^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

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

Parent: ^{156}Ho: E=0; $J^{\pi}=4^{-}$; $T_{1/2}$=56 min *1*; Q(ε)=5.05×10^{3} *6*; %ε+%β^{+} decay=100.0

^{156}Ho-$T_{1/2}$: Additional information 1.

^{156}Ho-J^{π}: Additional information 2.

^{156}Ho-Q(ε): Additional information 3.

Additional information 4.

γ data are primarily from 2002Ca49. Electron data are primarily from 1976Gr20. Other studies include 1957Mi67, 1960Gr24, 1961Ba32, 1966GrZX, 1966La11, 1970ScZO, and 1975IwZY.

2008VaZU: (Many of the same authors as 2003KaZP and 1999KaZV.) ^{156}Ho isotopes produced from p-induced spallation of a W target followed by isotope separation using the YASNAPP-2 facility. Focus is on 0^{+} states in ^{160}Dy, but propose the existence of a 0^{+} state at 1377.8 keV in ^{156}Dy.

2003KaZP: (Many of the same authors as 2008VaZU and 1999KaZV.) ^{156}Ho isotopes produced from p-induced spallation of a W target followed by isotope separation using the YASNAPP-2 facility. Focus is on the decay of the 7.6-min, 9^{+} ^{156}Ho isomer, but propose the existence of a 0^{+} state at 1377.80 keV in ^{156}Dy.

2002Ca49: ^{156}Ho, from ^{156}Er ε decay. ^{156}Er produced via the ^{148}Sm(^{12}C,4n) reaction, E(^{12}C)=73 MeV. Enriched (96%) target. Recoil products collected on a movable tape and transported to a shielded detector area for study. γ radiation studies using 3 Compton-suppressed segmented YRAST Ball "clover" HPGE detectors and one LEPS detector. Measured Eγ, Iγ, γγ.

1976Gr20: ^{156}Ho from spallation with 660-MeV p on Ta target. Chemical and isotopic separation. Measured γ singles and γγ coin using Ge detectors, ce in magnetic spectrometer, and γβ+ coincidences.

1970Mo39: Measured half-life of 2^{+} level from 138−γ coincidences.

1966Ab02: ^{156}Ho from Dy(p,xn) reaction with E(p)=64 MeV and isotope separation. Half-life of 2^{+} level measured by 138−γ coincidences.

^{156}Dy Levels

Several levels reported by 1976Gr20 have not been confirmed by 2002Ca49. These include: 1219.21; 1293.33; 1518.82; 1529.44; 1801.43; 2006.63; 2169.08; 2216.83; 2476.42; 2514.06; 2637.83; 2661.2; 2803.05; 2933.51. Also, the data of 2002Ca49 do not support the existence of levels above 2982 keV. Previously proposed levels in this region include: 2992.31; 3071.76; 3161.64; 3177.36; 3308.9; 3404.72; 3430.14; 3444.92; 3501.7; 3646.53; 3675.0.

A number of levels not previously reported in ε decay have been proposed by 2002Ca49. These are included here but are not specifically pointed out.

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0[#]	0^{+}	stable	
137.77[#] *8*	2^{+}	0.84 ns *4*	$T_{1/2}$: Weighted average of 0.82 ns *5* (1966Ab02) and 0.90 ns *8* (1970Mo39), from ^{156}Ho ε decay.
404.19[#] *10*	4^{+}		
675.60[@] *14*	0^{+}		
770.40[#] *11*	6^{+}		
828.64[@] *11*	2^{+}		
890.50[&] *9*	2^{+}		
1022.08[&] *10*	3^{+}		
1088.28[@] *11*	4^{+}		
1168.47[&] *11*	4^{+}		
1215.61[#] *20*	8^{+}		
1335.56[&] *13*	5^{+}		
1368.36[a] *12*	3^{-}		

Continued on next page (footnotes at end of table)

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

^{156}Dy Levels (continued)

E(level)[†]	Jπ[‡]	Comments
1377.80?	(0+)	2003KaZP report this level but give no other information about it. 2008VaZU, with many of the same authors, also list it but also provide no information other than what is given here.
1382.31 *16*	2+	
1437.32[@] *13*	6+	
1476.10 *15*		
1514.94 *20*	2+	
1525.17[&] *19*	6+	
1526.28[a] *15*	5−	
1609.33 *16*	(3)−	
1624.64 *18*		
1627.42 *16*	(4)+	
1677.15 *15*	4+	
1679.9 *8*		
1728.8[&] *5*	7+	
1772.4 *10*	(3−)	
1794.55 *19*		
1809.82[a] *22*	7−	
1840.07 *13*	(4)+	
1857.84 *14*		
1878.6 *4*		
1898.49 *18*	6−	
1930.1 *5*	(3−)	
1933.60 *18*	+	
1942.9 *4*	+	
1949.99 *22*	(3−)	
2002.9 *3*		
2058.49 *20*		
2085.14 *23*		
2089.81 *22*	2+	
2103.38 *25*	(4+)	
2164.3 *5*		
2183.7 *5*		
2193.6 *3*		
2199.68 *19*		
2207.4 *4*		
2220.4 *4*		
2228.9 *5*		
2230.9 *4*		
2244.64 *14*		
2264.3 *5*		
2270.0 *4*		
2293.4 *4*		
2300.1 *4*		
2307.44 *12*	4+	
2323.58 *13*		
2331.7 *3*		
2342.68 *23*		
2372.1 *3*		
2385.7 *3*		
2408.45 *14*	2+,3,4+	
2419.1 *6*		
2433.84 *16*		
2439.16 *17*		
2445.17 *21*	3+,4+	
2489.5 *5*		

Continued on next page (footnotes at end of table)

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

^{156}Dy Levels (continued)

E(level)†	E(level)†	E(level)†	Jπ‡	E(level)†
2491.90 *18*	2642.50 *22*	2810.4 *7*		2895.0 *4*
2517.0 *4*	2653.3 *6*	2818.35 *12*	$4^+,5^-$	2981.5 *13*
2571.7 *5*	2757.8 *5*	2823.38 *15*		
2594.3 *3*	2788.1 *9*	2833.7 *4*		

† From least-squares fit to γ energies.
‡ From the ^{156}Dy Adopted Levels, Gammas data set.
# Band(A): $K^\pi=0^+$, g.s. band.
@ Band(B): First excited $K^\pi=0^+$ band.
& Band(C): $K^\pi=2^+$ γ-vibrational band. (See the comment on this conf assignment in the Adopted Levels data set.).
a Band(D): $K^\pi=0^-$ band.

ε,β^+ radiations

With a Q(ε) value of≈5 MeV and no levels reported above 3 MeV, it is likely that the decay scheme is incomplete. Thus, beta-transition intensities computed from I(γ+ce) balances may be unreliable, especially for the weaker branches. The evaluator has not listed beta-transition data for this decay scheme.

E(decay)†	E(level)
3600	770.40
≈4000	404.19

† From experimental Eβ+ (1976Gr20). 2002KaZR also report positron branches having end-point energies of 680 *10* and 1540 *30*, with relative intensities of 0.08 and 1, respectively.

γ(^{156}Dy)

Iγ normalization, I(γ+ce) normalization: computed to give 100% feeding to the ground state, with no direct ε feeding of the ground state. Such a transition would have ΔJ=4.

Iγ normalization: although the decay scheme appears to be incomplete [see note on the I(ε+β^+) values], the Iγ normalization value should be reasonably accurate, since the 4$^-$ parent will decay only to levels which will not decay with any appreciable intensity directly to the ground state.

Data on the unplaced γ′s are from 1976Gr20. 2002Ca49 do not show any unplaced γ′s.

A number of γ′s reported by 1976Gr20 originate from levels whose existence has not been confirmed by 2002Ca49. Those γ′s from levels below 2982 keV that have not been placed elsewhere in the level scheme are listed as unplaced without comment. γ′s from levels above this energy that may be placed elsewhere are indicated by appropriate comments.

The Eγ and Iγ values for the γ′s reported by 1976Gr20 and 2002Ca49 differ somewhat. Where the placement of a γ by these authors differs, the evaluator has adopted that of 2002Ca49 and has made an association of the γ from 1976Gr20 with that of 2002Ca49.

E_γ [†]	I_γ [†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	$I_{(\gamma+ce)}$ [cd]	Comments
61.7	<0.06	890.50	2$^+$	828.64	2$^+$	[M1,E2]	14 *5*	0.75	ce(K)/(γ+ce)=0.36 *15*; ce(L)/(γ+ce)=0.4 *4*; ce(M)/(γ+ce)=0.11 *9*; ce(N+)/(γ+ce)=0.026 *23* ce(N)/(γ+ce)=0.024 *21*; ce(O)/(γ+ce)=0.0028 *24*; ce(P)/(γ+ce)=2.2×10^{-5} *14* E$_\gamma$: From ce data (1976Gr20).
80.2	<0.3	1168.47	4$^+$	1088.28	4$^+$			0.6	E$_\gamma$: From ce data (1976Gr20).
131.7	<0.08	1022.08	3$^+$	890.50	2$^+$	[M1,E2]	1.04 *5*	1.0	ce(K)/(γ+ce)=0.36 *6*; ce(L)/(γ+ce)=0.12 *5*; ce(M)/(γ+ce)=0.028 *13*; ce(N+)/(γ+ce)=0.007 *4* ce(N)/(γ+ce)=0.006 *3*; ce(O)/(γ+ce)=0.0008 *4*; ce(P)/(γ+ce)=2.0×10^{-5} *9* E$_\gamma$: From ce data (1976Gr20).
137.80 *10*	100 *7*	137.77	2$^+$	0	0$^+$	E2	0.849		α(K)=0.473 *7*; α(L)=0.290 *5*; α(M)=0.0689 *10*; α(N+..)=0.01741 *25* α(N)=0.01549 *23*; α(O)=0.00190 *3*; α(P)=2.06×10^{-5} *3*
146.4	<0.2	1168.47	4$^+$	1022.08	3$^+$	[M1,E2]	0.75 *7*	0.2	ce(K)/(γ+ce)=0.31 *6*; ce(L)/(γ+ce)=0.09 *4*; ce(M)/(γ+ce)=0.021 *9*; ce(N+)/(γ+ce)=0.0055 *22* ce(N)/(γ+ce)=0.0049 *20*; ce(O)/(γ+ce)=0.00063 *21*; ce(P)/(γ+ce)=1.7×10^{-5} *8* E$_\gamma$: From ce data (1976Gr20).
152.8	<0.07	828.64	2$^+$	675.60	0$^+$	[E2]	0.591		α(K)=0.351 *5*; α(L)=0.185 *3*; α(M)=0.0438 *7*; α(N+..)=0.01111 *16* α(N)=0.00987 *14*; α(O)=0.001220 *17*; α(P)=1.570×10^{-5} *22* E$_\gamma$: From ce data (1976Gr20).
167.0	<0.3	1335.56	5$^+$	1168.47	4$^+$	[M1,E2]	0.50 *7*	1.0	I$_\gamma$: From Ice(K) and ce(K) for mult=E2, one computes Iγ≈0.2. ce(K)/(γ+ce)=0.25 *5*; ce(L)/(γ+ce)=0.065 *19*; ce(M)/(γ+ce)=0.015 *5*; ce(N+)/(γ+ce)=0.0039 *12* ce(N)/(γ+ce)=0.0034 *11*; ce(O)/(γ+ce)=0.00045 *11*; ce(P)/(γ+ce)=1.4×10^{-5} *6* E$_\gamma$: From ce data (1976Gr20).
190[#]	<0.2	1525.17	6$^+$	1335.56	5$^+$				

$^{156}_{66}$Dy$_{90}$-4

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

$\gamma(^{156}Dy)$ (continued)

