2.5×10^{-4} 7, which is much larger than that for M1 or E2. 1982Ba28 show this γ as questionable.
6084.00 9	19.1 11	8536.39	2^-	2452.26			
6089.70 9	19.0 11	8536.39	2^-	2446.16	2^+	E1	
6099.31 9	17.7 10	8536.39	2^-	2436.95		E1	
6107.89 10	12.3 9	8536.39	2^-	2428.37		E1	
6120.36 8	19.5 11	8536.39	2^-	2415.489	3^+	E1	
6133.05 13	8.1 7	8536.39	2^-	2403.21		(M1)	
6153.6[g] 7	6.0[g] 9	8536.39	2^-	2382.469	2^+		
6234.16 9	20.8 12	8536.39	2^-	2302.820	2^+	E1	
6262.4[g] 13	3.3[g] 10	8536.39	2^-	2273.9			
6279.1[g] 6	9.6[g] 10	8536.39	2^-	2256.742	3^+	E1	
6307.56 18	6.4 6	8536.39	2^-	2227.626	3^-		
6319.14 8	26.8 13	8536.39	2^-	2216.611	2^+	E1	
6345.43 9	44 2	8536.39	2^-	2190.651	2^+	E1	
6349.36 10	35.6 24	8536.39	2^-	2186.788	1^+	E1	
6429.35 6	79 3	8536.39	2^-	2106.645	3^+	E1	
6465.74 14	24.6 13	8536.39	2^-	2070.287	3^+	E1	
6481.94 13	67 3	8536.39	2^-	2054.131	2^+	E1	
6531.9[g] 7	5.9[g] 9	8536.39	2^-	2003.747	2^+	E1	
6572.5[g] 7	6.1[g] 9	8536.39	2^-	1965.114	4^-		
6620.3[g] 6	10.6[g] 11	8536.39	2^-	1916.454	3^+	E1	
6750.14[p] 20	7.5 7	8536.39	2^-	1786.09?			1993Kl03 report α(K)exp=3.1×10^{-4} 4, which is much larger than that for M1 or E2. No final level is reported at the energy expected for the termination of this γ. 1982Ba28 do not report this γ.
6765.01 14	32.8 15	8536.39	2^-	1771.087	2^+		Mult.: 1993Kl03 report mult=E2,(M1), while 1982Ba28 report mult=E1.
7216.4 3	5.5 8	8536.39	2^-	1319.656	2^-	E2,M1	
7260.15 19	11.3 8	8536.39	2^-	1276.136	3^-		Mult.: From α(K)exp=8.2×10^{-5} 17, 1982Ba28 deduce mult=E2,M1. 1993Kl03 report α(K)exp=2.0×10^{-5} 12, which is smaller than that for E1.
7288.26 13	114 5	8536.39	2^-	1248.000	3^+	E1	

$^{156}_{64}$Gd$_{92}$-34

γ(^{156}Gd) (continued)

E_γ [†‡#@&]	I_γ [ab]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [cde]
7382.04 *14*	55 *2*	8536.39	2^-	1154.150	2^+	E1
8446.8[g] *7*	3.4[g] *3*	8536.39	2^-	88.968	2^+	

† Unless noted otherwise, the Eγ data are those reported by 1993Kl03. Above 2 MeV, the γ-ray data are from the pair-spectrometer measurements. Between 1.5 and 2 MeV, a weighted average of these data and those from the crystal-spectrometer measurements was used. Between 0.3 and 1.5 MeV, only the crystal-spectrometer data were used. Below 0.3 MeV, the data represent a weighted average of those of 1982Ba28 and 1993Kl03. 1982Ba28 do not report secondary γ's above≈2.35 MeV. Thus, such data are from 1993Kl03 only.

‡ The values reported by 1993Kl03 were corrected for nuclear recoil. The evaluator has removed this correction before recording them here. The correction employed by 1993Kl03 was equivalent to the following (J. Klora, priv. comm., 2001): $\Delta E_R=3.42(E\gamma)^2$, where ΔE_R is in eV and Eγ is in MeV.

\# The energy scale of the secondary capture γ rays was determined from the precisely measured values of the 8 indicated γ-ray transitions (1993Kl03). The listed uncertainties are the statistical ones only. An absolute error of 2 ppm or less (1993Kl03) has not been included in the listed uncertainties, although it was included in the least-squares fit to obtain the level energies.

@ The energy calibration of 1993Kl03 differs from that of 1982Ba28 (and presumably that of 1985HoZL) by the factor 1.0000307. Consequently, where a given γ transition has been reported by only one of these latter two authors, the evaluator has multiplied their reported values by this factor. This has been done only for those γ's below≈2 MeV, since this is the region presumably most influenced by the curved-crystal data.

& The primary γ's having Eγ values between 4415.3 and 5026.9 are from 1982Ba28 only. 1993Kl03 do not report γ's in this energy region. A number of primary γ's reported as questionable by 1982Ba28 and not reported by 1993Kl03 are not listed here.

a Values are in photons per 10,000 n captures.

b Below≈0.3 MeV, the values are those given in 1993Kl03, unless noted otherwise. Elsewhere, since 1982Ba28 and 1993Kl03 (and 1985HoZL also) quote their Iγ values in photons per 10^4 n captures, the Iγ values listed in this evaluation represent simple averages of those of 1993Kl03 and 1982Ba28 where a reasonably definite association of the γ's in the two studies can be made and where the two values reported agree reasonably well and have comparable uncertainties. In these cases, the listed uncertainty is the smaller of the two quoted ones. Where they do not overlap, but have comparable uncertainties, the listed uncertainty is large enough to encompass the two values. Where the two values differ significantly and one of the listed uncertainties is much smaller than the other, the Iγ value having the smaller uncertainty is given, with a note specifying the source.

c Derived primarily from α(K)exp values from 1982Ba28 and 1993Kl03. The electron and γ spectra from 1982Ba28 were normalized using the theoretical α(K) for the 296.5 E2 transition and checked by comparing with a number of higher-lying transitions. The spectra of 1993Kl03 were normalized using≈200 transitions having well established mults.

d In instances where transitions are assigned solely as mult=E2 or M1, it should be understood that, because of the uncertainties in the measured conversion coefficients, admixtures of the other mult are not ruled out.

e In cases where the α(K)exp data do not distinguish between E1, M1 or E2, a value for the multipolarity is generally not listed.

f The mixing ratios are from the ^{156}Gd Adopted γ Radiations and based on data from all the experiments.

g From 1982Ba28. Transition not reported by 1993Kl03.

h Value measured using the two-axis double-flat crystal spectrometer GAMS4 and used by 1993Kl03 as an energy calibration for the other secondary γ's in their study. In using these values for the least-squares fit to obtain the level energies, the evaluator has increased their listed uncertainties to include an absolute uncertainty of 2 ppm and has, arbitrarily, increased that of the 199 keV γ to be 1 eV.

i From 1985HoZL.

$^{156}_{64}$Gd$_{92}$-35

γ(^{156}Gd) (continued)

[j] γ not reported by 1982Ba28. In some instances where the γ's reported by 1993Kl03 are closely spaced, they can be associated with a single line reported by 1982Ba28. The evaluator has assumed that, in these cases, this results from the higher energy resolution in the later study. These cases are not specifically noted in the present evaluation.

[k] Establishing the γ-decay patterns of the two 1934 levels (J^π=2^- and 3^-) is problematic, in that a number of γ's are proposed to deexcite both of them. These levels are also populated in the ^{156}Tb ε decay. In this evaluation, the evaluator has generally used the Iγ value of a given γ, relative to that of the prominent 1646 γ (which deexcites only the 3^- member of this doublet), to deduce the split in intensity of that γ between these two levels. 1982Ba28 carried out a more detailed analysis of these cases. The evaluator has repeated this analysis using the new data and finds that these new results are in essential agreement with those obtained from the ratios involving the 1646 γ. This is largely due to the fact that, relative to the 3^- level, the 2^- level is fed much more weakly in the ^{156}Tb ε decay than in the (n,γ) reaction.

[l] The α(K)exp value is significantly larger than that for an M1 transition, suggesting some possible E0 admixture.

[m] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

[n] Multiply placed with undivided intensity.

[o] Multiply placed with intensity suitably divided.

