

Adopted Levels, Gammas

Type	Author	History
Full Evaluation	C. W. Reich	Citation
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Q(β^-)=-1996 9; S(n)=8886 16; S(p)=4814.1 22; Q(α)=1141.3 25 [2012Wa38](#)Note: Current evaluation has used the following Q record \$ -1994 9 8886 15 4813.8 22 1142.8 25 [2003Au03](#),[2009AuZZ](#).**Additional information 1.**These data are from ^{161}Er ε decay, in-beam γ studies, and several charged-particle reaction studies.Several studies of the ^{161}Er decay scheme reported after 2000 have appeared in which modifications to the level scheme presented here have been reported. Because many of the details regarding these modifications have not been given and because they remain as yet unpublished, the evaluator has not included them here. For a discussion of these matters, see the ^{161}Er decay data set.In $^{160}\text{Gd}(^7\text{Li},6\gamma)$, [2004Es01](#) propose the existence of a band structure consisting of both signature partners and tentatively assign it to ^{161}Ho . Because almost nothing is known about this band, the evaluator has not adopted it. For additional information about it, see the ($^7\text{Li},6\gamma$) data set. **^{161}Ho Levels**Model calculations can be found in the following: wavefunctions of various levels – [1972So12](#) (or [1971SoZW](#)), [1972WiZG](#), [1972FuZH](#), [1992Bo45](#), and [1995Dz02](#); B(E1) values between members of the 7/2[404] and 7/2[523] bands up to 17/2 – [1973Ba86](#); and other theory discussions – [1984Ja10](#) and [1992Ba42](#).**Additional information 2.****Cross Reference (XREF) Flags**

A	$^{160}\text{Gd}(^7\text{Li},6\gamma)$	E	$^{162}\text{Er}(\text{pol t},\alpha)$
B	^{161}Er ε decay	F	$^{164}\text{Er}(\text{p},\alpha)$
C	$^{159}\text{Tb}(\alpha,2\gamma)$, $^{161}\text{Dy}(\text{d},2\gamma)$	G	^{161}Ho IT decay (6.76 s)
D	$^{160}\text{Dy}(^3\text{He},\text{d})$, $^{160}\text{Dy}(\alpha,\text{t})$		

E(level) [†]	J ^{π#} @	T _{1/2}	XREF	Comments
0.0 ^{&}	7/2 ⁻	2.48 h 5	ABCDEFG	% ε =100 μ =+4.25 3; Q=+3.22 11 J ^π : J measured by atomic-beam magnetic resonance (1964Bu09 and 1969Ek01) and laser spectroscopy (1987AIZO , 1988NeZZ). Logf=4.88 to 5/2 ⁻ level indicates an allowed-unhindered ε transition, which in this mass region is $\pi7/2[523] \rightarrow \nu5/2[523]$. This thus establishes 7/2[523] as the configuration of the ^{161}Ho g.s. T _{1/2} : weighted average of 2.48 h 5 (1965Ab04), 2.5 h 2 (1963Ra15), 1.9 h 5 (1961Bj02), and 3.0 h 5 (1961Ba32). Others: 4.6 h 1 (1950Wi13) and 2.5 h (1954Ha01). μ : from the compilation of 2005St24 and based on a measurement of 1989Al27 . Q: from the compilation of 2005St24 and based on a measurement of 1989Al27 . $\delta < r^2 >(161-162) = 0.033 \text{ fm}^2$ 7 and $\delta < r^2 >(160-161) = 0.123 \text{ fm}^2$ 3, from 1989Al27 ; values computed by evaluator by subtraction of table entries. Uncertainties are computed by error propagation and may be overestimates. Other: plot in 1987AIZU by same authors. From an evaluation of data on nuclear rms charge radii, 2004An14 report $< r^2 >^{1/2} = 5.179 \text{ fm}$ 31.
99.63 ^a 3	9/2 ⁻		ABCDEF	J ^π : from M1 component in γ to 7/2 ⁻ level and analysis of (pol t, α) data.
211.15 ^b 3	1/2 ⁺	6.76 s 7	BCDEFG	%IT=100 J ^π : from E3 γ to 7/2 ⁻ and expected occurrence of this Nilsson orbital in this energy region.