E_γ †	I_γ †‡ d	E_i(level)	J_i^π	E_f	J_f^π	Mult. a	α b	Comments
259.59@ *15*	1.46 *13*	1088.28	4^+	828.64	2^+	[E2]	0.1012	α(K)=0.0735 *11*; α(L)=0.0215 *3*; α(M)=0.00498 *7*; α(N+..)=0.001279 *19* α(N)=0.001129 *16*; α(O)=0.0001464 *21*; α(P)=3.72×10^{-6} *6*
266.38 *10*	127 *6*	404.19	4^+	137.77	2^+	E2	0.0933	α(K)=0.0681 *10*; α(L)=0.0195 *3*; α(M)=0.00451 *7*; α(N+..)=0.001159 *17* α(N)=0.001023 *15*; α(O)=0.0001330 *19*; α(P)=3.47×10^{-6} *5*
271#	<0.16	1898.49	6^-	1627.42	$(4)^+$			
277.96 *18*	0.71 *7*	1168.47	4^+	890.50	2^+	E2	0.0816	α(K)=0.0602 *9*; α(L)=0.01661 *24*; α(M)=0.00384 *6*; α(N+..)=0.000988 *14* α(N)=0.000871 *13*; α(O)=0.0001137 *17*; α(P)=3.09×10^{-6} *5*
304.6e *7*	0.10 *3*	2408.45	2^+,3,4^+	2103.38	(4^+)			
313.4 *2*	0.66 *5*	1335.56	5^+	1022.08	3^+	E2	0.0565	α(K)=0.0427 *6*; α(L)=0.01071 *16*; α(M)=0.00246 *4*; α(N+..)=0.000636 *9* α(N)=0.000560 *8*; α(O)=7.39×10^{-5} *11*; α(P)=2.24×10^{-6} *4*
317.9 *2*	0.27 *4*	1088.28	4^+	770.40	6^+	E2	0.0541	α(K)=0.0410 *6*; α(L)=0.01018 *15*; α(M)=0.00234 *4*; α(N+..)=0.000604 *9* α(N)=0.000532 *8*; α(O)=7.03×10^{-5} *10*; α(P)=2.16×10^{-6} *3*
348.96 *14*	1.41 *7*	1437.32	6^+	1088.28	4^+	E2	0.0410	α(K)=0.0316 *5*; α(L)=0.00734 *11*; α(M)=0.001678 *24*; α(N+..)=0.000435 *7* α(N)=0.000382 *6*; α(O)=5.10×10^{-5} *8*; α(P)=1.688×10^{-6} *24*
356.3@ *3*	0.53 *5*	1525.17	6^+	1168.47	4^+			I_γ: γ peak is potentially a doublet, containing also the 357.0 γ from the 1526 level (2002Ca49).
357.0 *5*	<0.2	1526.28	5^-	1168.47	4^+			I_γ: γ peak is potentially a doublet, containing also the 356.3 γ from the 1525 level.
360.7e *12*	0.11 *4*	1382.31	2^+	1022.08	3^+			
366.22 *12*	27.9 *16*	770.40	6^+	404.19	4^+	E2	0.0356	α(K)=0.0276 *4*; α(L)=0.00622 *9*; α(M)=0.001420 *20*; α(N+..)=0.000368 *6* α(N)=0.000323 *5*; α(O)=4.34×10^{-5} *6*; α(P)=1.489×10^{-6} *21*
393.2 *6*	0.09 *4*	1728.8	7^+	1335.56	5^+			
397.9@ *2*	0.21 *5*	1168.47	4^+	770.40	6^+	[E2]	0.0281	α(K)=0.0221 *4*; α(L)=0.00471 *7*; α(M)=0.001072 *16*; α(N+..)=0.000279 *4* α(N)=0.000244 *4*; α(O)=3.30×10^{-5} *5*; α(P)=1.203×10^{-6} *17*
424.5 *2*	1.12 *6*	828.64	2^+	404.19	4^+	E2	0.0235	α(K)=0.0186 *3*; α(L)=0.00382 *6*; α(M)=0.000866 *13*; α(N+..)=0.000226 *4* α(N)=0.000198 *3*; α(O)=2.69×10^{-5} *4*; α(P)=1.021×10^{-6} *15*
437#	<0.13	1525.17	6^+	1088.28	4^+			I_γ: γ peak is potentially a doublet, containing also the 437.6 γ from the 1526 level (2002Ca49).
437.6e *6*	0.08 *6*	1526.28	5^-	1088.28	4^+			I_γ: γ Peak is potentially a doublet, containing also the 437 γ from the 1525 level (2002Ca49).
445.23@ *17*	0.37 *3*	1215.61	8^+	770.40	6^+			
456.2 *8*	0.09 *3*	1624.64		1168.47	4^+			
458.9 *4*	0.20 *6*	1627.42	$(4)^+$	1168.47	4^+			
486.4 *3*	0.50 *8*	890.50	2^+	404.19	4^+	[E2]	0.01629	α(K)=0.01308 *19*; α(L)=0.00250 *4*; α(M)=0.000563 *8*; α(N+..)=0.0001473 *21* α(N)=0.0001288 *19*; α(O)=1.77×10^{-5} *3*; α(P)=7.30×10^{-7} *11*
491.6 *3*	0.23 *6*	1382.31	2^+	890.50	2^+			
x524.0& *5*	0.11 *4*					(E2)	0.01343	α(K)=0.01086 *16*; α(L)=0.00200 *3*; α(M)=0.000450 *7*; α(N+..)=0.0001178 *17* α(N)=0.0001029 *15*; α(O)=1.426×10^{-5} *21*; α(P)=6.10×10^{-7} *9*
537.8 *2*	0.86 *12*	675.60	0^+	137.77	2^+	E2	0.01257	α(K)=0.01019 *15*; α(L)=0.00185 *3*; α(M)=0.000416 *6*; α(N+..)=0.0001092 *16* α(N)=9.53×10^{-5} *14*; α(O)=1.323×10^{-5} *19*; α(P)=5.74×10^{-7} *8*

$^{156}_{66}Dy_{90}$-5

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ [†]	I_γ [†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	$I_{(\gamma+ce)}$ [cd]	Comments
[x]548.4[&] 7	0.20 6					E2,M1	0.018 6		α(K)=0.015 5; α(L)=0.0023 6; α(M)=0.00050 11; α(N+..)=0.00013 3 α(N)=0.00012 3; α(O)=1.7×10^{-5} 5; α(P)=9.E−7 4
553.7 2	0.28 3	1382.31	2$^+$	828.64	2$^+$	M1	0.0229		α(K)=0.0194 3; α(L)=0.00274 4; α(M)=0.000599 9; α(N+..)=0.0001602 23 α(N)=0.0001386 20; α(O)=2.04×10^{-5} 3; α(P)=1.184×10^{-6} 17 Mult.: Assigned to a 554.03 γ by 1976Gr20, previously placed from a 3071.7 level. If this present association is correct, then J$^\pi$=2$^+$ uniquely for the 1382.3 level.
562.6 5	0.12 5	1898.49	6$^-$	1335.56	5$^+$				
565.07 17	1.15 6	1335.56	5$^+$	770.40	6$^+$	E2(+M1)	0.016 6		α(K)=0.014 5; α(L)=0.0021 5; α(M)=0.00046 11; α(N+..)=0.00012 3 α(N)=0.000107 25; α(O)=1.5×10^{-5} 4; α(P)=8.E−7 3 E$_\gamma$: Energy in table of 1976Gr20 (556.16) is apparently in error.
[x]582.6[&] 4	0.24 4					M1	0.0201		α(K)=0.01707 24; α(L)=0.00240 4; α(M)=0.000526 8; α(N+..)=0.0001406 20 α(N)=0.0001217 18; α(O)=1.79×10^{-5} 3; α(P)=1.040×10^{-6} 15
585.6 2	0.35 7	1476.10		890.50	2$^+$	E1	0.00364		α(K)=0.00310 5; α(L)=0.000422 6; α(M)=9.18×10^{-5} 13; α(N+..)=2.44×10^{-5} 4 α(N)=2.11×10^{-5} 3; α(O)=3.06×10^{-6} 5; α(P)=1.702×10^{-7} 24 Probably the same as the 586.2, E1, γ previously placed from a 2803 level (1976Gr20).
588.88 14	0.52 14	1677.15	4$^+$	1088.28	4$^+$				
594.9 6	0.047 13	1809.82	7$^-$	1215.61	8$^+$				
605.3 3	0.36 7	1627.42	(4)$^+$	1022.08	3$^+$	E2	0.00937		α(K)=0.00767 11; α(L)=0.001327 19; α(M)=0.000296 5; α(N+..)=7.80×10^{-5} 11 α(N)=6.80×10^{-5} 10; α(O)=9.52×10^{-6} 14; α(P)=4.35×10^{-7} 7
[x]608.2[&] 8	0.21 9					M1	0.0181		α(K)=0.01532 22; α(L)=0.00216 4; α(M)=0.000471 7; α(N+..)=0.0001260 19 α(N)=0.0001090 16; α(O)=1.602×10^{-5} 23; α(P)=9.33×10^{-7} 14
617.88 12	3.6 4	1022.08	3$^+$	404.19	4$^+$	E2	0.00891		α(K)=0.00730 11; α(L)=0.001254 18; α(M)=0.000280 4; α(N+..)=7.37×10^{-5} 11 α(N)=6.42×10^{-5} 9; α(O)=9.01×10^{-6} 13; α(P)=4.15×10^{-7} 6
620.1 8	0.10 3	2244.64		1624.64					
624.4 3	0.11 5	1514.94	2$^+$	890.50	2$^+$				
[x]638.2[&] 10	0.24 11								
654.9 4	0.33 9	1677.15	4$^+$	1022.08	3$^+$				
[x]663.3 4	0.29 7					E2	0.00753		α(K)=0.00620 9; α(L)=0.001036 15; α(M)=0.000231 4; α(N+..)=6.08×10^{-5} 9 α(N)=5.30×10^{-5} 8; α(O)=7.46×10^{-6} 11; α(P)=3.54×10^{-7} 5 Previously (1976Gr20) placed from a 3177 level whose existence is not confirmed.

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ[†]	I_γ[†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	$I_{(\gamma+ce)}$[cd]	Comments
666.88 *15*	1.92 *10*	1437.32	6^+	770.40	6^+	E0+E2	0.048		
671.2 *2*	0.18 *4*	1840.07	$(4)^+$	1168.47	4^+	M1+E2	0.011 *4*		α(K)=0.009 *3*; α(L)=0.0013 *4*; α(M)=0.00030 *8*; α(N+..)=7.9×10^{-5} *20* α(N)=6.8×10^{-5} *17*; α(O)=1.0×10^{-5} *3*; α(P)=5.4×10^{-7} *20*
675.8 *3*		675.60	0^+	0	0^+	E0		0.02	I_γ: Measured Iγ is <0.05 (1976Gr20). Transition is E0.
680.6 *5*	<0.10	2307.44	4^+	1627.42	$(4)^+$	E2+M1	0.010 *4*		α(K)=0.009 *3*; α(L)=0.0013 *4*; α(M)=0.00028 *7*; α(N+..)=7.6×10^{-5} *19* α(N)=6.6×10^{-5} *17*; α(O)=1.0×10^{-5} *3*; α(P)=5.2×10^{-7} *19* I_γ: 1976Gr20 report Iγ=0.48 *10*. Mult.: From 1976Gr20.
684.10 *10*	13.3 *9*	1088.28	4^+	404.19	4^+	E0+E2	0.035		
688.9[e] *5*	0.15 *9*	1857.84		1168.47	4^+				
690.86 *13*	10.4 *5*	828.64	2^+	137.77	2^+	E0+E2	0.031		
706.74 *16*	0.14 *2*	1382.31	2^+	675.60	0^+				
[x]715.1 *4*	0.24 *4*					M1	0.01206		α(K)=0.01023 *15*; α(L)=0.001431 *21*; α(M)=0.000313 *5*; α(N+..)=8.36×10^{-5} *12* α(N)=7.24×10^{-5} *11*; α(O)=1.064×10^{-5} *15*; α(P)=6.21×10^{-7} *9*
722.3 *7*	0.13 *4*	2058.49		1335.56	5^+				
723.5 *4*	0.14 *4*	2199.68		1476.10					
752.67 *15*	3.3 *3*	890.50	2^+	137.77	2^+	E2+E0(+M1)	0.0085		
754.9[@] *2*	1.75 *11*	1525.17	6^+	770.40	6^+				I_γ: γ peak is potentially a doublet, containing also the 755 γ from the 1526 level (2002Ca49). Mult.: Previously, a 755.4 γ was assigned mult=E0+E2. However, the possibility of this peak being a doublet casts doubt on this mult.
755[#]	<0.6	1526.28	5^-	770.40	6^+				I_γ: γ peak is potentially a doublet, including also the 754.9 γ from the 1525 level (2002Ca49). Mult.: Previously assigned as E1. See the comment on the mult of the 754.9 G.
764.12 *13*	9.0 *5*	1168.47	4^+	404.19	4^+	E0+E2,M1	0.0095		
767.8 *4*	0.16 *4*	2103.38	(4^+)	1335.56	5^+				
786.1[e] *5*	0.10 *3*	1677.15	4^+	890.50	2^+				
796.03 *15*	0.98 *6*	1624.64		828.64	2^+				
818.1 *2*	0.26 *6*	1840.07	$(4)^+$	1022.08	3^+	M1	0.00865		α(K)=0.00735 *11*; α(L)=0.001023 *15*; α(M)=0.000223 *4*; α(N+..)=5.97×10^{-5} *9* α(N)=5.17×10^{-5} *8*; α(O)=7.60×10^{-6} *11*; α(P)=4.45×10^{-7} *7*
818.7[e] *4*	0.19 *5*	2445.17	$3^+,4^+$	1627.42	$(4)^+$				
820.9[e] *6*	0.08 *2*	2445.17	$3^+,4^+$	1624.64					
(828.7[#])	<0.4	828.64	2^+	0	0^+	[E2]	0.00454		α(K)=0.00379 *6*; α(L)=0.000590 *9*; α(M)=0.0001304 *19*; α(N+..)=3.45×10^{-5} *5* α(N)=3.00×10^{-5} *5*; α(O)=4.28×10^{-6} *6*; α(P)=2.18×10^{-7} *3*
839.3 *2*	0.20 *2*	1514.94	2^+	675.60	0^+				