[p] Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

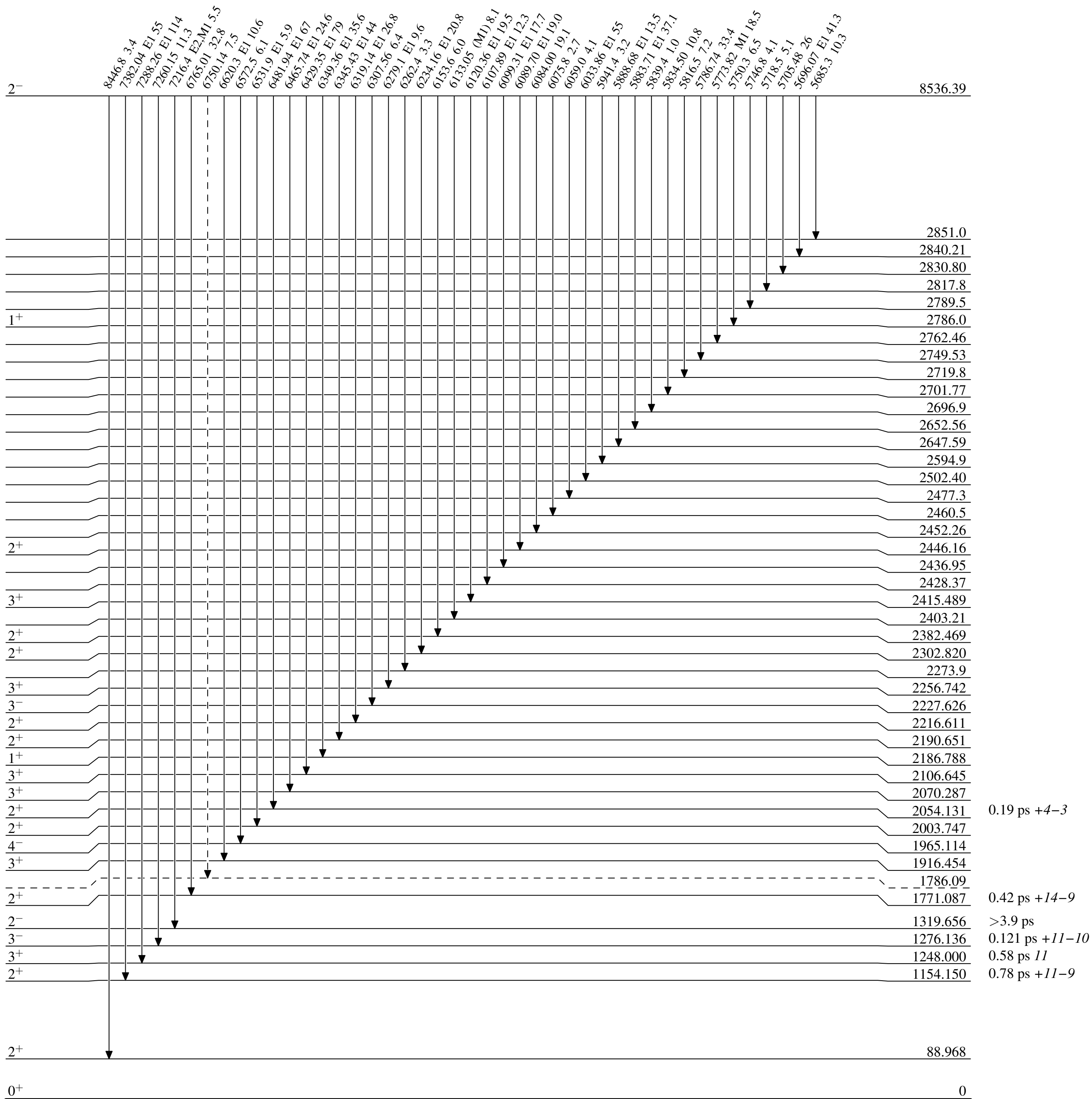
^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme

Intensities: Photons per 10,000 n captures.

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

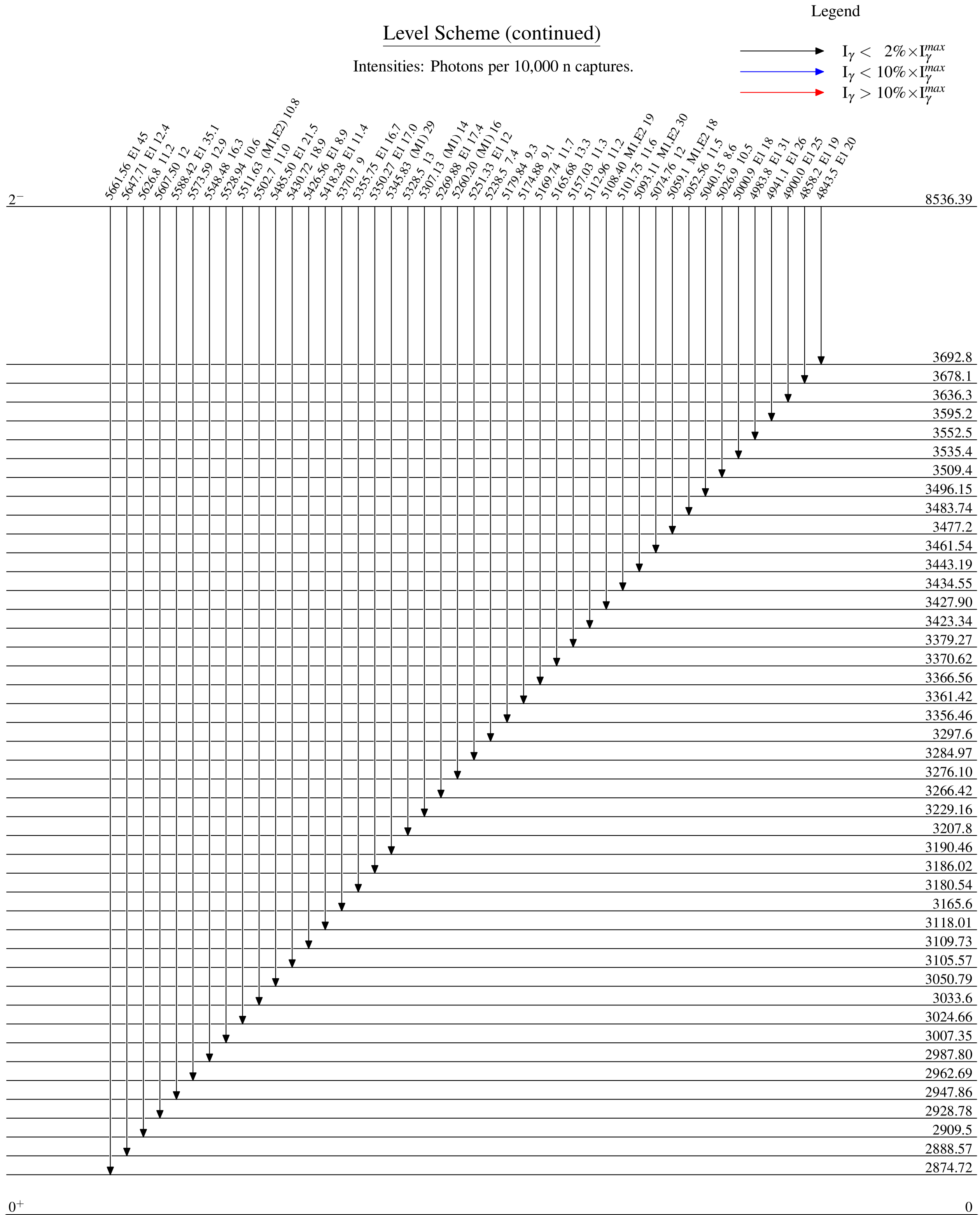


$^{156}_{64}Gd_{92}$

$^{155}Gd(n,\gamma)$ E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.



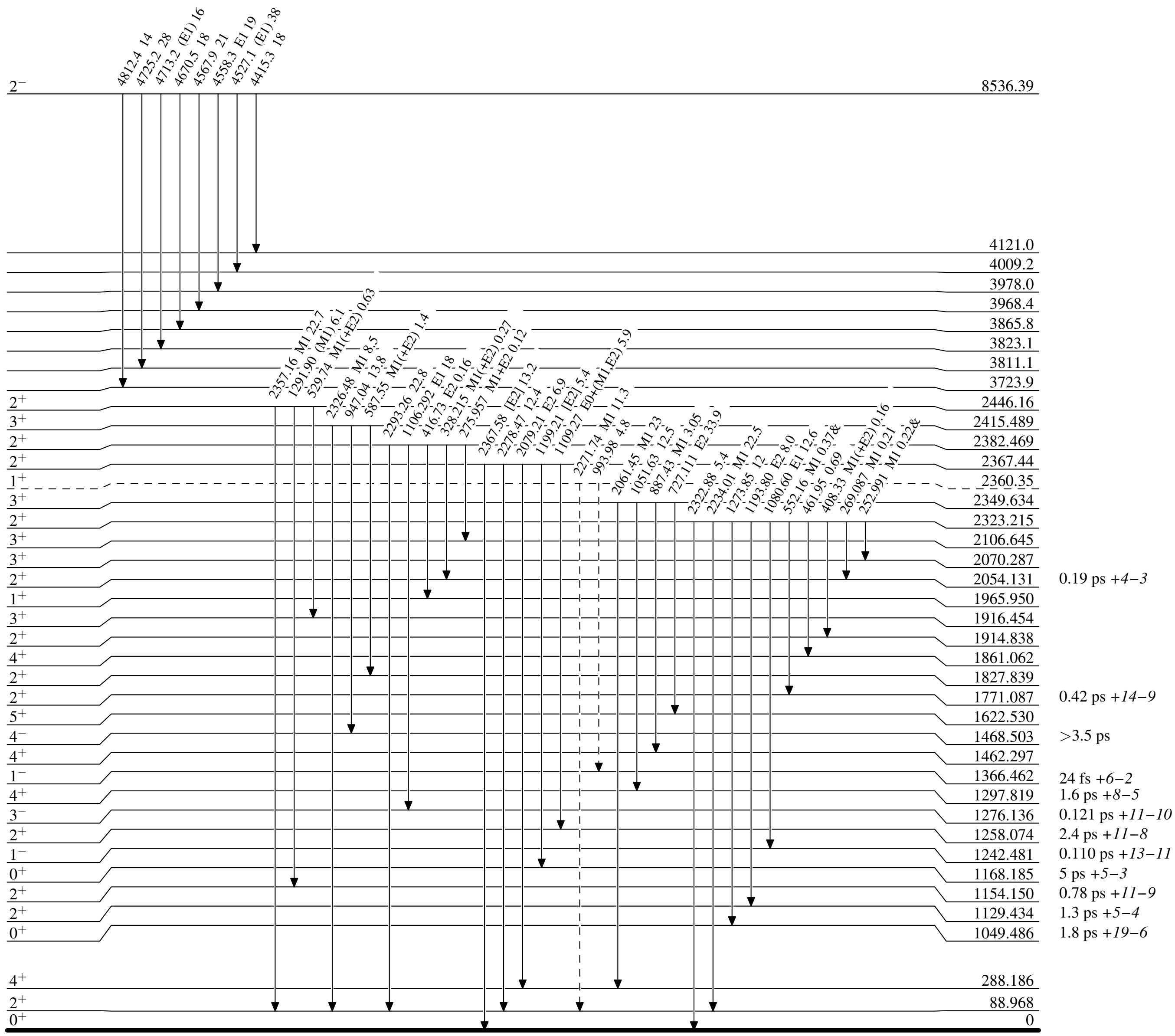
$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