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Adopted Levels, Gammas (continued) **^{161}Ho Levels (continued)**

E(level) [†]	J ^π #@	T _{1/2}	XREF	Comments
221.95 ^{&} 6	11/2 ⁻		ABCDEF	T _{1/2} : weighted average of 6.80 s 10 (1965St08) and 6.73 s 10 (1971Ge01). Others: 6.1 s 3 (1966Bo02) and 6.78 s 15 (1967Ge09) by the same authors as 1971Ge01 (all from ^{161}Ho IT decay).
222.43 ^c 3	3/2 ⁺		BCDEF	J ^π : from M1 γ to 1/2 ⁺ level and band structure.
252.68 ^d 3	7/2 ⁺	≤0.2 ns	ABCDEF	J ^π : from L=4 in ($^3\text{He},\text{d}$), analysis of (pol t, α) data, and E1 γ 's to 7/2 ⁻ and 9/2 ⁻ . T _{1/2} : from $\gamma\gamma(t)$ in (p,ny) study (1976Sc19).
282			D	
298.68 ^f 3	3/2 ⁺		BCDEF	J ^π : from L=2 in ($^3\text{He},\text{d}$) and M1 γ to 1/2 ⁺ level.
316.56 ^b 4	5/2 ⁺		ABCDEF	J ^π : from E2 γ to 1/2 ⁺ level, L=2 in ($^3\text{He},\text{d}$), and analysis of (pol t, α) data.
353.28 ^c 4	7/2 ⁺	0.52 ns 15	ABCD	J ^π : from E2 γ to 3/2 ⁺ level and band structure. T _{1/2} : from (p,ny) study (1976Sc19).
368.10 ^a 7	13/2 ⁻		A C	J ^π : from Q γ to 9/2 ⁻ level and expected band structure.
370.77 ^e 7	9/2 ⁺		ABC	J ^π : from D component in γ to 7/2 ⁻ level, γ to 11/2 ⁻ , and expected band structure.
373.24 ^g 4	5/2 ⁺		BCDEF	J ^π : from L=2 in ($^3\text{He},\text{d}$) and M1 γ to 7/2 ⁺ level.
423.91 ^h 4	1/2 ⁻		BCD	J ^π : from E1 γ to 1/2 ⁺ level, L=1 in ($^3\text{He},\text{d}$) and band structure. J ^π : from model calcuations of 1992Bo45 , this state is 30% 1/2[541], 18% 1/2[550], 25% quadrupole vibration, and 14% octupole vibration.
446.83 ^j 4	5/2 ⁺		B D	J ^π : from L=(2) in ($^3\text{He},\text{d}$), E1 γ to 7/2 ⁻ level, and band structure. J ^π : from model calcuations of 1992Bo45 , this state is 82% 5/2[402], 5% quadrupole vibration, and 5% octupole vibration.
458.87 ^h 4	5/2 ⁻		B de	XREF: d(459)e(458). J ^π : from E1 γ 's to 3/2 ⁺ and 7/2 ⁺ levels.
463.23 ^f 7	7/2 ⁺		BCdefF	XREF: d(459)e(458). J ^π : from M1 γ 's to 5/2 ⁺ and 7/2 ⁺ levels and band structure.
511.78 ^d 7	11/2 ⁺		A C	J ^π : from D γ to 9/2 ⁻ level, γ to 7/2 ⁺ , and expected band structure.
519.57 ^b 19	9/2 ⁺		A C F	J ^π : from expected band structure and γ to 5/2 ⁺ level.
525.92 ⁱ 4	3/2 ⁻		BCD	J ^π : from E1 γ 's to 1/2 ⁺ and 5/2 ⁺ levels and L=1 in ($^3\text{He},\text{d}$).
534.45 ^{&} 8	15/2 ⁻		A C EF	J ^π : from D γ to 13/2 ⁻ and Q γ to 11/2 ⁻ level, and expected band structure.
554.12 9	(5/2 ⁻ ,7/2,9/2 ⁺)		B	J ^π : from γ 's to 5/2 ⁺ and 9/2 ⁻ levels.
579.50 ^h 10	9/2 ⁻	≤0.2 ns	A CDE	XREF: E(585). J ^π : from L=(5) in ($^3\text{He},\text{d}$), analysis of (pol t, α) data, and D γ to 7/2 ⁺ level. T _{1/2} : From (p,ny) study (1976Sc19).
583.85 ^c 10	11/2 ⁺		A C	J ^π : from Q γ to 7/2 ⁺ level and expected band structure.
592.66 ^k 4	3/2 ⁻		B	J ^π : from E2 γ to 7/2 ⁻ level and E1 γ to 3/2 ⁺ . J ^π : from model calcuations of 1992Bo45 , this state is 36% 3/2[541], 49% quadrupole vibration, and 9% octupole vibration.
598.80 ^g 12	9/2 ⁺		C F	J ^π : from γ 's to 5/2 ⁺ and 7/2 ⁺ levels and expected band structure.
649.02 ^k 10	5/2 ⁻		B D	XREF: D(646). J ^π : from E1 γ to 3/2 ⁺ level and E2 γ to 9/2 ⁻ .
674.50 ^e 9	13/2 ⁺		A C	J ^π : from Q γ to 9/2 ⁺ level, D γ to 11/2 ⁻ , and expected band structure.
694 ⁱ 2	7/2 ⁻		D	J ^π : from L=(3,4) in ($^3\text{He},\text{d}$) and band structure.
710.67 [‡] 4			B	
726.42 ^a 9	17/2 ⁻		A CD	J ^π : from Q γ to 13/2 ⁻ level, D γ to 15/2 ⁻ , and expected band structure.