$^{156}_{66}Dy_{90}$-7

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ[†]	I_γ[†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	Comments
845.3 *3*	0.11 *2*	1933.60	$^+$	1088.28	4^+			
848.2 *5*	0.12 *5*	1677.15	4^+	828.64	2^+			
851.0[e] *12*	0.07 *4*	1679.9		828.64	2^+			
854.6 *3*	0.34 *5*	1942.9	$^+$	1088.28	4^+	E2	0.00425	α(K)=0.00355 *5*; α(L)=0.000548 *8*; α(M)=0.0001210 *17*; α(N+..)=3.20×10^{-5} *5* α(N)=2.78×10^{-5} *4*; α(O)=3.98×10^{-6} *6*; α(P)=2.04×10^{-7} *3*
858.0 *3*	0.34 *5*	2193.6		1335.56	5^+	M1	0.00770	α(K)=0.00654 *10*; α(L)=0.000909 *13*; α(M)=0.000199 *3*; α(N+..)=5.31×10^{-5} *8* α(N)=4.59×10^{-5} *7*; α(O)=6.76×10^{-6} *10*; α(P)=3.96×10^{-7} *6*
863.3 *10*	0.10 *4*	2199.68		1335.56	5^+			
871.6 *5*	0.18 *5*	2207.4		1335.56	5^+			
[x]880.5 *3*	0.66 *8*					M1	0.00723	α(K)=0.00614 *9*; α(L)=0.000853 *12*; α(M)=0.000186 *3*; α(N+..)=4.98×10^{-5} *7* α(N)=4.31×10^{-5} *6*; α(O)=6.34×10^{-6} *9*; α(P)=3.71×10^{-7} *6* Previously placed from a 2408 level, but 2002Ca49 do not place it there.
884.30 *10*	16.4 *16*	1022.08	3^+	137.77	2^+	E2	0.00394	α(K)=0.00330 *5*; α(L)=0.000505 *7*; α(M)=0.0001114 *16*; α(N+..)=2.95×10^{-5} *5* α(N)=2.56×10^{-5} *4*; α(O)=3.67×10^{-6} *6*; α(P)=1.90×10^{-7} *3*
884.3 *8*	0.11 *5*	2818.35	4^+,5^-	1933.60	$^+$			
890.2 *4*	0.27 *10*	2058.49		1168.47	4^+			
890.44 *12*	5.9 *9*	890.50	2^+	0	0^+	E2	0.00389	α(K)=0.00325 *5*; α(L)=0.000497 *7*; α(M)=0.0001096 *16*; α(N+..)=2.90×10^{-5} *4* α(N)=2.52×10^{-5} *4*; α(O)=3.61×10^{-6} *5*; α(P)=1.87×10^{-7} *3*
907[#]	<0.10	2517.0		1609.33	$(3)^-$			I_γ: 1976Gr20 report Iγ=0.29 *5* for this γ, but 2002Ca49 place most of this from the 1677 level.
907.2 *4*	0.14 *5*	1677.15	4^+	770.40	6^+	E2	0.00373	α(K)=0.00313 *5*; α(L)=0.000476 *7*; α(M)=0.0001049 *15*; α(N+..)=2.78×10^{-5} *4* α(N)=2.41×10^{-5} *4*; α(O)=3.46×10^{-6} *5*; α(P)=1.80×10^{-7} *3*
908.0[e] *10*	0.19 *6*	2433.84		1526.28	5^-			
911.5 *6*	0.15 *4*	1933.60	$^+$	1022.08	3^+	E2	0.00370	α(K)=0.00310 *5*; α(L)=0.000470 *7*; α(M)=0.0001037 *15*; α(N+..)=2.75×10^{-5} *4* α(N)=2.39×10^{-5} *4*; α(O)=3.42×10^{-6} *5*; α(P)=1.78×10^{-7} *3*
914.6 *3*	0.14 *5*	2002.9		1088.28	4^+			
919.7 *15*	0.13 *5*	2818.35	4^+,5^-	1898.49	6^-			
921.2 *3*	0.26 *6*	2089.81	2^+	1168.47	4^+	[E2]	0.00361	α(K)=0.00303 *5*; α(L)=0.000459 *7*; α(M)=0.0001012 *15*; α(N+..)=2.68×10^{-5} *4* α(N)=2.33×10^{-5} *4*; α(O)=3.34×10^{-6} *5*; α(P)=1.745×10^{-7} *25* Mult.: The ce data indicate mult=M1, but the placement requires E2.
931.35 *16*	7.2 *4*	1335.56	5^+	404.19	4^+	E2	0.00353	α(K)=0.00296 *5*; α(L)=0.000447 *7*; α(M)=9.86×10^{-5} *14*; α(N+..)=2.61×10^{-5} *4* α(N)=2.27×10^{-5} *4*; α(O)=3.26×10^{-6} *5*; α(P)=1.706×10^{-7} *24*
935.0 *4*	0.19 *6*	2103.38	(4^+)	1168.47	4^+			
939.2 *1*	0.17 *6*	2307.44	4^+	1368.36	3^-			
944.3 *4*	0.15 *3*	2571.7		1627.42	$(4)^+$			
949.60 *16*	0.71 *5*	1840.07	$(4)^+$	890.50	2^+			
950.5 *2*	1.2 *2*	1088.28	4^+	137.77	2^+	E2	0.00338	α(K)=0.00284 *4*; α(L)=0.000427 *6*; α(M)=9.40×10^{-5} *14*; α(N+..)=2.49×10^{-5} *4* α(N)=2.16×10^{-5} *3*; α(O)=3.11×10^{-6} *5*; α(P)=1.636×10^{-7} *23*
955.4 *4*	0.19 *4*	2323.58		1368.36	3^-			
958.3 *8*	0.22 *7*	1728.8	7^+	770.40	6^+			
960.6 *3*	0.69 *7*	2818.35	4^+,5^-	1857.84		E1	0.00135	α(K)=0.001150 *17*; α(L)=0.0001529 *22*; α(M)=3.32×10^{-5} *5*; α(N+..)=8.84×10^{-6}

$^{156}_{66}Dy_{90}$-8

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ[†]	I_γ[†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	Comments
								13 α(N)=7.65×10^{-6} *11*; α(O)=1.118×10^{-6} *16*; α(P)=6.41×10^{-8} *9*
964.36 *18*	1.51 *12*	1368.36	3$^-$	404.19	4$^+$	E1	0.00134	α(K)=0.001142 *16*; α(L)=0.0001518 *22*; α(M)=3.29×10^{-5} *5*; α(N+..)=8.77×10^{-6} *13* α(N)=7.60×10^{-6} *11*; α(O)=1.109×10^{-6} *16*; α(P)=6.37×10^{-8} *9*
965.3 *8*	0.10 *5*	2823.38		1857.84				
[x]968.2 *7*	0.23 *7*					E2	0.00326	α(K)=0.00273 *4*; α(L)=0.000409 *6*; α(M)=9.01×10^{-5} *13*; α(N+..)=2.39×10^{-5} *4* α(N)=2.07×10^{-5} *3*; α(O)=2.98×10^{-6} *5*; α(P)=1.575×10^{-7} *23* Previously placed from a 3444 level whose existence is not confirmed.
970.4[e] *18*	0.06 *4*	2058.49		1088.28	4$^+$			
[x]980.1 *6*	0.23 *6*							
988.7[e] *5*	0.14 *3*	1878.6		890.50	2$^+$	E2	0.00312	α(K)=0.00262 *4*; α(L)=0.000390 *6*; α(M)=8.59×10^{-5} *12*; α(N+..)=2.28×10^{-5} *4* α(N)=1.98×10^{-5} *3*; α(O)=2.85×10^{-6} *4*; α(P)=1.509×10^{-7} *22*
996.1 *4*	0.14 *5*	2331.7		1335.56	5$^+$			
1001.7 *3*	0.43 *6*	2089.81	2$^+$	1088.28	4$^+$	[E2]	0.00303	α(K)=0.00255 *4*; α(L)=0.000379 *6*; α(M)=8.33×10^{-5} *12*; α(N+..)=2.21×10^{-5} *3* α(N)=1.92×10^{-5} *3*; α(O)=2.76×10^{-6} *4*; α(P)=1.470×10^{-7} *21* Mult.: The ce data indicate mult=E1, but the placement requires E2.
1011.7 *2*	0.10 *3*	1840.07	(4)$^+$	828.64	2$^+$			
1024.6 *6*	0.12 *5*	1794.55		770.40	6$^+$			
1030.7 *2*	7.7 *4*	1168.47	4$^+$	137.77	2$^+$	E2	0.00286	α(K)=0.00240 *4*; α(L)=0.000355 *5*; α(M)=7.81×10^{-5} *11*; α(N+..)=2.07×10^{-5} *3* α(N)=1.80×10^{-5} *3*; α(O)=2.59×10^{-6} *4*; α(P)=1.387×10^{-7} *20*
1031.8 *8*	0.11 *3*	2199.68		1168.47	4$^+$			
1033.2 *3*	0.65 *13*	1437.32	6$^+$	404.19	4$^+$			
1036.4 *2*	0.32 *6*	2058.49		1022.08	3$^+$			
1039.3 *2*	0.33 *5*	1809.82	7$^-$	770.40	6$^+$	[E1]	0.00116	α(K)=0.000994 *14*; α(L)=0.0001317 *19*; α(M)=2.86×10^{-5} *4*; α(N+..)=7.61×10^{-6} *11* α(N)=6.59×10^{-6} *10*; α(O)=9.63×10^{-7} *14*; α(P)=5.55×10^{-8} *8* Mult.: Mult=M1(+E2) from 1976Gr20. Placement requires E1.
1040.0 *7*	0.11 *4*	2408.45	2$^+$,3,4$^+$	1368.36	3$^-$			
1049.6[e] *15*	0.12 *5*	1878.6		828.64	2$^+$	M1	0.00472	α(K)=0.00402 *6*; α(L)=0.000555 *8*; α(M)=0.0001210 *18*; α(N+..)=3.24×10^{-5} *5* α(N)=2.80×10^{-5} *4*; α(O)=4.12×10^{-6} *6*; α(P)=2.42×10^{-7} *4*
1050.0 *5*	0.11 *3*	2385.7		1335.56	5$^+$			
1076.2 *5*	0.42 *8*	2244.64		1168.47	4$^+$	E1	0.00109	α(K)=0.000932 *13*; α(L)=0.0001233 *18*; α(M)=2.67×10^{-5} *4*; α(N+..)=7.12×10^{-6} *10* α(N)=6.17×10^{-6} *9*; α(O)=9.02×10^{-7} *13*; α(P)=5.21×10^{-8} *8*
1081.2 *4*	0.64 *5*	2103.38	(4$^+$)	1022.08	3$^+$			
1087.40 *16*	0.62 *4*	1857.84		770.40	6$^+$			
1094.8[e] *10*	0.15 *5*	2264.3		1168.47	4$^+$			
1095.9[e] *5*	0.10 *6*	2183.7		1088.28	4$^+$			
1110.7 *7*	0.29 *6*	2445.17	3$^+$,4$^+$	1335.56	5$^+$			Abnormally wide peak in coincidence spectrum (2002Ca46) may indicate presence of more that one G.
1111.2 *6*	0.53 *13*	1514.94	2$^+$	404.19	4$^+$			