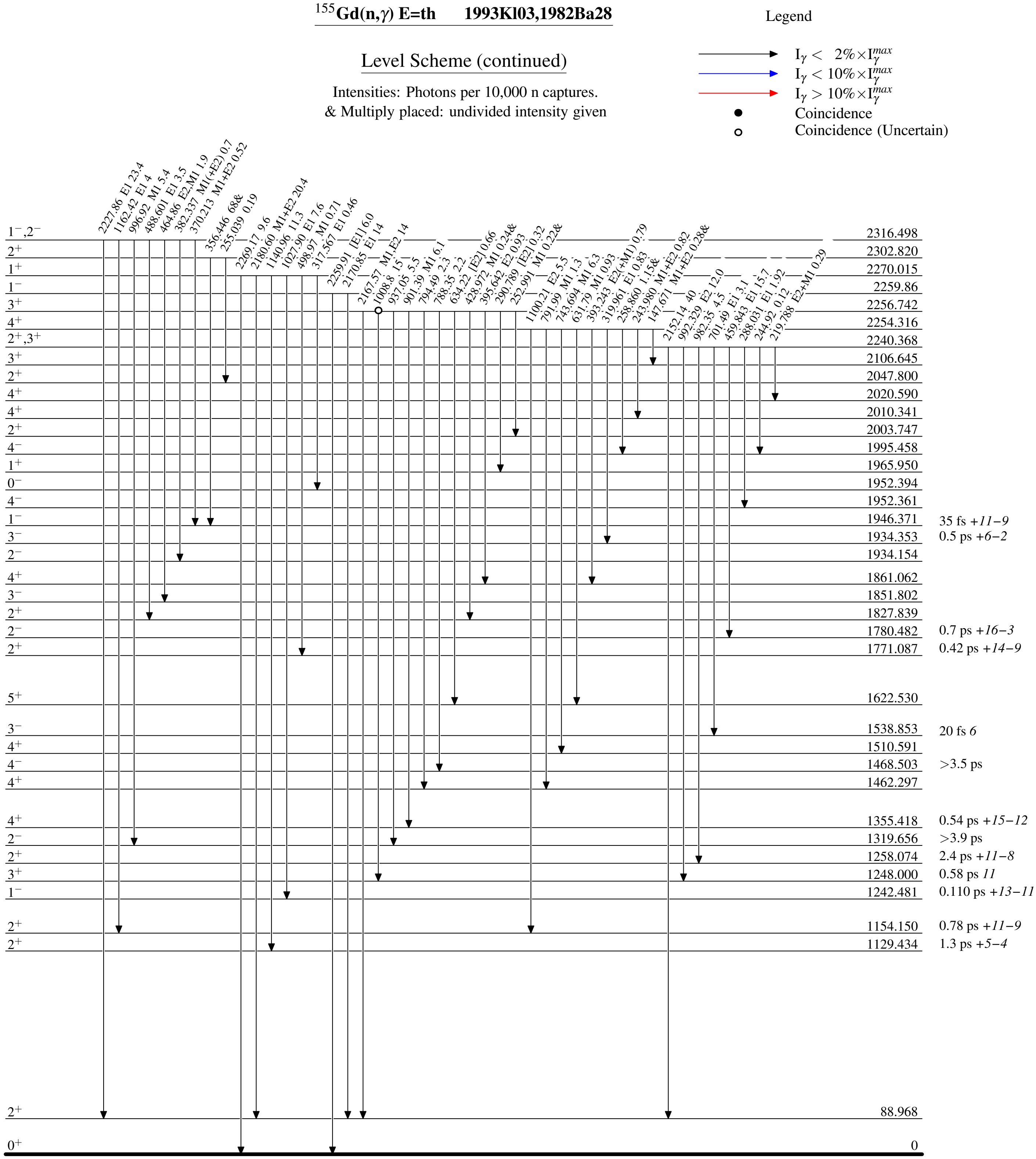


$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given

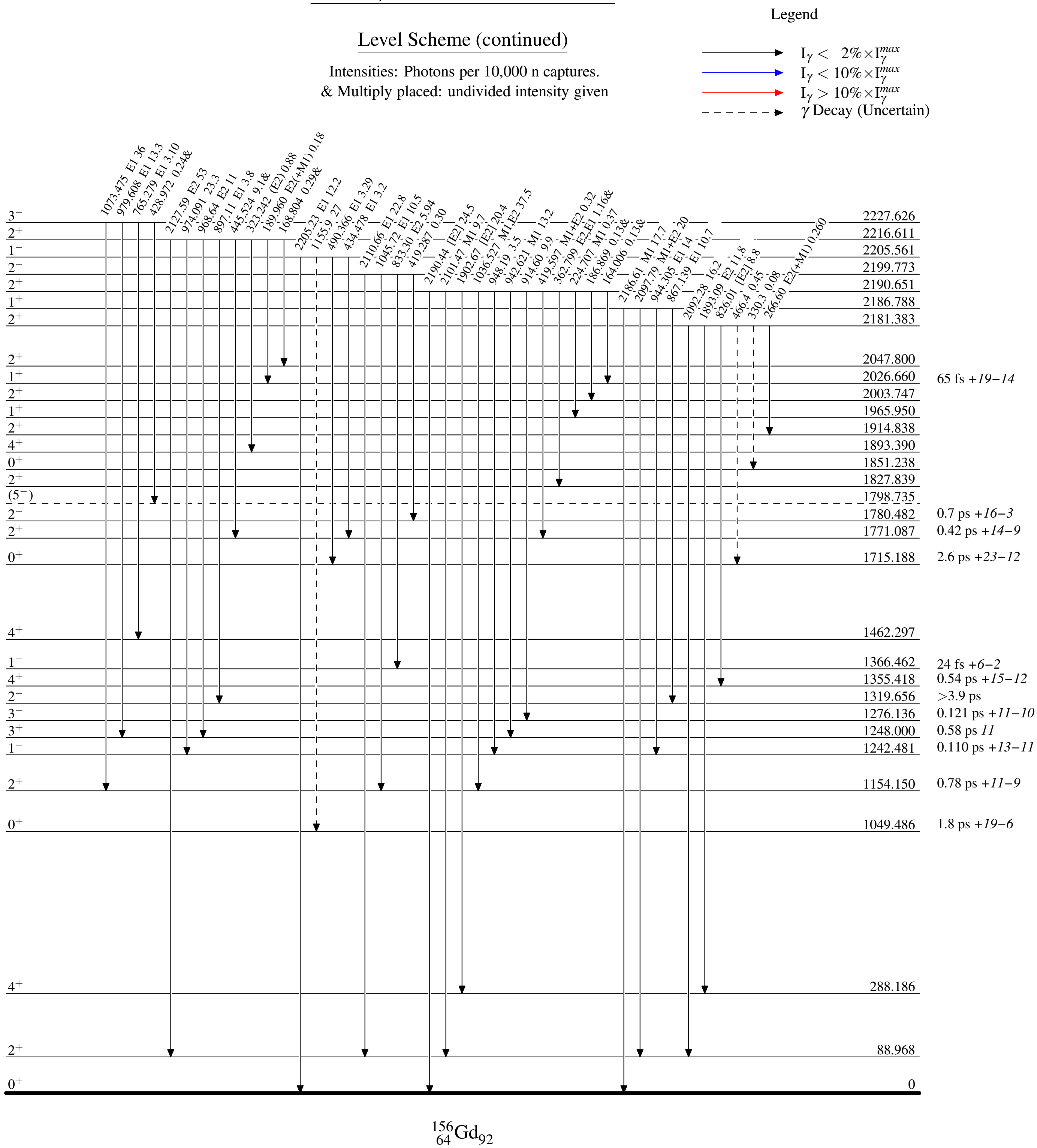


$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given

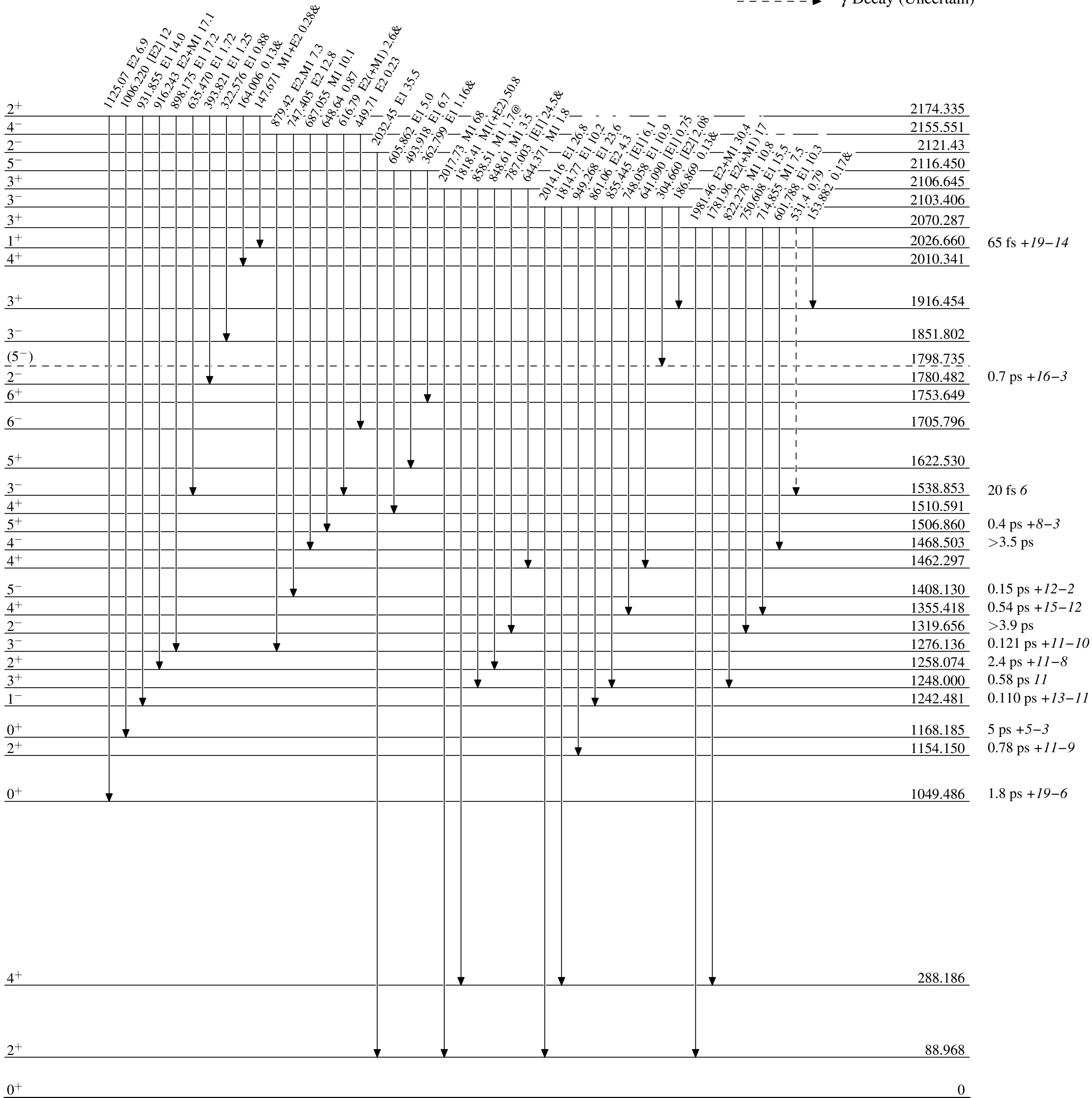