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Adopted Levels, Gammas (continued) **^{161}Ho Levels (continued)**

E(level) [†]	J ^π #@	XREF	Comments
732.94 ^f 11	11/2 ⁺	C F	J^π : from D γ to 9/2 ⁺ level and expected band structure.
760.44 ^l 13	5/2 ⁺	B EF	J^π : from M1 γ to 7/2 ⁺ level, analysis of (pol t, α) data, and expected band structure.
788.12 ^h 11	13/2 ⁻	A C	J^π : from Q γ to 9/2 ⁻ level and D γ to 11/2 ⁺ .
821.08 ^b 21	13/2 ⁺	A C	J^π : Q γ to 9/2 ⁺ level, γ to 11/2 ⁺ , and expected band structure.
826.62 ^m 9	5/2 ⁻	B D F	J^π : from E1 γ to 3/2 ⁺ level and E2 γ to 9/2 ⁻ .
857.30 ^d 9	15/2 ⁺	A C	J^π : from D γ to 13/2 ⁻ level and Q γ to 11/2 ⁺ .
860 ^l 4	7/2 ⁺	EF	J^π : from analysis of (pol t, α) data.
906 ^m 4	7/2 ⁻	DEF	XREF: F(909).
906.84 ^c 12	15/2 ⁺	C	J^π : from analysis of (pol t, α) data.
920.68 ^g 14	(13/2 ⁺)	C	J^π : from expected band structure and γ 's to 9/2 ⁺ and 11/2 ⁺ levels.
931.64 ^{&} 10	19/2 ⁻	A C D	J^π : from Q γ to 15/2 ⁻ level, D γ to 17/2 ⁻ , and expected band structure.
933			
940		D F	
955 ⁿ 2	3/2 ⁺	D	J^π : from L=(2) in (³ He,d).
992 ^l	(9/2 ⁺)	EF	J^π : from analysis of (pol t, α) data.
1030 ^m	(9/2 ⁻)	F	J^π : from analysis of (pol t, α) data.
1059.53 ^e 10	17/2 ⁺	A C	J^π : from D γ to 15/2 ⁻ level, Q γ to 13/2 ⁺ , and expected band structure.
1084.41 ^h 13	17/2 ⁻	A C	J^π : from D γ to 15/2 ⁺ level, Q γ to 13/2 ⁻ , and expected band structure.
1096.01 ^f 18	(15/2 ⁺)	C	J^π : from γ 's to 11/2 ⁺ and (13/2 ⁺) and expected band structure.
1100 ^o 2	1/2 ⁺	D F	J^π : from L=0 in (³ He,d).
1128 ^m 3	11/2 ⁻	EF	J^π : from analysis of (pol t, α) data.
1137.1? [‡] 4	(5/2,7/2) ⁻	B	J^π : from E1 γ to 5/2 ⁺ level and γ to 7/2 ⁺ .
1167.29 ^a 11	21/2 ⁻	A C D	J^π : from Q γ to 17/2 ⁻ level, D γ to 19/2 ⁻ , and expected band structure.
1177 3			
1210.89 ^b 23	17/2 ⁺	A C	J^π : from Q γ to 13/2 ⁺ level, γ to 15/2 ⁺ , and expected band structure.
1214 2		D	
1232.85 14	(3/2) ⁺	B	J^π : from γ 's to 1/2 ⁻ , 1/2 ⁺ , and 7/2 ⁺ levels, but all γ 's are multiply placed.
1240.07 22	(1/2,3/2,5/2) ⁺	B	J^π : from M1 γ 's to 3/2 ⁺ levels.
1278.33 ^d 11	19/2 ⁺	A C	J^π : from D γ to 17/2 ⁻ level, γ 's to 15/2 ⁺ and 17/2 ⁺ , and expected band structure.
1280 ^p 2	(11/2 ⁻)	D	J^π : from L=(5) in (³ He,d).
1291 4		E	
1311.78 ^c 15	19/2 ⁺	A C	J^π : from Q γ to 15/2 ⁺ level and expected band structure.
1325.20? [‡] 19	(3/2,5/2) ⁺	B	J^π : from E1 γ to 3/2 ⁻ and γ 's to 5/2 ⁻ and 5/2 ⁺ .
1355 4		EF	
1394.46 16	(1/2 ^{+,3/2})	B d	XREF: d(1392).
1396.95 12	3/2 ⁻	B d	J^π : from γ 's to 1/2 ⁻ , 1/2 ⁺ , and 5/2 ⁺ levels, but most γ 's are multiply placed.
			XREF: d(1392).
1404.22 ^{&} 12	23/2 ⁻	A C	J^π : from Q γ to 19/2 ⁻ level and expected band structure.
1404.35 15	1/2,3/2	B	J^π : from γ 's to 1/2 ⁺ , 1/2 ⁻ , and 3/2 ⁻ levels.
1436 ^q 4	(1/2 ⁺)	DEF	J^π : from analysis of (pol t, α) data.
1457.67 10	3/2 ⁻	B	J^π : from E1 γ 's to 1/2 ⁺ and 3/2 ⁺ levels, and γ to 7/2 ⁻ .
1461.55 13	3/2 ⁻	B D	J^π : from E1 γ to 5/2 ⁺ level and γ 's to 1/2 ⁺ and 7/2 ⁻ .
1465.62 ^h 16	21/2 ⁻	A C	J^π : from Q γ to 17/2 ⁻ and expected band structure.
1488.33 12	3/2 ⁻	B De	XREF: e(1490).
1491.17 13	(3/2) ⁻	B eF	J^π : from M1 γ to 3/2 ⁻ level and γ 's to 1/2 ⁻ , 1/2 ⁺ , and 7/2 ⁻ .
			XREF: e(1490).
1514.03 ^e 13	21/2 ⁺	A C	J^π : from E1 γ to 5/2 ⁺ level and (E1) γ to 1/2 ⁺ .
1524.64 11	(5/2,7/2) ⁻	B D	J^π : from D γ to 19/2 ⁻ level, γ 's to 17/2 ⁺ and 19/2 ⁺ , and expected band structure.
			XREF: D(1519).