γ(^{156}Dy) (continued)

E_γ [†]	I_γ [†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	Comments
1121[#]	<3	1525.17	6^+	404.19	4^+			I_γ: γ peak is potentially a doublet, containing also the 1121.8 γ from the 1526 level (2002Ca49).
1121.8 *2*	8.2 *8*	1526.28	5^-	404.19	4^+			I_γ: γ peak is potentially a doublet, containing also the 1121 γ from the 1525 level (2002Ca49).
1128.07 *15*	0.89 *5*	1898.49	6^-	770.40	6^+	[E1]		Mult.: 1976Gr20 report mult=E2 for a 1128.28 G. The present placement requires a parity change.
[x]1137.4 *7*	0.33 *8*							Previously placed from a 3444 level whose existence is not confirmed.
1139.0 *6*	0.32 *9*	2307.44	4^+	1168.47	4^+			
1148	0.12 *5*	2517.0		1368.36	3^-			E_γ: From level-energy difference. Assumed the same as the 1149.1 γ reported by 1976Gr20 from this level. I_γ: From 1976Gr20. 2002Ca49 report Iγ<0.15.
1154.4[e] *5*	0.14 *6*	2489.5		1335.56	5^+			
1155.3 *2*	1.26 *9*	2323.58		1168.47	4^+			
1156.4 *3*	0.32 *7*	2244.64		1088.28	4^+			
1163.1[e] *6*	0.10 *5*	2331.7		1168.47	4^+			
1172.5[e] *16*	0.20 *6*	1942.9	$^+$	770.40	6^+			
1174.2 *2*	0.42 *7*	2342.68		1168.47	4^+			
1174.5 *8*	0.22 *8*	2002.9		828.64	2^+			
1177.6 *2*	0.29 *5*	2199.68		1022.08	3^+	E2	0.00219	α(K)=0.00184 *3*; α(L)=0.000266 *4*; α(M)=5.82×10^{-5} *9*; α(N+..)=1.88×10^{-5} *3* α(N)=1.342×10^{-5} *19*; α(O)=1.94×10^{-6} *3*; α(P)=1.064×10^{-7} *15*; α(IPF)=3.28×10^{-6} *5* Mult.: Reported by 1976Gr20 for a 1178.0 γ, formerly placed from a 2006 level whose existence has not been confirmed. The evaluator has assumed that this is the same transition.
1185.6 *5*	0.22 *4*	2207.4		1022.08	3^+			
1191.1 *5*	0.43 *6*	2818.35	4^+,5^-	1627.42	$(4)^+$			
1205.2 *2*	1.27 *11*	1609.33	$(3)^-$	404.19	4^+	E1	9.13×10^{-4}	α(K)=0.000760 *11*; α(L)=0.0001001 *14*; α(M)=2.17×10^{-5} *3*; α(N+..)=3.14×10^{-5} *5* α(N)=5.01×10^{-6} *7*; α(O)=7.33×10^{-7} *11*; α(P)=4.25×10^{-8} *6*; α(IPF)=2.57×10^{-5} *4*
1217.2 *3*	0.25 *7*	2385.7		1168.47	4^+			
1218.8 *9*	0.39 *10*	2307.44	4^+	1088.28	4^+			
1222.8 *3*	0.37 *8*	2244.64		1022.08	3^+			
1223.36 *18*	5.6 *4*	1627.42	$(4)^+$	404.19	4^+	E2,M1	0.0027 *7*	α(K)=0.0022 *6*; α(L)=0.00031 *7*; α(M)=6.9×10^{-5} *15*; α(N+..)=2.7×10^{-5} *5* α(N)=1.6×10^{-5} *4*; α(O)=2.3×10^{-6} *6*; α(P)=1.3×10^{-7} *4*; α(IPF)=8.6×10^{-6} *7*
1230.72 *14*	5.3 *5*	1368.36	3^-	137.77	2^+	E1	8.92×10^{-4}	α(K)=0.000732 *11*; α(L)=9.64×10^{-5} *14*; α(M)=2.09×10^{-5} *3*; α(N+..)=4.22×10^{-5} *6* α(N)=4.82×10^{-6} *7*; α(O)=7.06×10^{-7} *10*; α(P)=4.10×10^{-8} *6*; α(IPF)=3.67×10^{-5} *6*

$^{156}_{66}Dy_{90}$-10

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ [†]	I_γ [†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	Comments
1235.3 *2*	0.43 *9*	2323.58		1088.28	4^+			
1241.2[e] *6*	0.15 *6*	2264.3		1022.08	3^+			
1241.3[e] *12*	0.14 *6*	2408.45	$2^+,3,4^+$	1168.47	4^+			
1259.1 *7*	0.19 *8*	2594.3		1335.56	5^+			
1272.8 *3*	0.32 *8*	1677.15	4^+	404.19	4^+			
1278.0 *3*	0.52 *14*	2300.1		1022.08	3^+			
1285.4 *4*	0.18 *7*	2307.44	4^+	1022.08	3^+			
1292.3 *3*	0.87 *11*	2818.35	$4^+,5^-$	1526.28	5^-			
1293.0[e] *5*	0.14 *8*	2183.7		890.50	2^+			
1293.4 *15*	0.27 *4*	2818.35	$4^+,5^-$	1525.17	6^+			
1297.3 *2*	0.33 *8*	2823.38		1526.28	5^-			
[x]1297.5[&] *3*	0.75 *5*							
1301.5 *4*	2.58 *14*	2323.58		1022.08	3^+			
1309.7 *4*	0.37 *8*	2331.7		1022.08	3^+			
1314.7 *2*	0.52 *5*	2085.14		770.40	6^+			
1320.3 *15*	0.12 *5*	2408.45	$2^+,3,4^+$	1088.28	4^+			
1323.2 *4*	0.17 *5*	2491.90		1168.47	4^+			
[x]1332.9 *4*	0.24 *5*							Previously placed from a 3501 level whose existence is not confirmed.
1338.31 *17*	1.11 *11*	1476.10		137.77	2^+			
1345.6 *3*	0.19 *5*	2433.84		1088.28	4^+			
1348.9 *5*	0.19 *5*	2517.0		1168.47	4^+			
1351.3[e] *6*	0.10 *4*	2439.16		1088.28	4^+			
1354.1 *2*	0.41 *5*	2244.64		890.50	2^+			
1355.1 *4*	0.21 *5*	2183.7		828.64	2^+			
1363.4[e] *7*	0.08 *3*	2385.7		1022.08	3^+			
[x]1364.7 *5*	0.18 *4*							Previously placed from a 2992 level whose existence is not confirmed.
1380.9 *2*	0.65 *6*	2818.35	$4^+,5^-$	1437.32	6^+			
1386.3 *2*	0.67 *6*	2408.45	$2^+,3,4^+$	1022.08	3^+			
1390.33 *17*	2.07 *12*	1794.55		404.19	4^+			
1393.9[e] *7*	0.09 *4*	2164.3		770.40	6^+			
[x]1397.4[&] *4*	0.46 *7*							
[x]1407.2[&] *9*	0.16 *7*							
1415.9 *2*	1.50 *9*	2244.64		828.64	2^+			
1416.8 *2*	0.92 *10*	2307.44	4^+	890.50	2^+	[E2]	0.00157	α(K)=0.001289 *18*; α(L)=0.000181 *3*; α(M)=3.95×10^{-5} *6*; α(N+..)=5.78×10^{-5} *9* α(N)=9.11×10^{-6} *13*; α(O)=1.326×10^{-6} *19*; α(P)=7.45×10^{-8} *11*; α(IPF)=4.73×10^{-5} *7*
1423.0 *2*	0.68 *9*	2445.17	$3^+,4^+$	1022.08	3^+			
1423.3 *6*	0.16 *6*	2193.6		770.40	6^+			
1425.9 *4*	0.20 *5*	2594.3		1168.47	4^+			
1432.8 *2*	1.00 *10*	2323.58		890.50	2^+			
1435.7 *5*	0.47 *9*	1840.07	$(4)^+$	404.19	4^+			
1450.0 *3*	0.22 *6*	2220.4		770.40	6^+			

$^{156}_{66}Dy_{90}$-11

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ [†]	I_γ [†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	Comments
1450.0[e] 8	0.15 6	2818.35	4$^+$,5$^-$	1368.36	3$^-$			
1453.65 15	2.5 3	1857.84		404.19	4$^+$			
1460.5 3	0.22 4	2230.9		770.40	6$^+$			
1467.1 8	0.10 5	2489.5		1022.08	3$^+$			
1469.9 5	0.19 6	2491.90		1022.08	3$^+$			
1471.5 2	2.5 3	1609.33	(3)$^-$	137.77	2$^+$	[E1]	8.07×10^{-4}	α(K)=0.000537 8; α(L)=7.03×10^{-5} 10; α(M)=1.522×10^{-5} 22; α(N+..)=0.000184 3 α(N)=3.51×10^{-6} 5; α(O)=5.15×10^{-7} 8; α(P)=3.01×10^{-8} 5; α(IPF)=0.000180 3
1474.2 4	0.56 14	1878.6		404.19	4$^+$			
1478.7 2	0.28 3	2307.44	4$^+$	828.64	2$^+$	[E2]	0.00147	α(K)=0.001189 17; α(L)=0.0001657 24; α(M)=3.62×10^{-5} 5; α(N+..)=7.58×10^{-5} 11 α(N)=8.35×10^{-6} 12; α(O)=1.216×10^{-6} 17; α(P)=6.87×10^{-8} 10; α(IPF)=6.62×10^{-5} 10
1482.7 2	0.30 5	2818.35	4$^+$,5$^-$	1335.56	5$^+$			
x1485.2 7	0.27 8							Previously placed from a 3430 level whose existence is not confirmed.
1486.4 7	0.54 16	1624.64		137.77	2$^+$			
1493.8 10	0.20 5	2517.0		1022.08	3$^+$			
1494.5 5	0.29 7	2323.58		828.64	2$^+$			
1499.6 3	0.62 9	2270.0		770.40	6$^+$			
1518.7 3	0.25 7	2408.45	2$^+$,3,4$^+$	890.50	2$^+$			
1523.0 3	0.38 6	2293.4		770.40	6$^+$			
1526.1 6	0.64 16	1930.1	(3$^-$)	404.19	4$^+$			
1529.4 2	1.52 13	1933.60	$^+$	404.19	4$^+$			
1536.0 4	0.49 8	2307.44	4$^+$	770.40	6$^+$	[E2]	0.00139	α(K)=0.001106 16; α(L)=0.0001535 22; α(M)=3.35×10^{-5} 5; α(N+..)=9.43×10^{-5} 14 α(N)=7.73×10^{-6} 11; α(O)=1.128×10^{-6} 16; α(P)=6.39×10^{-8} 9; α(IPF)=8.54×10^{-5} 12
1538.0[e] 12	0.41 13	1942.9	$^+$	404.19	4$^+$			
1542.1 8	0.80 16	1679.9		137.77	2$^+$			
x1542.2 5	0.51 8							Previously placed from a 3071 level whose existence is not confirmed.
1545.8 2	1.44 8	1949.99	(3$^-$)	404.19	4$^+$			
x1565.0[&] 4	0.28 5							
1572.0 5	0.13 5	2594.3		1022.08	3$^+$			
1572.5 8	0.08 2	2788.1		1215.61	8$^+$			
1580.3 4	0.11 3	2408.45	2$^+$,3,4$^+$	828.64	2$^+$			
x1583.2[&] 9	0.14 5							
1598.7 5	0.25 7	2002.9		404.19	4$^+$			
x1601.4[&] 6	0.16 3							
1609.1 6	0.14 3	1609.33	(3)$^-$	0	0$^+$	[E3]	0.00232	α(K)=0.00190 3; α(L)=0.000287 4; α(M)=6.33×10^{-5} 9; α(N+..)=6.93×10^{-5} 10