^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)

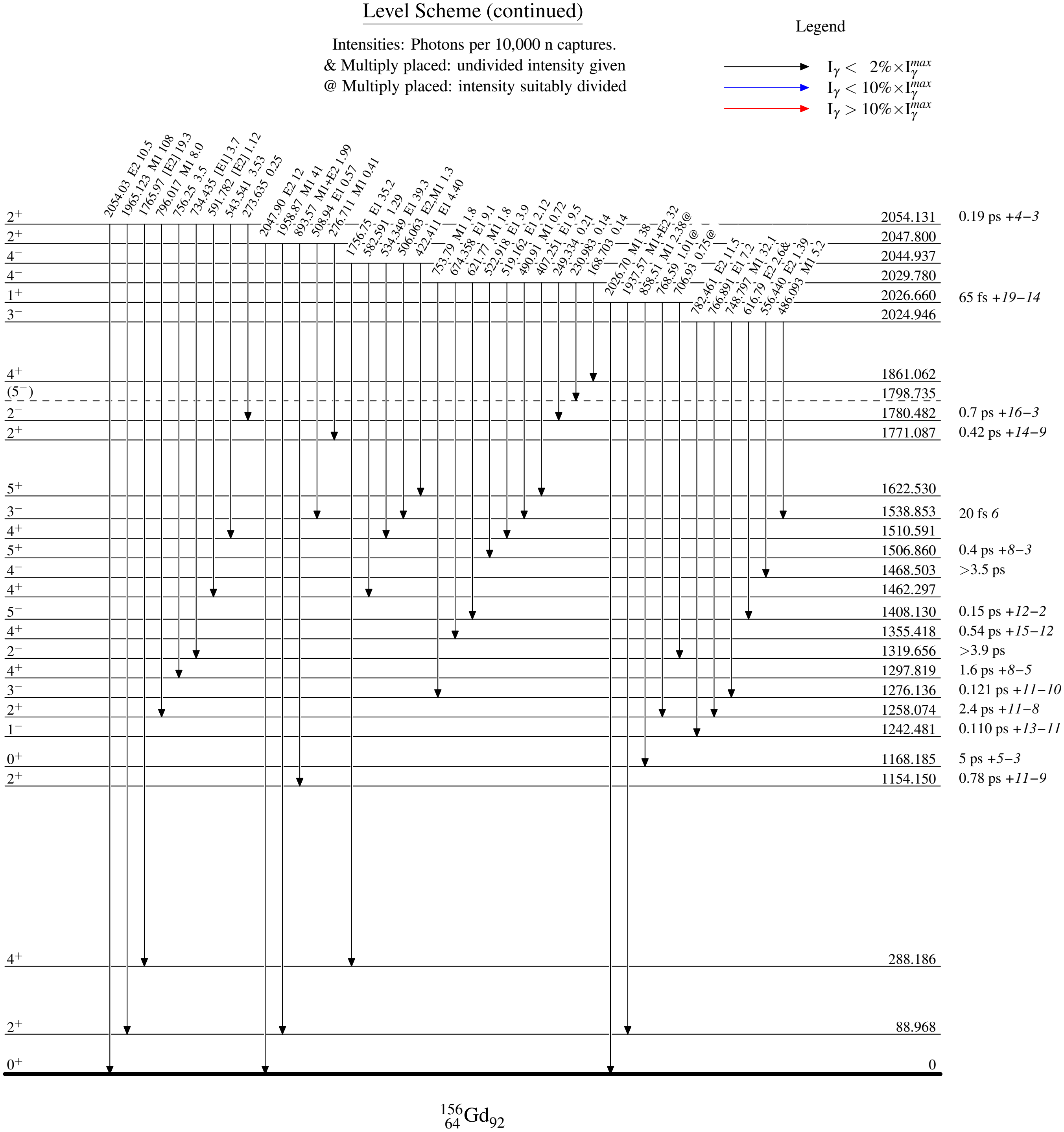


$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



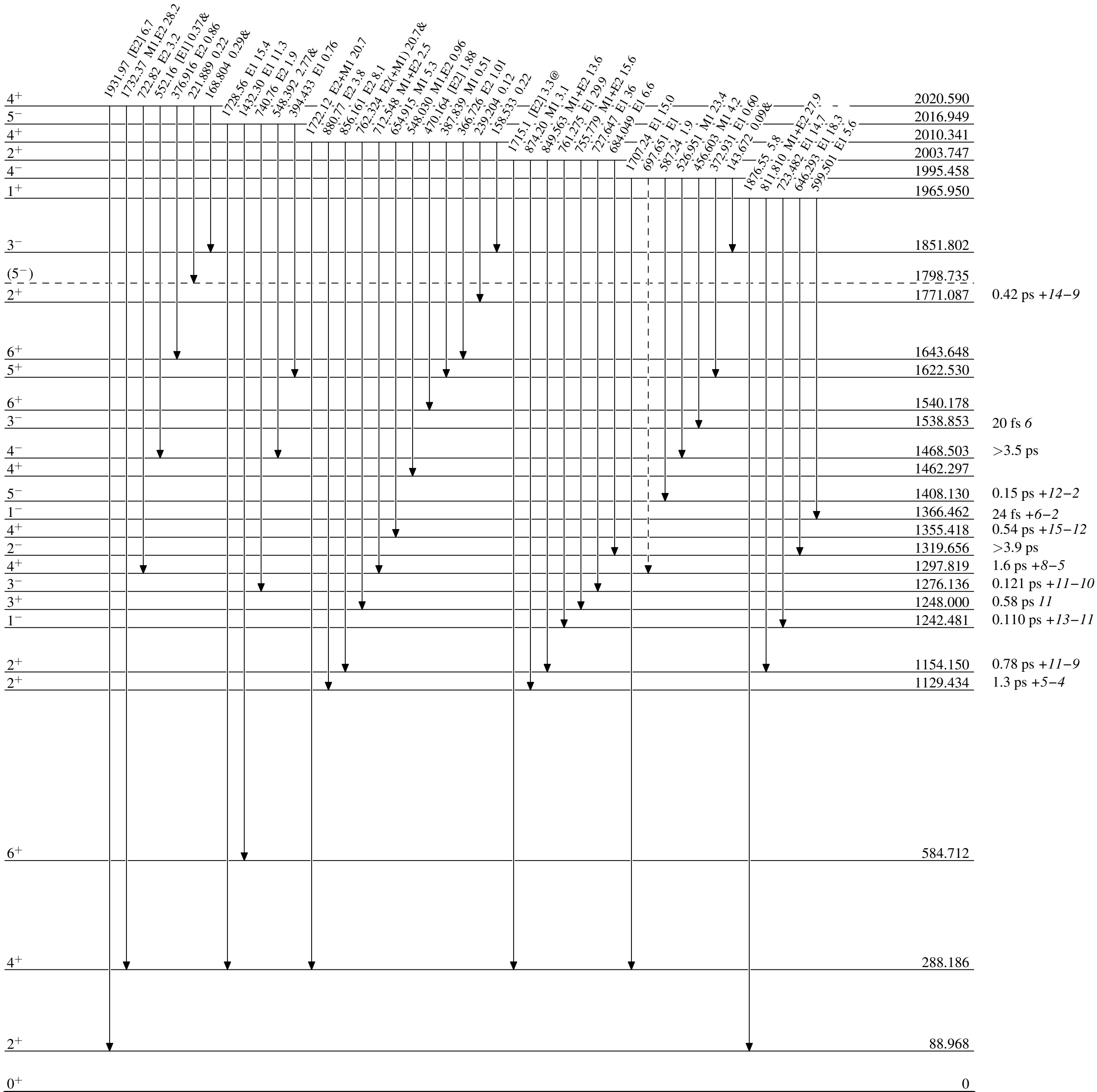
^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