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Adopted Levels, Gammas (continued) **^{161}Ho Levels (continued)**

E(level) [†]	J ^π #@	XREF	Comments
1529 ^q 4	(5/2 ⁺)	eF	J ^π : from M1 γ to 5/2 ⁻ level, γ to 9/2 ⁻ , and multiply placed M1 γ to 3/2 ⁻ . XREF: e(1530).
1545 ^q	(3/2 ⁺)	eF	J ^π : from analysis of (pol t, α) data for doublet. XREF: e(1530).
1592 2		D	J ^π : from analysis of (pol t, α) data for doublet.
1640.45 14	(5/2 ⁺)	B D	XREF: D(1635). J ^π : from γ 's to 1/2 ⁺ , 7/2 ⁺ , and 7/2 ⁻ levels.
1644		D	
1656.64 10	5/2 ⁻	B	J ^π : from E1 γ 's to 3/2 ⁺ and 7/2 ⁺ levels.
1665 4		D	
1674.40 ^b 25	21/2 ⁺	A C	J ^π : from Q γ to 17/2 ⁺ level, γ to 16/2 ⁺ , and expected band structure. XREF: D(1674).
1675.31 18		B D	
1678.38 ^a 13	25/2 ⁻	A C	J ^π : from D γ to 23/2 ⁻ , γ to 21/2 ⁻ , and expected band structure.
1691.39 13	5/2 ⁺	B	J ^π : from γ 's to 1/2 ⁺ , 7/2 ⁺ , and 7/2 ⁻ levels.
1714.80 17	5/2 ⁻	B	J ^π : from E1 γ to 3/2 ⁺ level and γ 's to 7/2 ⁺ and 7/2 ⁻ .
1725 2		D	
1740.42 14	5/2 ⁻	B	J ^π : from M1 γ to 7/2 ⁻ level and γ 's to 3/2 ⁻ and 3/2 ⁺ .
1745.90 17	(3/2 ⁺ ,5/2 ⁺)	B	J ^π : from γ 's to 1/2 ⁺ and 7/2 ⁺ levels.
1762.30 ^d 22	23/2 ⁺	A C	J ^π : from (Q) γ to 19/2 ⁺ level, γ 's to 21/2 ⁻ and 21/2 ⁺ , and expected band structure.
1767 4		E	
1776.43 16	(3/2,5/2) ⁺	B	J ^π : from E2,M1 γ to 3/2 ⁺ level, γ 's to 1/2 ⁺ and 5/2 ⁻ . The placement of the 1352 γ to 1/2 ⁻ is only by 1972Wo08; if this is correct, J ^π is not 5/2 ⁺ .
1786.37 ^c 18	23/2 ⁺	A C	J ^π : from Q γ to 19/2 ⁺ level, γ to 21/2 ⁻ , and expected band structure.
1817.96 22	5/2 ⁺ ,7/2,9/2	B	J ^π : from γ 's to 7/2 ⁻ , 7/2 ⁺ , and 9/2 ⁺ levels.
1829.97 23	3/2 ⁻ ,5/2	B	J ^π : from γ 's to 3/2 ⁻ , 3/2 ⁺ , and 7/2 ⁻ levels.
1848.0 3		B	
1868.7 3	3/2 ⁻ ,5/2,7/2 ⁻	B	J ^π : from γ 's to 3/2 ⁻ and 7/2 ⁻ levels.