γ(^{156}Dy) (continued)

E_γ[†]	I_γ[†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Comments
						α(N)=1.462×10^{-5} *21*; α(O)=2.12×10^{-6} *3*; α(P)=1.143×10^{-7} *16*; α(IPF)=5.25×10^{-5} *8*
						I_γ: From 1976Gr20. 2002Ca49 report Iγ<1.3.
1626.8[e] *6*	0.16 *6*	2517.0		890.50	2$^+$	
[x]1630.6 *10*	0.08 *3*					
1634.6 *10*	1.1 *3*	1772.4	(3$^-$)	137.77	2$^+$	
[x]1643.5 *5*	0.24 *3*					Previously placed from a 3161 level whose existence is not confirmed.
1648.1[e] *7*	0.19 *6*	2419.1		770.40	6$^+$	
1649.7 *2*	1.37 *11*	2818.35	4$^+$,5$^-$	1168.47	4$^+$	
1654.0[e] *11*	0.14 *6*	2823.38		1168.47	4$^+$	
1663.3 *2*	0.52 *10*	2433.84		770.40	6$^+$	
1668.7 *2*	0.32 *7*	2439.16		770.40	6$^+$	
[x]1681.7 *8*	0.19 *7*					Previously placed from a 3308 level whose existence is not confirmed.
[x]1685.4[&] *6*	0.30 *8*					
1688.2[e] *15*	0.07 *5*	2517.0		828.64	2$^+$	
[x]1706.1[&] *7*	0.20 *5*					
1730.1 *2*	0.57 *6*	2818.35	4$^+$,5$^-$	1088.28	4$^+$	
1735.7 *5*	0.18 *5*	2757.8		1022.08	3$^+$	
1741.5 *7*	0.36 *9*	1878.6		137.77	2$^+$	
[x]1758.3 *7*	0.35 *9*					
1760.1 *4*	0.31 *9*	2164.3		404.19	4$^+$	
1791.9 *9*	0.50 *18*	1930.1	(3$^-$)	137.77	2$^+$	
1795.6 *5*	0.42 *15*	2199.68		404.19	4$^+$	
1796[#]	<0.13	2818.35	4$^+$,5$^-$	1022.08	3$^+$	I_γ: 1976Gr20 report Iγ=0.46 *4*, but that may be for another placement of this G.
[x]1801.4[&] *10*	0.10 *4*					
[x]1814.4 *10*	0.09 *4*					
1824.7 *5*	0.63 *9*	2228.9		404.19	4$^+$	
1824.7 *6*	0.20 *5*	2653.3		828.64	2$^+$	
1840.5[e] *8*	0.22 *9*	2244.64		404.19	4$^+$	
1841.9[#] *9*	<0.03	2517.0		675.60	0$^+$	
[x]1844.5[&] *8*	0.17 *3*					
1860.1 *5*	0.81 *13*	2264.3		404.19	4$^+$	
[x]1866.8[&] *8*	0.14 *3*					
[x]1869.9[&] *7*	0.16 *3*					
1872.9 *4*	0.21 *5*	2895.0		1022.08	3$^+$	
1888.8[e] *15*	0.27 *10*	2293.4		404.19	4$^+$	
[x]1899.8 *6*	0.39 *6*					Previously placed from a 3430 level whose existence is not confirmed.
1902.5 *5*	0.42 *10*	2307.44	4$^+$	404.19	4$^+$	
[x]1908.9 *6*	0.32 *5*					
1919.8 *4*	0.61 *13*	2323.58		404.19	4$^+$	
[x]1921.3 *7*	0.29 *5*					
1932[#]	<0.11	2823.38		890.50	2$^+$	I_γ: 1976Gr20 report Iγ=0.26 *4*.

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ[†]	I_γ[†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	Comments
1952.3 *9*	0.24 *10*	2089.81	2^+	137.77	2^+		
[x]1962.4 *10*	0.19 *8*						
1967.9 *3*	0.59 *16*	2372.1		404.19	4^+		
1990[#]	<0.07	2818.35	$4^+,5^-$	828.64	2^+		I_γ: 1976Gr20 report Iγ=0.21 *9*.
1994[#]	<0.07	2823.38		828.64	2^+		I_γ: 1976Gr20 report Iγ=0.13 *9*.
2003.7[e] *7*	0.34 *10*	2408.45	$2^+,3,4^+$	404.19	4^+		
2004.2[e] *9*	0.10 *4*	2895.0		890.50	2^+		
2014.9 *6*	0.42 *10*	2419.1		404.19	4^+		
[x]2027.0 *6*	0.40 *6*						
2029.70 *18*	2.17 *16*	2433.84		404.19	4^+		
2035.0 *2*	1.7 *2*	2439.16		404.19	4^+		
2039.9[e] *10*	0.11 *4*	2810.4		770.40	6^+		
[x]2042.4[&] *6*	0.33 *6*						
2048.0 *2*	0.19 *6*	2818.35	$4^+,5^-$	770.40	6^+		
2052.8 *2*	0.69 *11*	2823.38		770.40	6^+		
2063.2 *4*	0.23 *4*	2833.7		770.40	6^+		
[x]2075.5 *7*	0.30 *5*						Previously placed from a 3444 level whose existence is not confirmed.
[x]2078.6[&] *10*	0.14 *9*						
2085.4 *5*	0.49 *10*	2489.5		404.19	4^+		
2088.2 *6*	0.37 *15*	2491.90		404.19	4^+		
2089.1 *10*	0.31 *13*	2089.81	2^+	0	0^+	[E2]	E_γ,I_γ: From 1976Gr20. 2002Ca49 report Iγ<0.6.
[x]2101.6 *7*	0.17 *3*						Previously placed from a 2992 level whose existence is not confirmed.
[x]2136.0 *8*	0.20 *5*						Previously placed from a 3430 level whose existence is not confirmed.
2168.9[e] *7*	0.23 *8*	2571.7		404.19	4^+		
2169.8 *6*	0.31 *4*	2307.44	4^+	137.77	2^+	[E2]	I_γ: From 1976Gr20. 2002Ca49 report Iγ<0.4.
2185.6 *6*	0.31 *10*	2323.58		137.77	2^+		
[x]2209.2 *9*	0.19 *7*						Previously placed from a 3646 level whose existence is not confirmed.
[x]2216.6[&] *9*	0.17 *7*						
2234.2 *4*	1.7 *4*	2372.1		137.77	2^+		
2238.3 *2*	0.77 *13*	2642.50		404.19	4^+		
2249[e] *2*	0.32 *15*	2653.3		404.19	4^+		
2271.0 *2*	0.88 *13*	2408.45	$2^+,3,4^+$	137.77	2^+		
[x]2277.4 *6*	0.37 *5*						Previously placed from a 3646 level whose existence is not confirmed.
[x]2286.3 *9*	0.15 *4*						Previously placed from a 3308 level whose existence is not confirmed.
[x]2301.6 *6*	0.30 *6*						Previously placed from a 3071 level whose existence is not confirmed.
2307.4 *8*	0.27 *11*	2445.17	$3^+,4^+$	137.77	2^+		
[x]2321.2 *7*	0.15 *2*						
[x]2327.5 *6*	0.22 *3*						
[x]2339.0 *9*	0.13 *4*						Previously placed from a 3675 level whose existence is not confirmed.
[x]2349.3 *9*	0.15 *7*						Previously placed from a 3177 level whose existence is not confirmed.
2354.1 *2*	0.90 *8*	2491.90		137.77	2^+		
[x]2365.1 *6*	0.29 *6*						

$^{156}_{66}Dy_{90}$-14

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49 (continued)

γ(^{156}Dy) (continued)

E_γ[†]	I_γ[†‡d]	E_i(level)	J_i^π	E_f	J_f^π	Comments
[x]2368.9 *8*	0.21 *6*					
[x]2373.9 *6*	0.34 *6*					
[x]2398.1[&] *8*	0.14 *4*					
2406.2 *7*	0.38 *11*	2810.4		404.19	4^+	
2414.2 *2*	1.60 *18*	2818.35	$4^+,5^-$	404.19	4^+	
2419.2 *2*	3.3 *3*	2823.38		404.19	4^+	
2429.5 *7*	0.63 *9*	2833.7		404.19	4^+	
[x]2434.2 *6*	0.21 *4*					
[x]2451.0 *6*	0.24 *5*					
[x]2480.3 *4*	0.21 *5*					Previously placed from a 3308 level whose existence is not confirmed.
[x]2485.9 *8*	0.16 *6*					Previously placed from a 3161 level whose existence is not confirmed.
2490.7 *6*	0.21 *7*	2895.0		404.19	4^+	
[x]2570.8 *5*	0.37 *6*					
2577.3 *13*	0.33 *7*	2981.5		404.19	4^+	
[x]2580.1 *7*	0.34 *5*					
[x]2589.4 *7*	0.19 *5*					
[x]2610.5 *6*	0.19 *3*					Previously placed from a 3501 level whose existence is not confirmed.
[x]2724.8 *7*	0.17 *3*					
[x]2753.8 *5*	0.27 *2*					Previously placed from a 3430 level whose existence is not confirmed.
[x]2820.6 *8*	0.05 *2*					
[x]2825.3 *8*	0.12 *3*					
[x]2890.8 *7*	0.22 *3*					
[x]2893.4 *6*	0.10 *3*					
[x]3270.6 *7*	0.14 *2*					Previously placed from a 3675 level whose existence is not confirmed.

[†] Iγ values are quoted relative to Iγ(137.8 γ)=100. The Iγ data from 2002Ca49 are based on the analysis of coincidence spectra. These authors list upper limits on Iγ values for many γ′s that they do not observe but which might be expected to occur based on J^π considerations. In most instances, these are not given here.

[‡] Values from 2002Ca49, unless noted otherwise.

[#] Nominal value from level-energy difference.

[@] Transition previously reported but not in ε decay.

[&] Transition previously placed from a level below 2982 keV whose existence was not confirmed by 2002Ca49.

[a] From the ^{156}Dy Adopted Gamma Radiations data set. Where a reasonable association of a γ from 2002Ca49 can be made with one from 1976Gr20, the evaluator has assigned the mult from 1976Gr20.

[b] Values for γ′s with E0 components are discussed in the ^{156}Dy Adopted γ Radiations data set.

[c] Computed by 1976Gr20 from ce intensities.

[d] For absolute intensity per 100 decays, multiply by 0.52 *4*.

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

[x] γ ray not placed in level scheme.