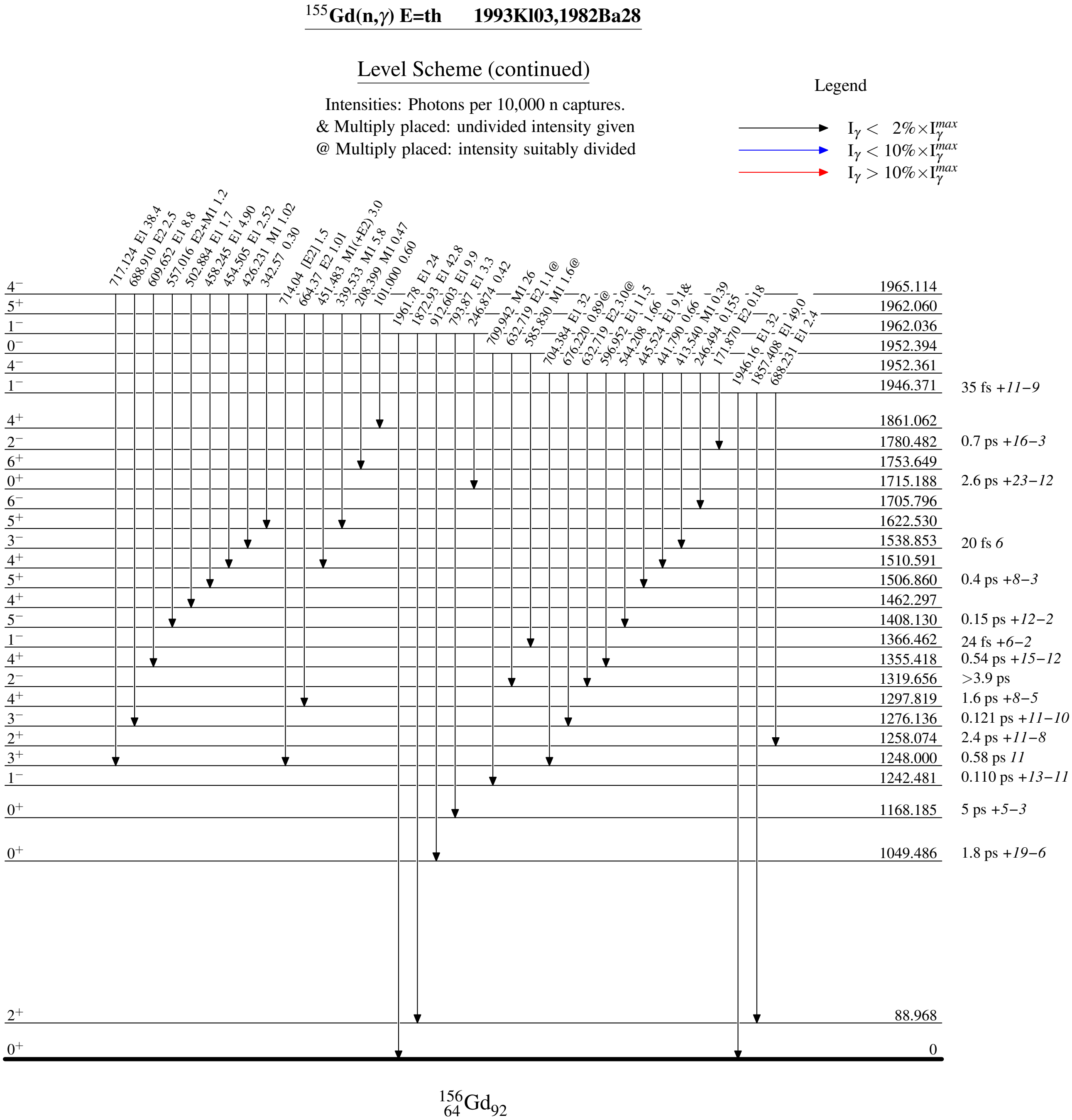
Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