1926.93 ^h 19	25/2 ⁻	A C	J ^π : from expected band structure and γ to 21/2 ⁻ level.
1938.67 ^{&} 15	27/2 ⁻	A C	J ^π : from Q γ to 23/2 ⁻ level, γ to 25/2 ⁻ , and expected band structure.
1980 4		E	
2023.0 ^e	25/2 ⁺	A	J ^π : from γ 's to 23/2 ⁻ , 21/2 ⁺ and 23/2 ⁺ levels, and expected band structure.
2192.9 ^b	25/2 ⁺	A	J ^π : γ 's to 21/2 ⁺ and 23/2 ⁺ levels, and expected band structure.
2239.9 ^a	29/2 ⁻	A	J ^π : from γ 's to 25/2 ⁻ and 27/2 ⁻ levels and expected band structure.
2292.6 ^d	27/2 ⁺	A	J ^π : from γ 's to 25/2 ⁻ , 23/2 ⁺ and 25/2 ⁺ levels and expected band structure.
2310.7 ^c	27/2 ⁺	A C	XREF: C(2316.7). J ^π : from γ 's to 23/2 ⁺ and 21/2 ⁻ levels, and expected band structure.
2462 ^h	29/2 ⁻	A	J ^π : γ to 25/2 ⁻ and expected band structure.
2510.9 ^{&}	31/2 ⁻	A C	XREF: C(2512.0). J ^π : from Q γ to 27/2 ⁻ , γ to 29/2 ⁻ , and expected band structure.
2569.0 ^e	29/2 ⁺	A	J ^π : from γ to 25/2 ⁺ level, possible γ to 27/2 ⁺ , and expected band structure.
2738 ^b	29/2 ⁺	A	J ^π : γ to 25/2 ⁺ and expected band structure.
2813.8 ^a	33/2 ⁻	A	J ^π : from γ 's to 29/2 ⁻ and 31/2 ⁻ levels and expected band structure.
2845.6 ^d	31/2 ⁺	A	J ^π : from γ to 27/2 ⁺ , possible γ to 25/2 ⁺ , and expected band structure.
2863 ^c	31/2 ⁺	A	J ^π : γ to 27/2 ⁺ and expected band structure.
3065 ^h	33/2 ⁻	A	J ^π : γ to 29/2 ⁻ and expected band structure.
3079.9 ^{&} 10	35/2 ⁻	A C	XREF: C(3080.9). J ^π : from (Q) γ to 31/2 ⁻ , γ to 33/2 ⁻ , and expected band structure.
3125? ^e	(33/2 ⁺)	A	J ^π : possible γ to 29/2 ⁺ and expected band structure.
3277 ^b	33/2 ⁺	A	J ^π : γ to 29/2 ⁺ and expected band structure.
3361.6 ^a	37/2 ⁻	A	J ^π : from γ 's to 33/2 ⁻ and 35/2 ⁻ levels and expected band structure.
3392 ^d	35/2 ⁺	A	J ^π : from γ to 31/2 ⁺ and expected band structure.