$^{156}_{66}Dy_{90}$-15

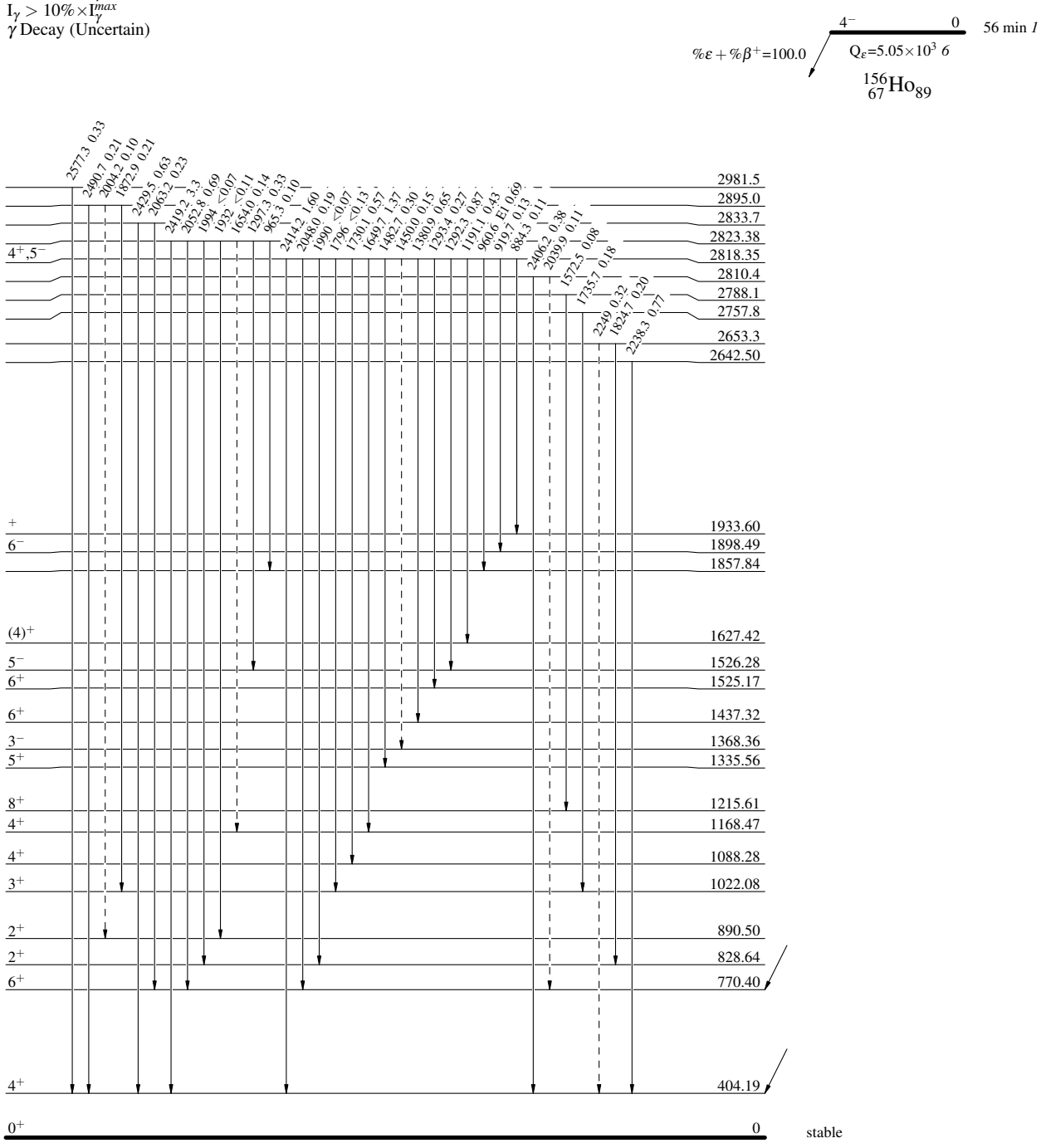
^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme

Intensities: Relative I_γ

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)



$^{156}_{66}Dy_{90}$

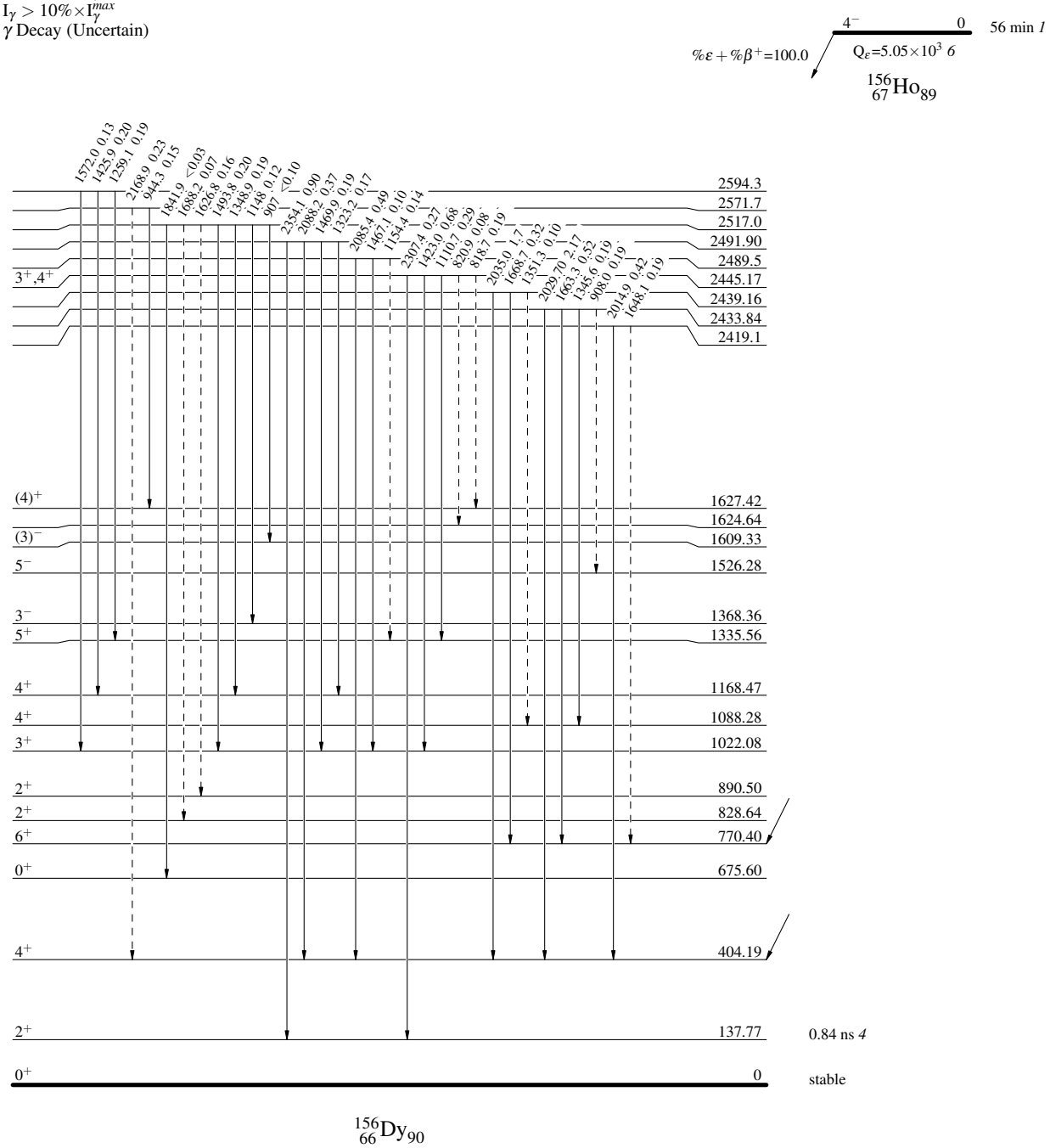
^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

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)