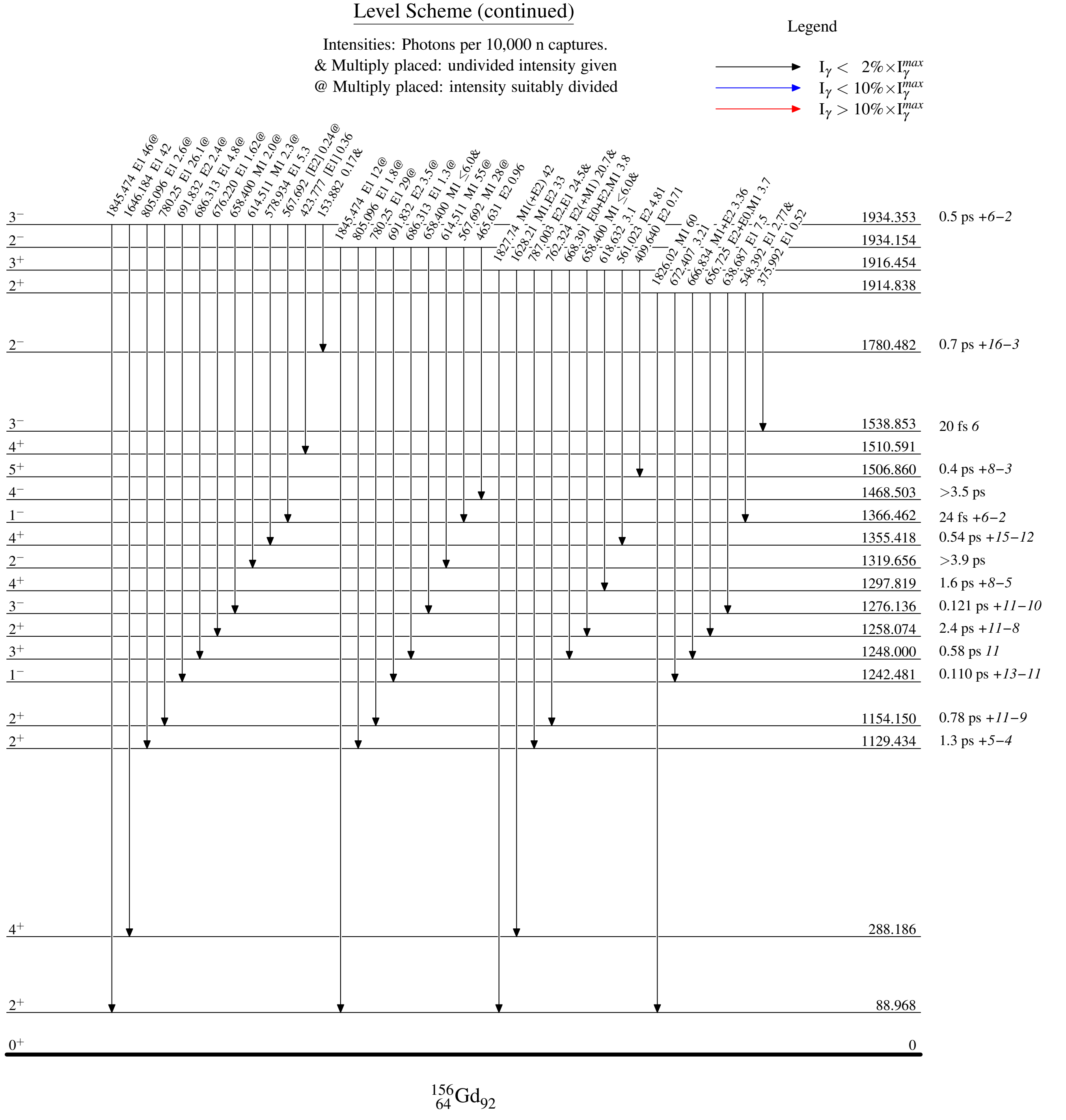
$^{156}_{64}Gd_{92}$


^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28
Level Scheme (continued)
Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided
Legend
Iγ < 2%×Iγmax
Iγ < 10%×Iγmax
Iγ > 10%×Iγmax
717.124 E1 38.4
688.910 E2 2.5
609.652 E1 8.8
557.016 E2+M1 1.2
502.884 E1 1.7
458.245 E1 4.90
454.505 E1 2.52
426.231 M1 1.02
342.57 0.30
714.04 [E2] 1.5
664.37 E2 1.01
451.483 M1(+E2) 3.0
339.533 M1 5.8
208.399 M1 0.47
101.000 0.60
1961.78 E1 24
1872.93 E1 42.8
912.603 E1 9.9
793.87 E1 3.3
246.874 0.42
709.942 M1 26
632.719 E2 1.1@
585.830 M1 1.6@
704.384 E1 32
676.220 0.89@
632.719 E2 3.0@
596.952 E1 11.5
544.208 1.66
445.524 E1 9.1&
441.790 0.66
413.540 M1 0.39
246.494 0.155
171.870 E2 0.18
1946.16 E1 32
1857.408 E1 49.0
688.231 E1 2.4
4− 1965.114
5+ 1962.060
1− 1962.036
0− 1952.394
4− 1952.361
1− 1946.371 35 fs +11−9
4+ 1861.062
2− 1780.482 0.7 ps +16−3
6+ 1753.649
0+ 1715.188 2.6 ps +23−12
6− 1705.796
5+ 1622.530
3− 1538.853 20 fs 6
4+ 1510.591
5+ 1506.860 0.4 ps +8−3
4+ 1462.297
5− 1408.130 0.15 ps +12−2
1− 1366.462 24 fs +6−2
4+ 1355.418 0.54 ps +15−12
2− 1319.656 >3.9 ps
4+ 1297.819 1.6 ps +8−5
3− 1276.136 0.121 ps +11−10
2+ 1258.074 2.4 ps +11−8
3+ 1248.000 0.58 ps 11
1− 1242.481 0.110 ps +13−11
0+ 1168.185 5 ps +5−3
0+ 1049.486 1.8 ps +19−6
2+ 88.968
0+ 0
$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

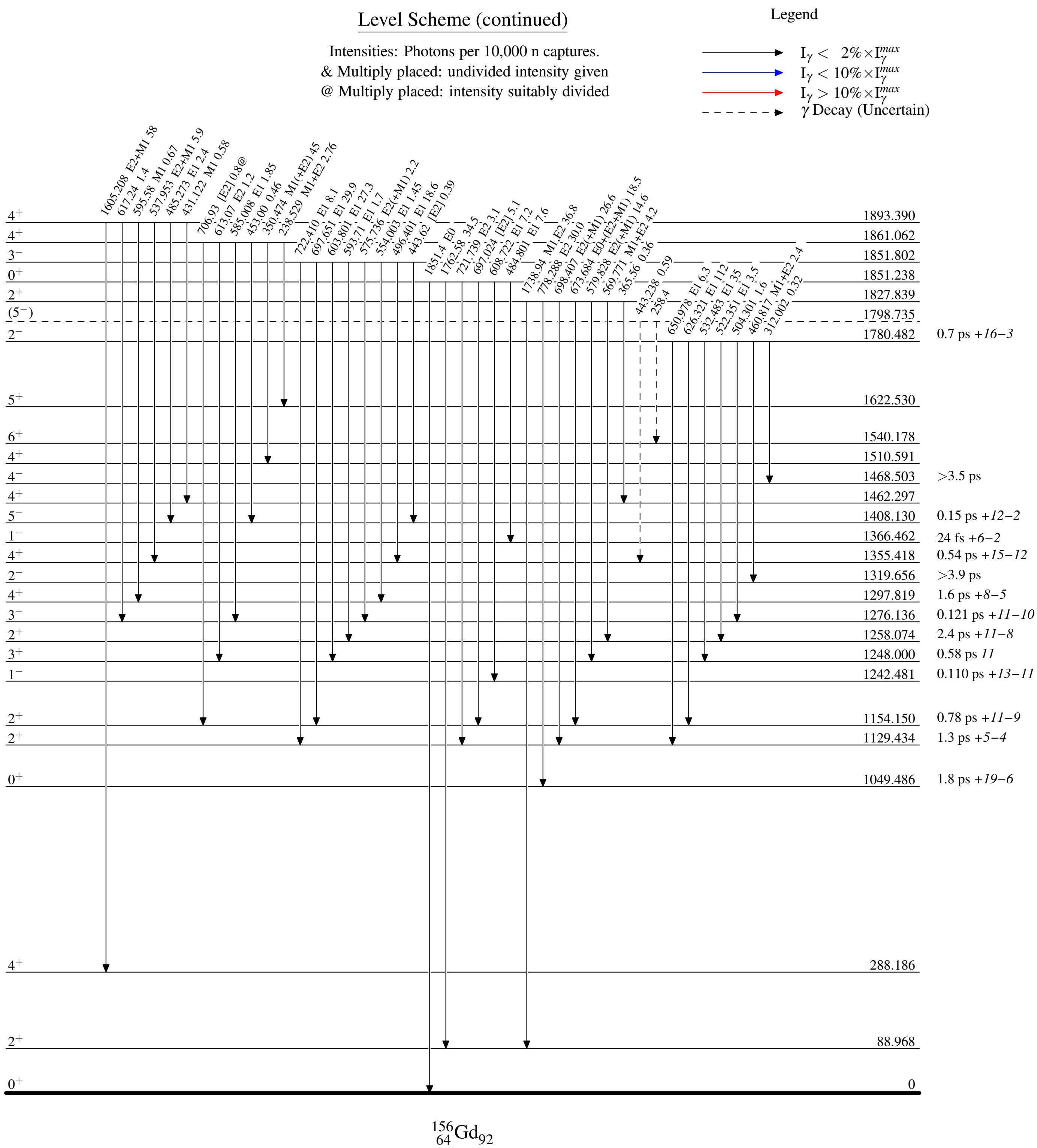
Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