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Adopted Levels, Gammas (continued) **^{161}Ho Levels (continued)**

E(level) [†]	J ^π # [‡]	XREF	Comments
3418 ^c	35/2 ⁺	A	J ^π : γ to 31/2 ⁺ and expected band structure.
3630.3 ^{&}	39/2 ⁻	A C	XREF: C(3625.7).
			J ^π : from γ 's to 35/2 ⁻ and 37/2 ⁻ levels and expected band structure.
3727 ^h	37/2 ⁻	A	J ^π : γ to 33/2 ⁻ and expected band structure.
3824 ^b	37/2 ⁺	A	J ^π : γ to 33/2 ⁺ and expected band structure.
3920.4 ^a	41/2 ⁻	A	J ^π : from γ 's to 37/2 ⁻ and 39/2 ⁻ levels and expected band structure.
3981 ^c	39/2 ⁺	A	J ^π : γ to 35/2 ⁺ and expected band structure.
4211.5 ^{&}	43/2 ⁻	A	J ^π : from γ 's to 39/2 ⁻ and 41/2 ⁻ levels and expected band structure.
4402 ^b	41/2 ⁺	A	J ^π : γ to 37/2 ⁺ and expected band structure.
4419 ^h	41/2 ⁻	A	J ^π : γ to 37/2 ⁻ and expected band structure.
4536.0 ^a	45/2 ⁻	A	J ^π : from γ 's to 41/2 ⁻ and 43/2 ⁻ levels and expected band structure.
4583 ^c	43/2 ⁺	A	J ^π : γ to 39/2 ⁺ and expected band structure.
4853.4 ^{&}	47/2 ⁻	A	J ^π : from γ 's to 43/2 ⁻ and 45/2 ⁻ levels and expected band structure.
5223.7 ^a	49/2 ⁻	A	J ^π : from γ 's to 45/2 ⁻ and 47/2 ⁻ levels and expected band structure.
5239 ^c	47/2 ⁺	A	J ^π : γ to 43/2 ⁺ and expected band structure.
5562 ^{&}	51/2 ⁻	A	J ^π : from γ to 47/2 ⁻ level and expected band structure.
5949 ^c	51/2 ⁺	A	J ^π : γ to 47/2 ⁺ and expected band structure.

[†] From least-squares fit to γ energies where γ transitions occur; otherwise from average of results of reaction studies. For γ 's whose energies are quoted to only the nearest keV, the ΔE values are assumed to be 1 keV. For levels all of whose deexciting γ 's are known to only the nearest keV no uncertainties are given for the level energies.

[‡] See the comment on this level in the ^{161}Er ε Decay data set.

[#] J^{π} and band assignments are based on the following: ce data from ^{161}Er ε decay studies; $\gamma(\theta)$ from in-beam studies, especially as they imply stretched E2 character of the γ 's; the agreement of measured and calculated cross sections for the charged-particle reactions; and the expected structure of the rotational bands.

[@] Wave functions from model calculations of [1992Bo45](#) show >88% of the state corresponds to the Nilsson state listed here for bandheads at 0, 211, 252, 298, 760, and 826 keV. The model results for the bandheads at 423, 446, and 592 keV are listed for those levels.

[&] Band(A): 7/2[523] g.s. band, $\alpha=-1/2$ branch. A=10.97 keV, B=2.5 eV, from energies of 7/2, 9/2, and 11/2 levels (i.e., both signatures).

^a Band(a): 7/2[523] g.s. band, $\alpha=+1/2$ branch.

^b Band(B): 1/2[411] band, $\alpha=+1/2$ branch. A=10.70 keV, B=74 eV, $\alpha=-0.676$, from 1/2, 3/2, 5/2, and 7/2 levels.

^c Band(b): 1/2[411] band, $\alpha=-1/2$ branch.

^d Band(C): 7/2[404] band, $\alpha=-1/2$ branch. A=13.36 keV, B=-15.1 eV, from 7/2, 9/2, and 11/2 levels.