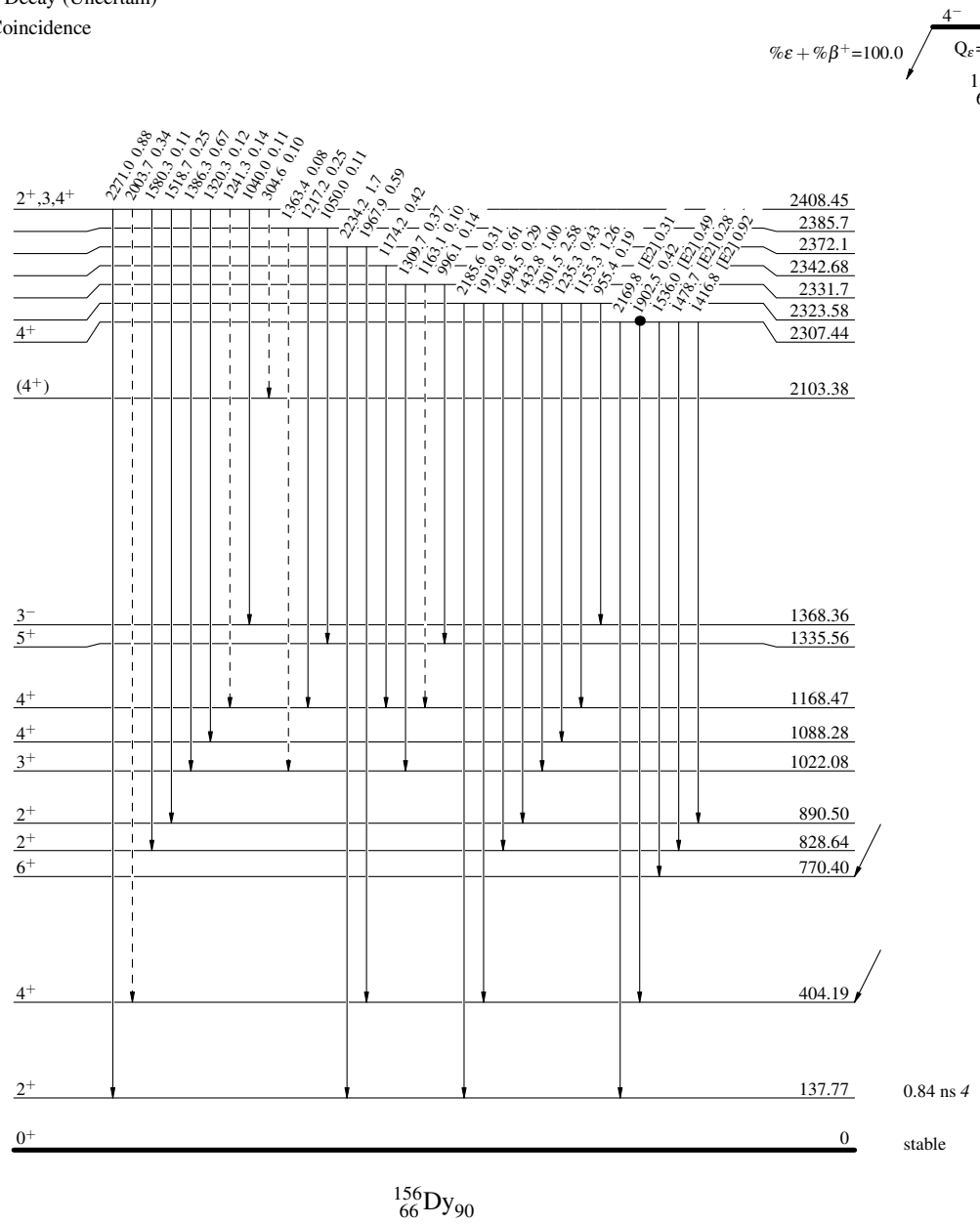


^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

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)
- Coincidence



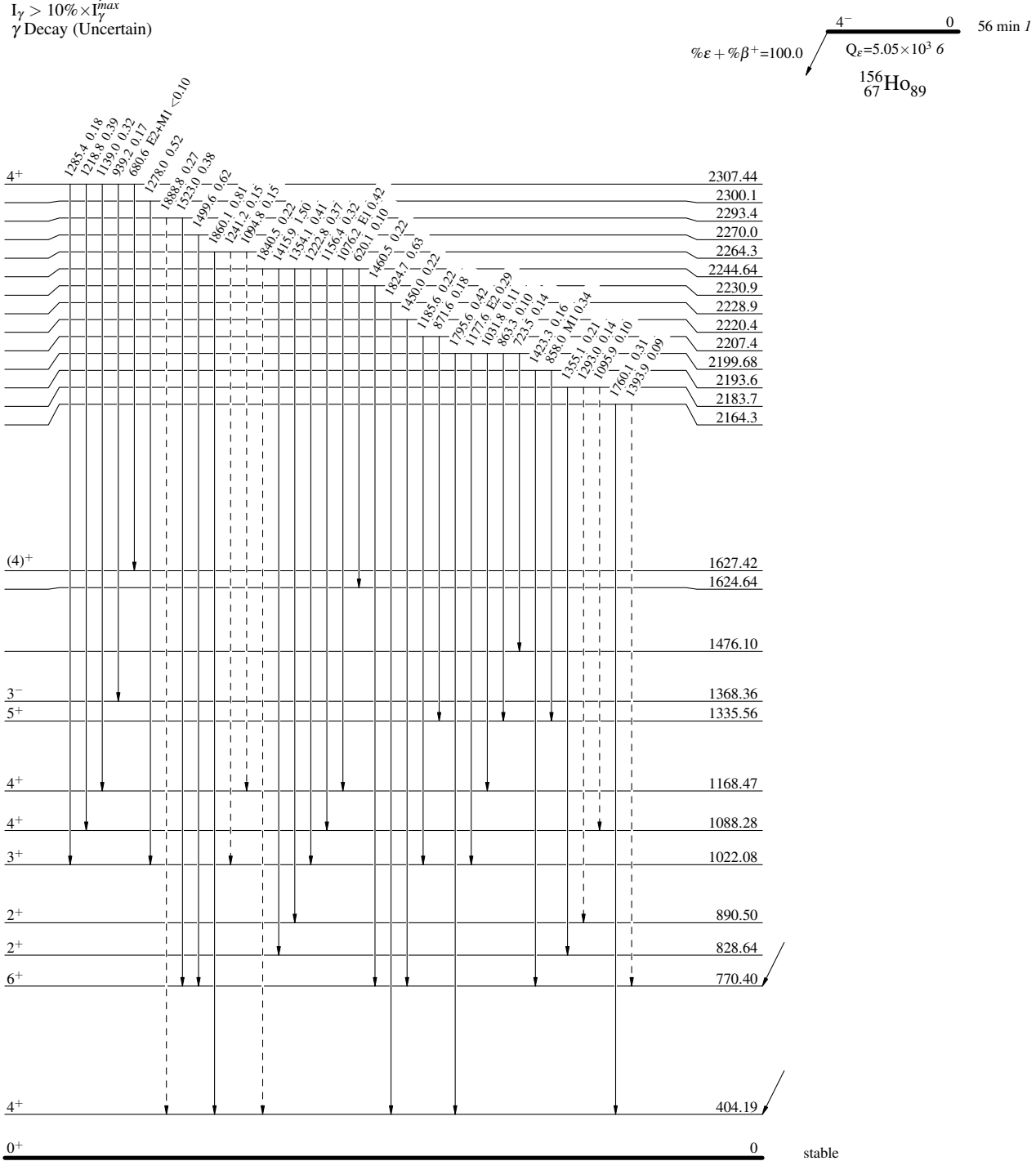
$^{156}_{66}Dy_{90}$

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

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)