$^{155}Gd(n,\gamma)$ E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

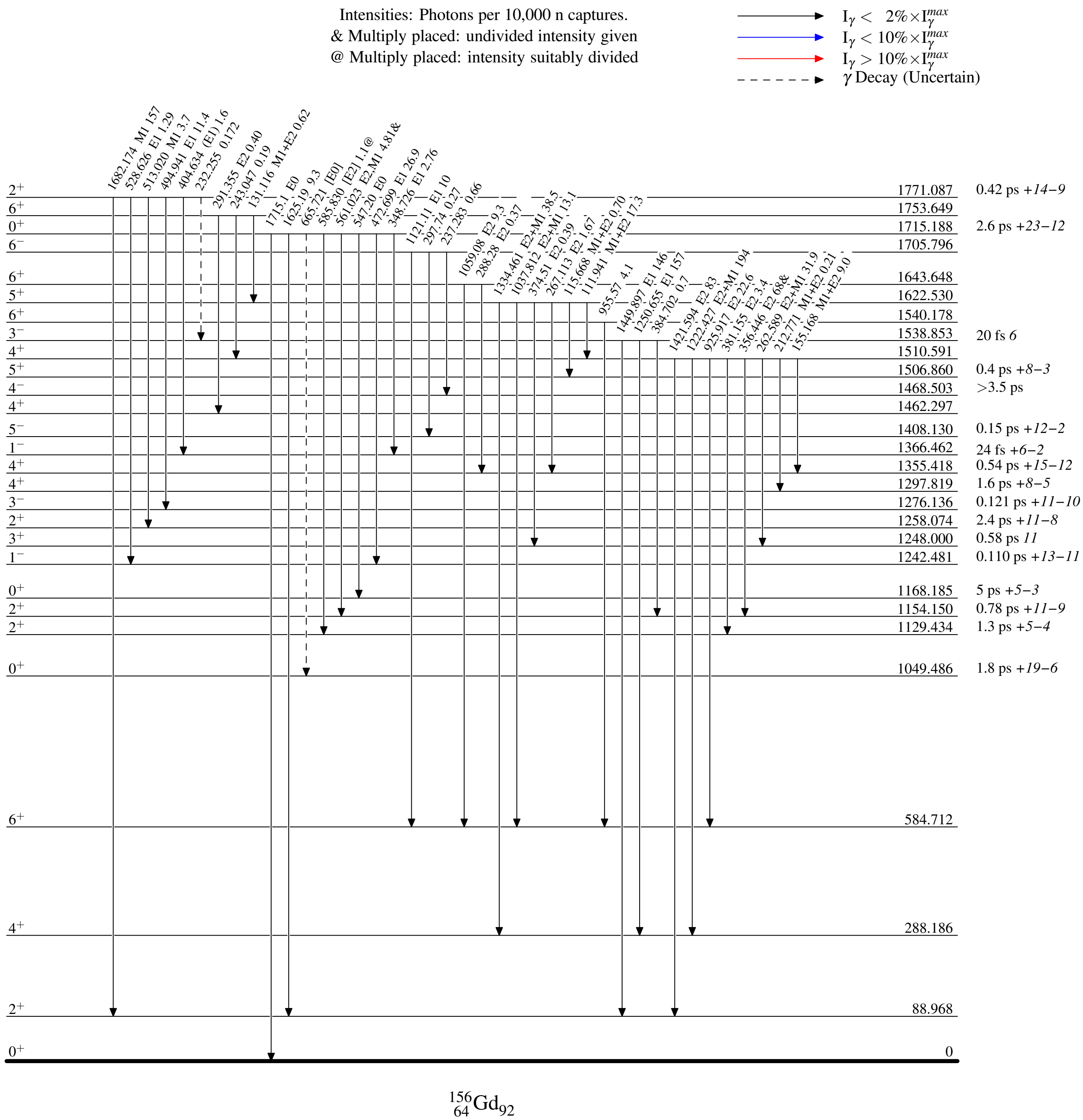


^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend



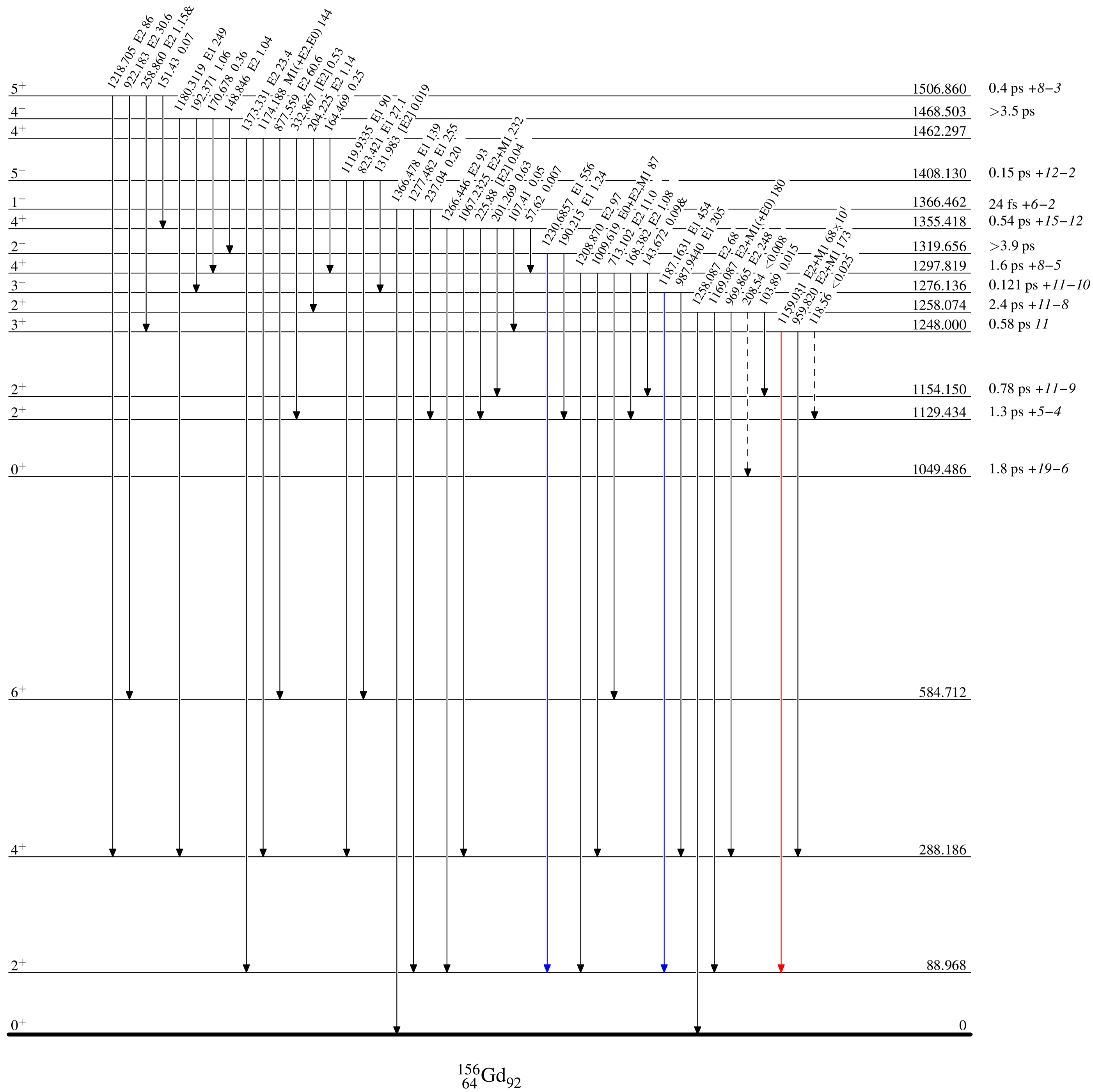
^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

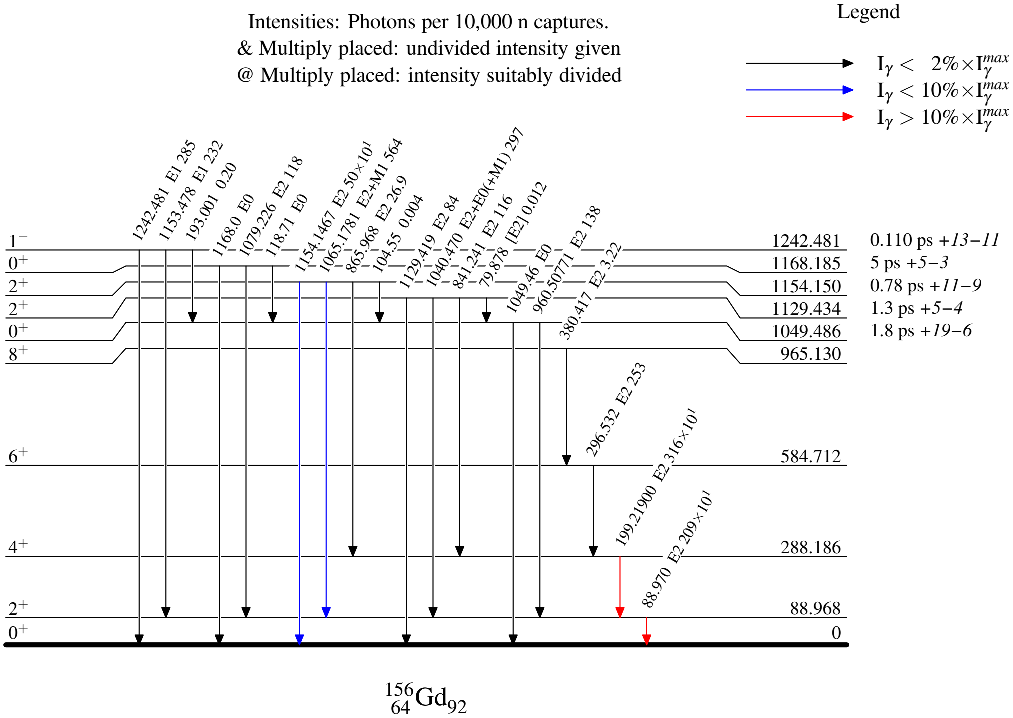
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



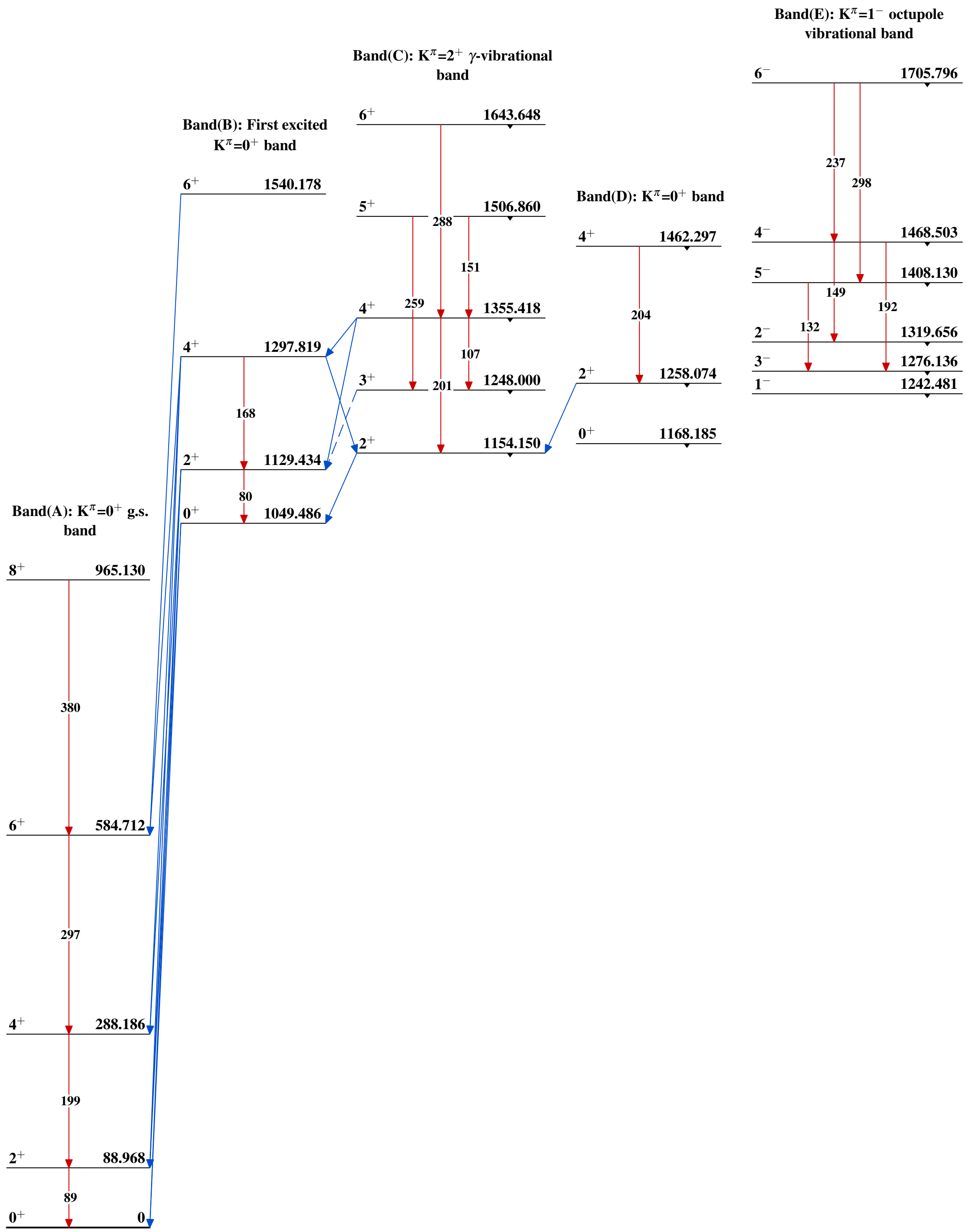
^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28