^e Band(c): 7/2[404] band, $\alpha=+1/2$ branch.

^f Band(D): 3/2[411] band, $\alpha=-1/2$ branch. A=14.88 keV, B=-39 eV, $A_3=+89$ eV, from 3/2, 5/2, 7/2, and 9/2 levels.

^g Band(d): 3/2[411] band, $\alpha=+1/2$ branch.

^h Band(E): 1/2[541] band, $\alpha=+1/2$ branch. A=10.30 keV, B=-21 eV, $\alpha=2.30$, from 1/2, 3/2, 5/2, and 7/2 levels.

ⁱ Band(e): 1/2[541] band, $\alpha=-1/2$ branch.

^j Band(F): 5/2[402] bandhead.

^k Band(G): K-2 γ vibr based on g.s. band. Contains a mixture of 3/2[541]. A=11.27 keV, from 3/2 and 5/2 levels.

^l Band(H): 5/2[413] band. A=14.2 keV, from 5/2 and 7/2 levels.

^m Band(I): 5/2[532] band. A=11.3 keV.

ⁿ Band(J): K-2 γ vibr based on 7/2[404]. Contains an admixture of 3/2[402].

^o Band(K): K-2 γ vibr based on 5/2[402]. Contains an admixture of 1/2[400].

^p Band(L): 9/2[514] bandhead.

^q Band(M): 1/2[420] band. A=16.6 kev, $\alpha=1.19$. Levels are 1/2(1436), 3/2(1545), and 5/2(1529).

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$

$E_i(\text{level})$	J_i^π	E_γ^{\dagger}	$I_\gamma @$	E_f	J_f^π	Mult. &	δ	a^a	Comments
99.63	9/2 ⁻	99.63 3	100	0.0	7/2 ⁻	M1+E2	0.16	2.64	
211.15	1/2 ⁺	211.15 3	100	0.0	7/2 ⁻	E3		1.218	B(E3)(W.u.)=0.00281 4
221.95	11/2 ⁻	122.3 1	100	99.63	9/2 ⁻	(M1)			
		221.9 1	17	0.0	7/2 ⁻	(E2)			
222.43	3/2 ⁺	11.282 5	100	211.15	1/2 ⁺	M1		258	
252.68	7/2 ⁺	153.0 1	10.5 20	99.63	9/2 ⁻	(E1)		0.1020	B(E1)(W.u.)>2.9×10 ⁻⁵
		252.68 3	100 5	0.0	7/2 ⁻	E1		0.0275	B(E1)(W.u.)>6.2×10 ⁻⁵
298.68	3/2 ⁺	76.246 9	100 51	222.43	3/2 ⁺	M1			
		87.53 3	46 6	211.15	1/2 ⁺	M1			
316.56	5/2 ⁺	94.13 3	100 8	222.43	3/2 ⁺	M1+E2	0.15		
		105.4 1	7.3 13	211.15	1/2 ⁺	E2			
353.28	7/2 ⁺	36.7		316.56	5/2 ⁺	M1+E2	0.08	9.12	
		130.85 3	100	222.43	3/2 ⁺	E2		1.055	B(E2)(W.u.)=2.7×10 ² 8 The B(E2)(W.u.) value was calculated assuming that $I_\gamma(36.7\gamma)=0$ and thus represents an upper limit. of the 36.7 γ .
368.10	13/2 ⁻	146.1 1	100	221.95	11/2 ⁻	D			
		268.5 1	34	99.63	9/2 ⁻	Q			
370.77	9/2 ⁺	118.5 ^b 5	$\leq 28^b$	252.68	7/2 ⁺				
		148.6 2	37	221.95	11/2 ⁻				
		271.2 1	90	99.63	9/2 ⁻				
		370.8 1	100	0.0	7/2 ⁻	D			
373.24	5/2 ⁺	74.560 10	100	298.68	3/2 ⁺	M1+E2	0.10		
		150.9 3	50	222.43	3/2 ⁺	M1			
		162.1 1	41	211.15	1/2 ⁺	E2			
423.91	1/2 ⁻	125.4 2	1.1 3	298.68	3/2 ⁺				
		201.47 3	100 4	222.43	3/2 ⁺	E1			
		212.77 3	74 4	211.15	1/2 ⁺	E1			
446.83	5/2 ⁺	148.15 3	58 18	298.68	3/2 ⁺	M1+E2		0.77 9	Mult.: 2008Eg01, in ε decay, report that the dominant mult is M1.
		446.9 1	100 9	0.0	7/2 ⁻	E1		0.00690	
458.87	5/2 ⁻	105.7 1	6.0 19	353.28	7/2 ⁺	E1			
		236.43 3	100 5	222.43	3/2 ⁺	E1			
463.23	7/2 ⁺	90.0 1	64 20	373.24	5/2 ⁺	M1+E2	≈ 0.15	3.63	
		109.9 1	100 20	353.28	7/2 ⁺	M1		2.03	
		164.7 2	35 12	298.68	3/2 ⁺			0.476	
		240.9 2	27	222.43	3/2 ⁺				
511.78	11/2 ⁺	141.1 2	≤ 14	370.77	9/2 ⁺				I_γ : doublet, but other component is unplaced in in-beam study.
		258.7 2	13	252.68	7/2 ⁺				
		289.8 2	37	221.95	11/2 ⁻				Mult.: $\gamma(\theta)$ indicates Q, but placement suggests E1.
		412.2 1	100	99.63	9/2 ⁻	D			