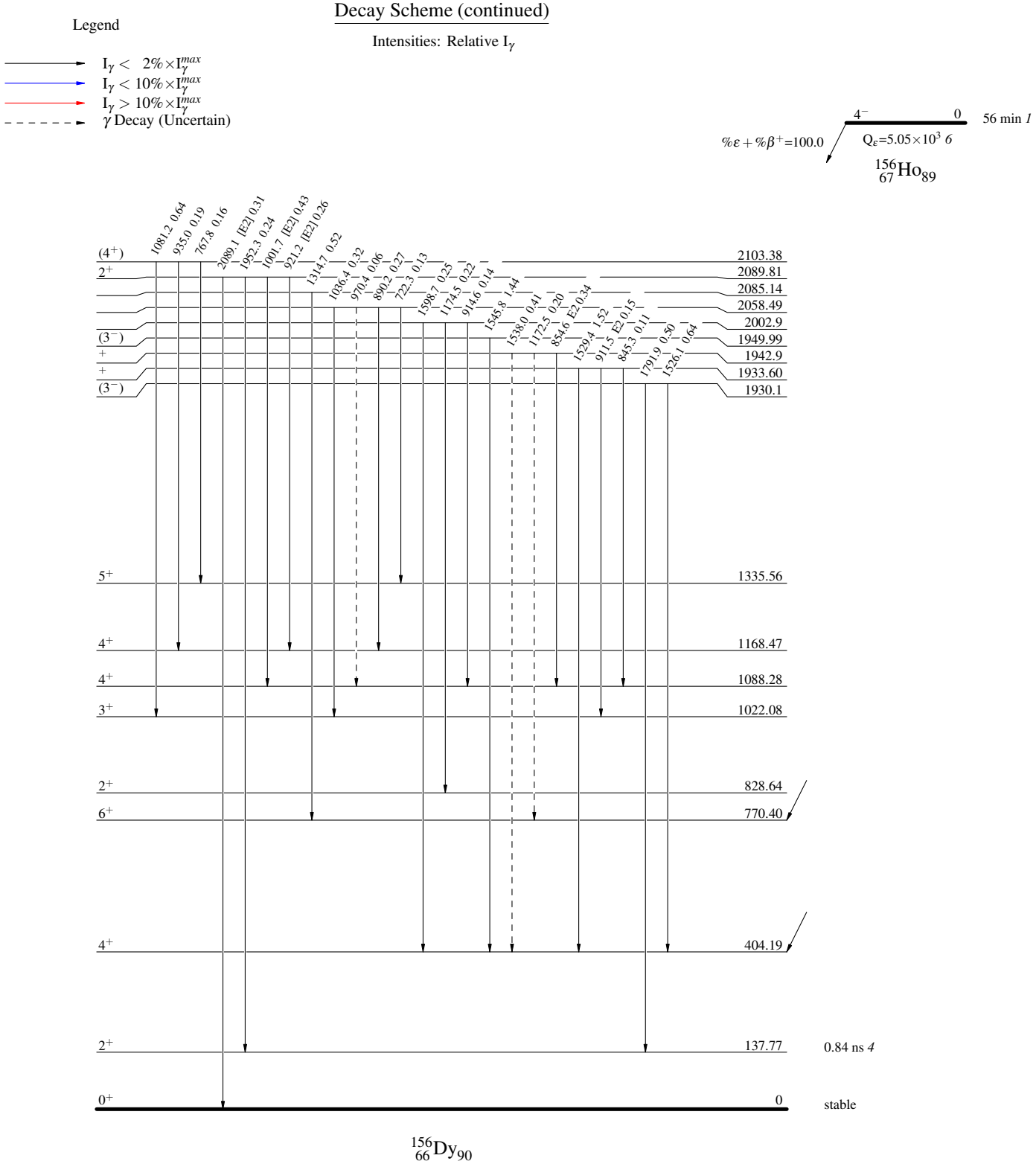


$^{156}_{66}Dy_{90}$

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

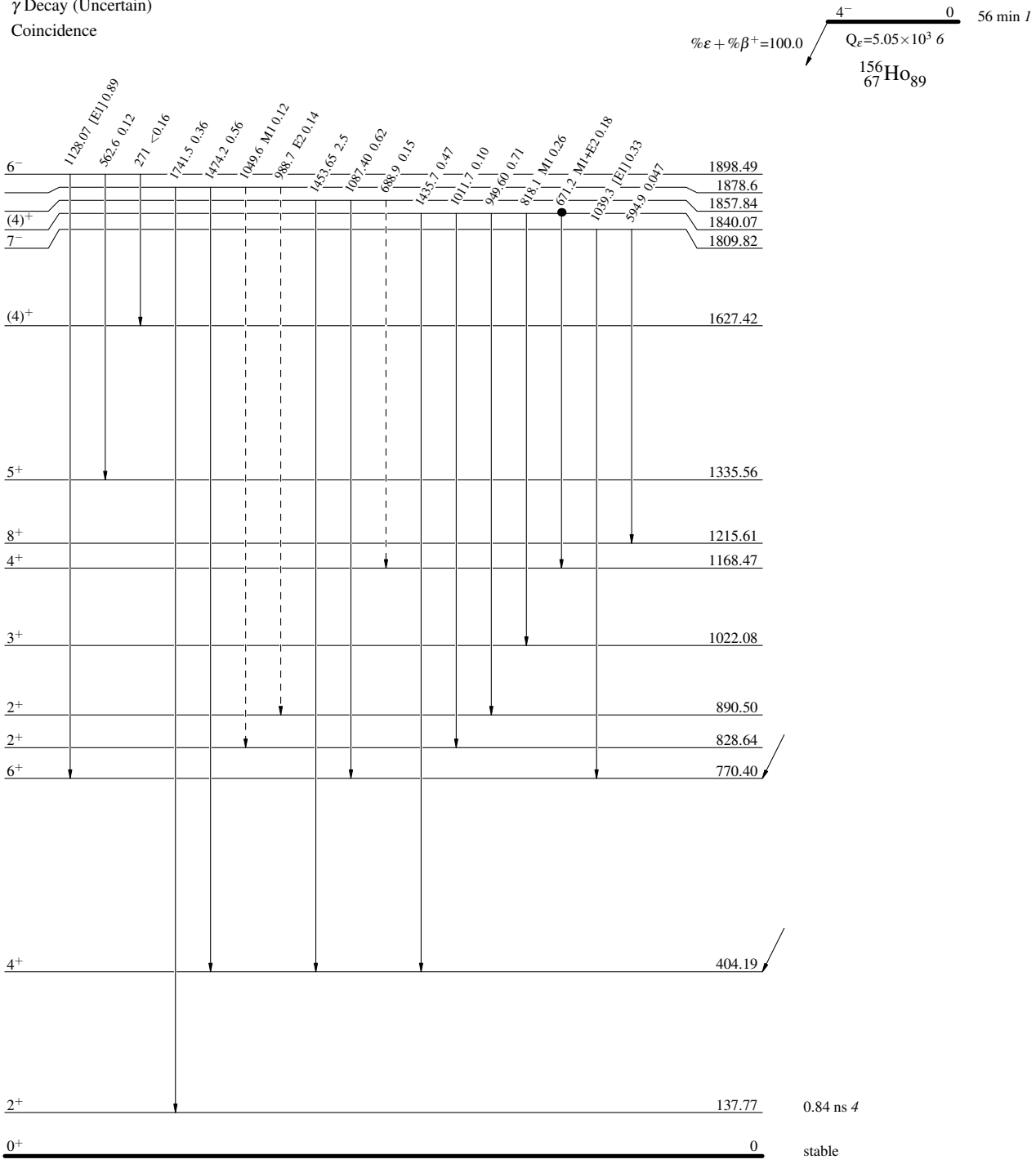


^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

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)
- Coincidence



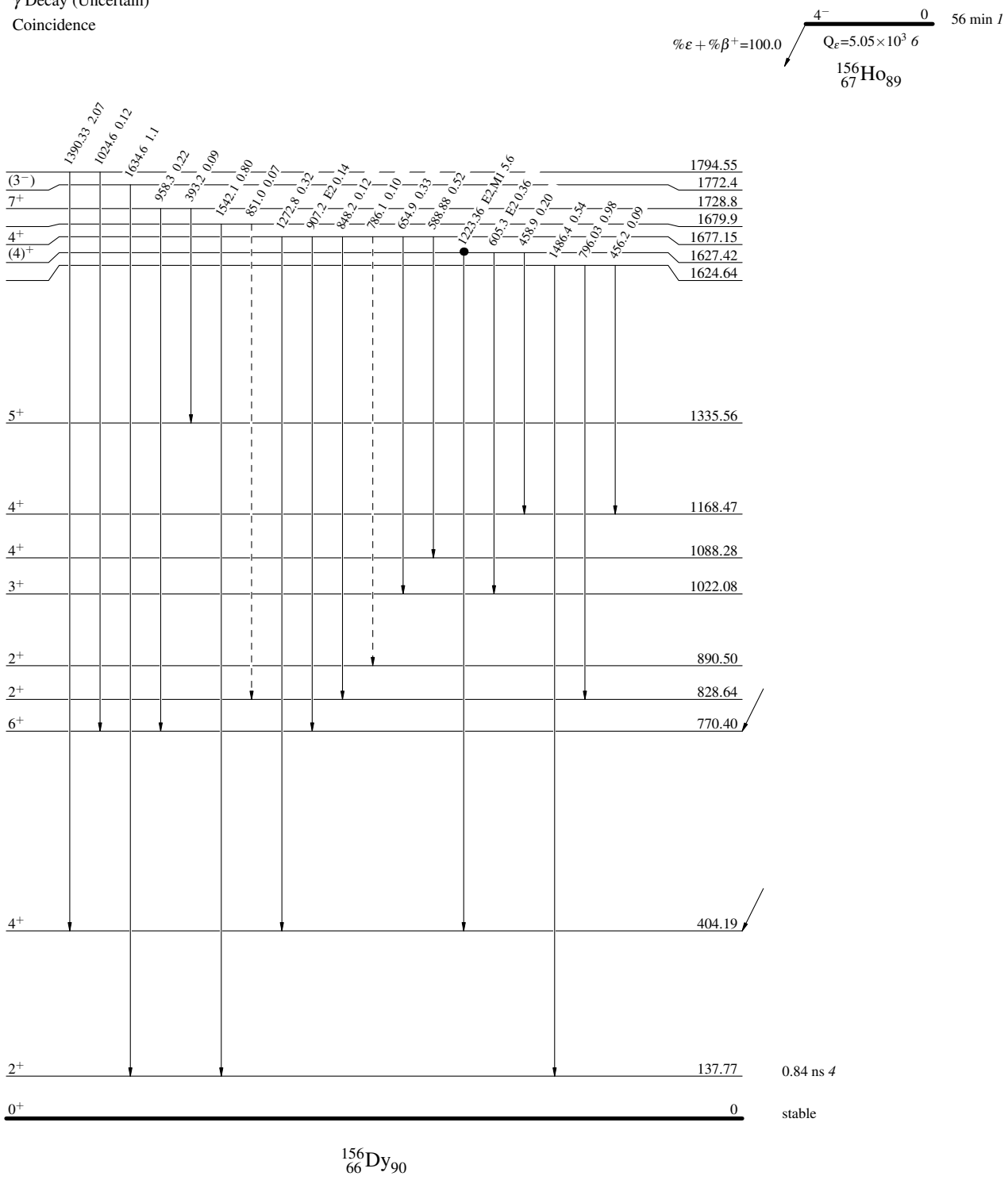
$^{156}_{66}Dy_{90}$

^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

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)
- Coincidence

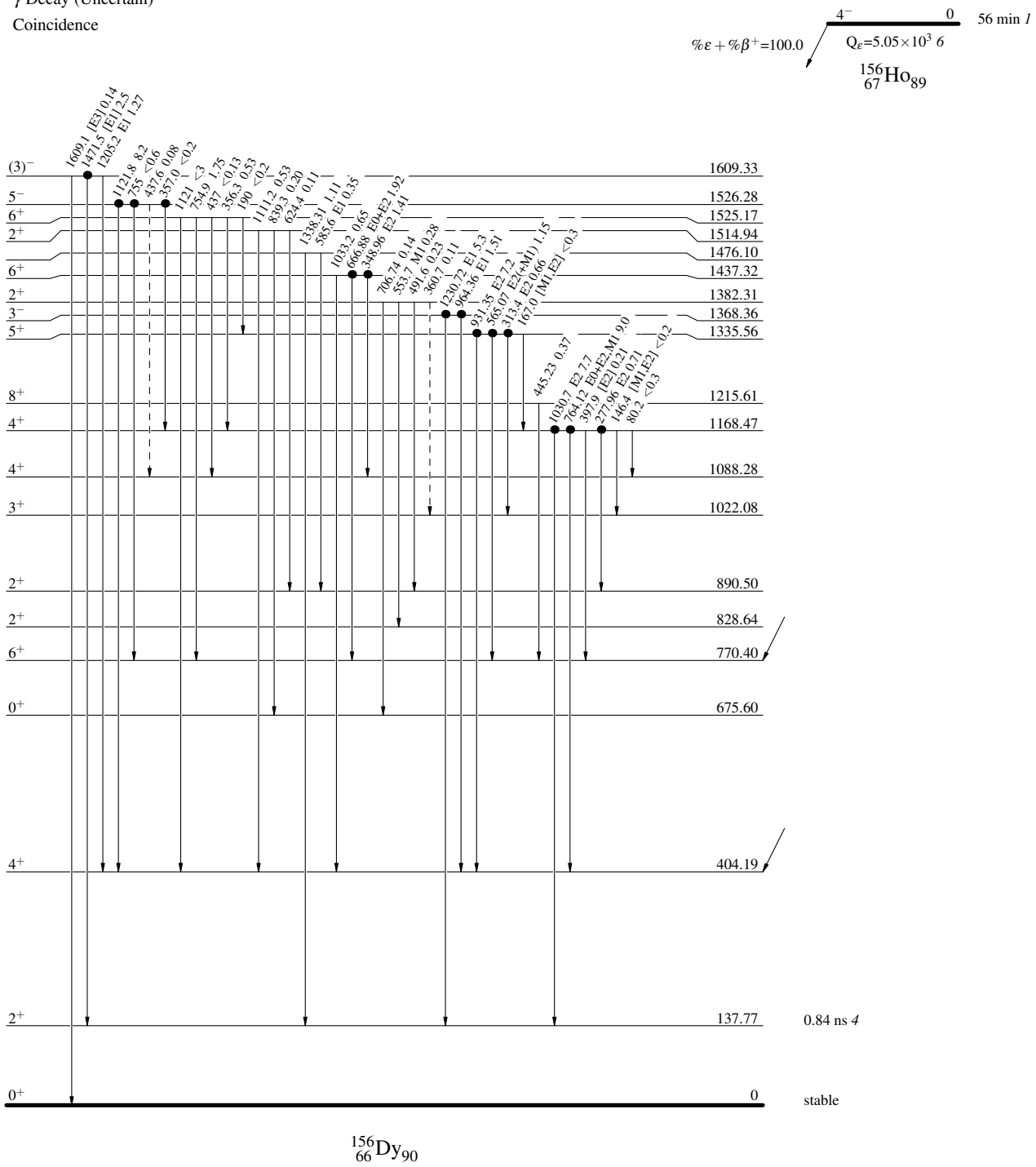


^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Decay Scheme (continued)

Intensities: Relative I_γ

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)
- Coincidence



$^{156}_{66}Dy_{90}$

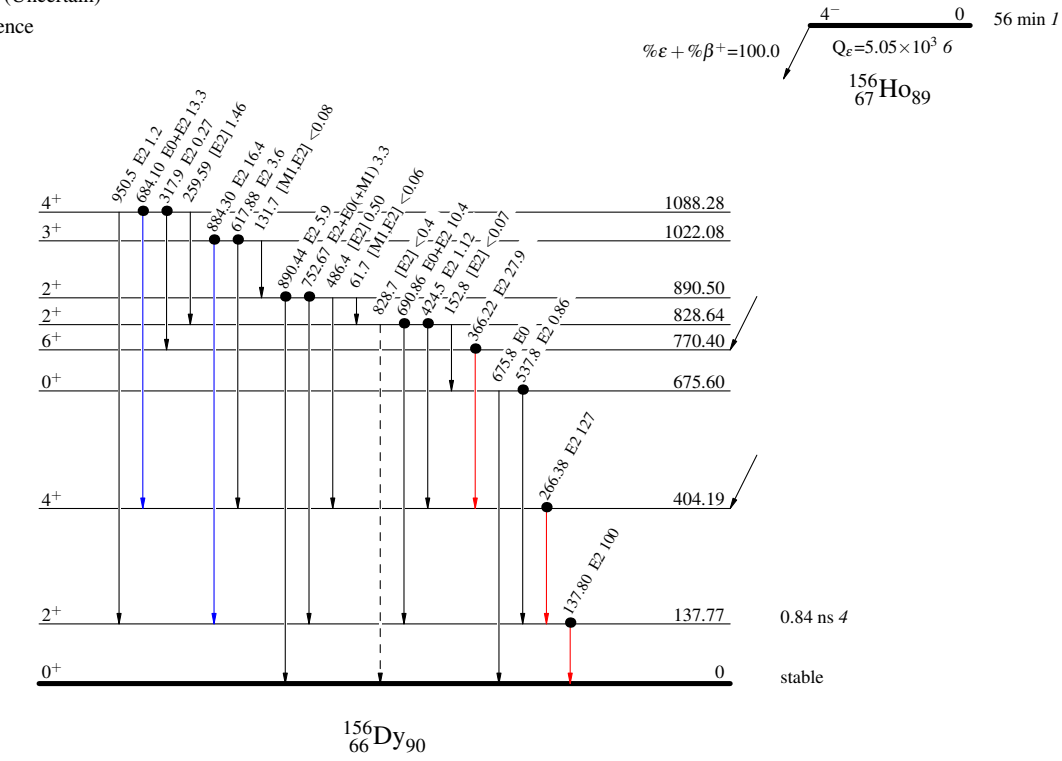
^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49

Legend

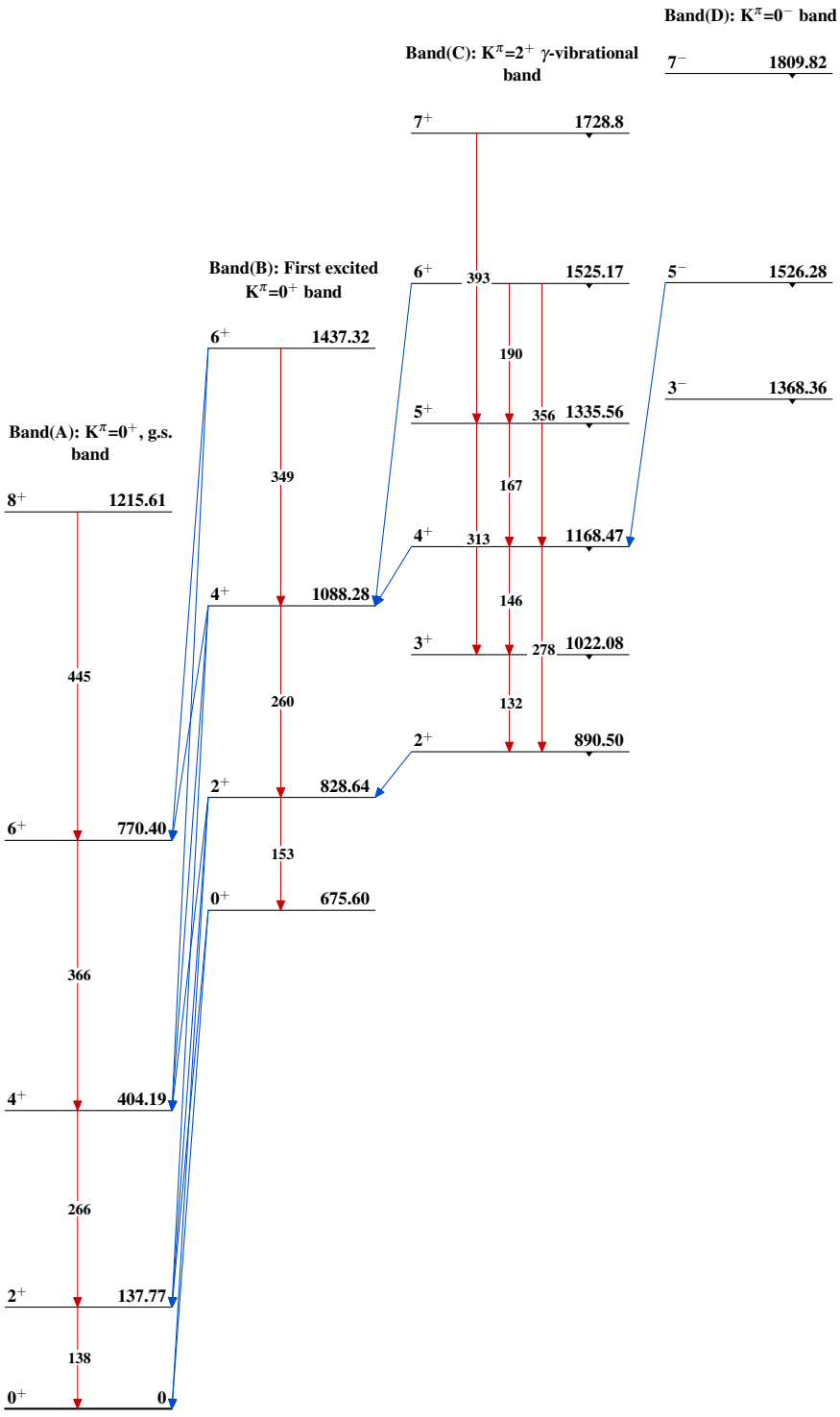
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence

Decay Scheme (continued)

Intensities: Relative I_γ



^{156}Ho ε decay (56 min) 1976Gr20,2002Ca49



$^{156}_{66}Dy_{90}$