Level Scheme (continued)

Intensities: Photons per 10,000 n captures.
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

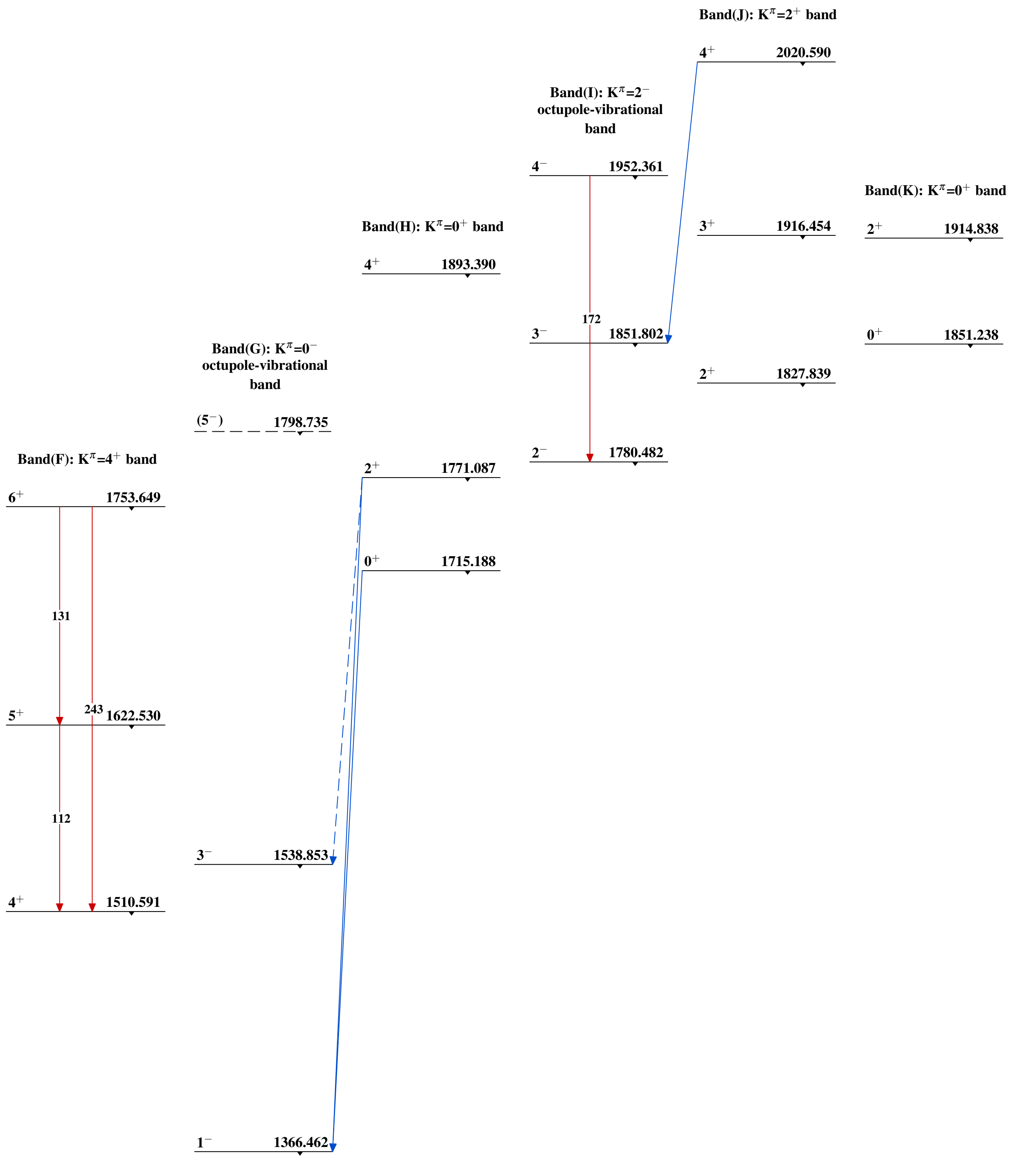


^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28



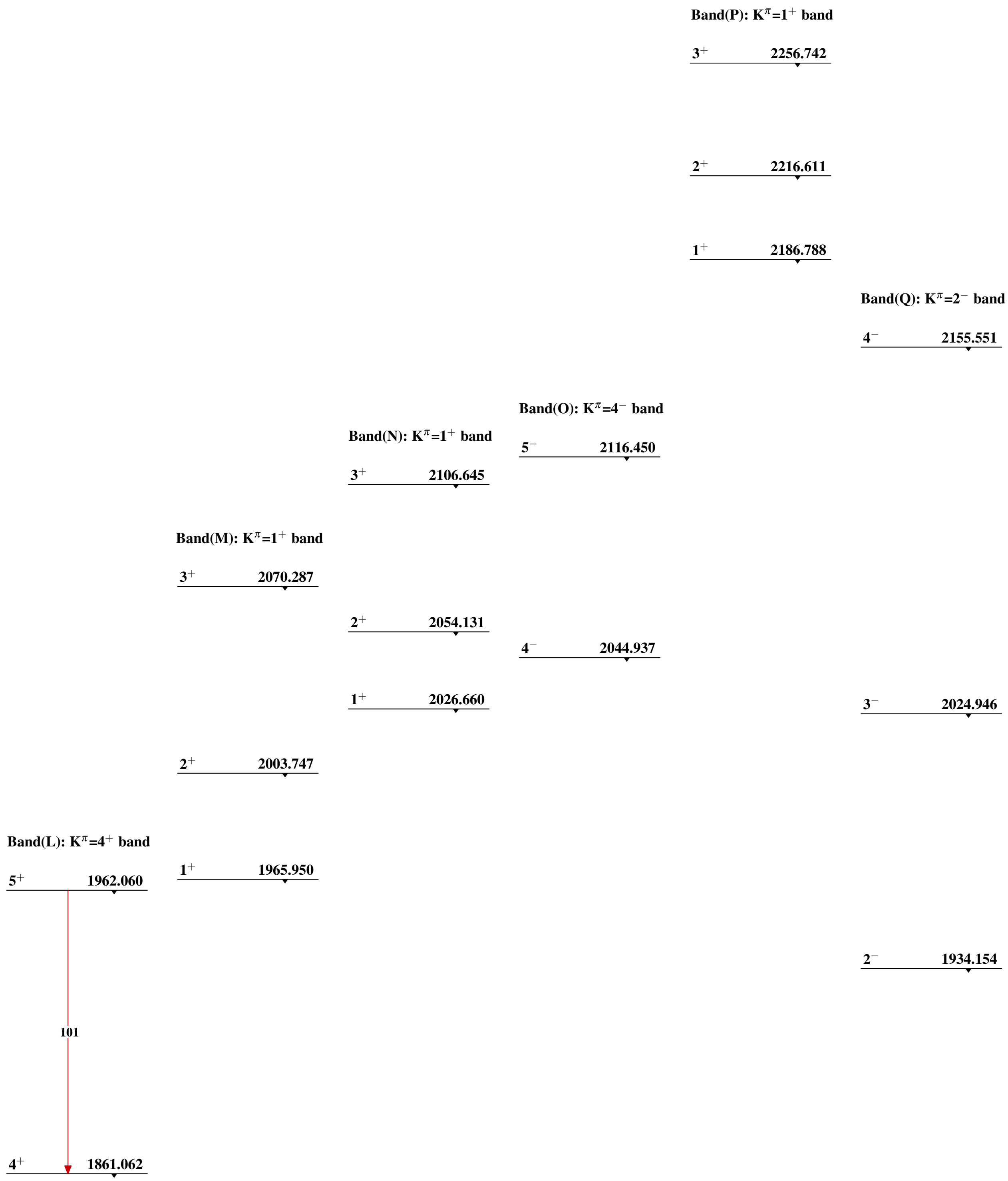
$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)



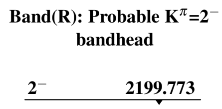
$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)



$^{156}_{64}Gd_{92}$

^{155}Gd(n,γ) E=th 1993Kl03,1982Ba28 (continued)



$^{156}_{64}Gd_{92}$