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult. ^{&}	α ^a	Comments
519.57	9/2 ⁺	166 [#]		353.28	7/2 ⁺			
		203.0 2	100	316.56	5/2 ⁺			
525.92	3/2 ⁻	102.0 1	1.0 5	423.91	1/2 ⁻	M1		
		152.6 1	4.9 10	373.24	5/2 ⁺	E1		
		209.36 3	38 8	316.56	5/2 ⁺	E1		
		303.50 4	13.7 15	222.43	3/2 ⁺	E1		
		314.77 4	100 4	211.15	1/2 ⁺	E1		
534.45	15/2 ⁻	166.3 1	100	368.10	13/2 ⁻	D		
		312.5 1	53	221.95	11/2 ⁻	Q		
554.12	(5/2 ⁻ ,7/2 ⁺)	107.3 1	100 25	446.83	5/2 ⁺			
		180.9 3	25 8	373.24	5/2 ⁺			
		301 1	≈38	252.68	7/2 ⁺			
		454.3 4	90 25	99.63	9/2 ⁻			
		554.2 ^b 4	≤175 ^b	0.0	7/2 ⁻			
579.50	9/2 ⁻	226.3 1	100	353.28	7/2 ⁺	E1	0.0365	B(E1)(W.u.)>9.5×10 ⁻⁵
583.85	11/2 ⁺	230.5 1	100	353.28	7/2 ⁺	Q		
592.66	3/2 ⁻	219.4 2	2.1 3	373.24	5/2 ⁺			
		276.0 1	2.7 3	316.56	5/2 ⁺	E1		
		294.00 4	12.0 7	298.68	3/2 ⁺	E1		
		370.6 3	≤2.0	222.43	3/2 ⁺			
		592.6 1	100 10	0.0	7/2 ⁻	E2		
598.80	9/2 ⁺	135.7 2	98	463.23	7/2 ⁺	Q		
		225.5 2	100	373.24	5/2 ⁺			
		245.0 ^c 2	36	353.28	7/2 ⁺			
649.02	5/2 ⁻	350.4 2	9.7 14	298.68	3/2 ⁺	E1		
		549.4 2	38 6	99.63	9/2 ⁻	E2		
		649.0 2	100 12	0.0	7/2 ⁻	E2		Mult.: assigned E2 by 1972Ka37 and 1972Wo08 , and M1 by 1972Ha41 .
674.50	13/2 ⁺	162.3 2	≤8	511.78	11/2 ⁺			I _γ : γ is doubly placed in in-beam study.
		303.8 2	30	370.77	9/2 ⁺	Q		
		306.5 2	16	368.10	13/2 ⁻			Mult.: γ(θ) indicates Q, but placement suggests E1.
		452.6 1	100	221.95	11/2 ⁻	D		
710.6?		488.8 ^{‡c} 4	100 25	221.95	11/2 ⁻	M1		
		499.1 ^{‡c} 5	≤40 ^b	211.15	1/2 ⁺			
726.42	17/2 ⁻	191.9 1	100	534.45	15/2 ⁻	D		
		358.3 1	73	368.10	13/2 ⁻	Q		
732.94	11/2 ⁺	134.1 2	60	598.80	9/2 ⁺	D		
		269.7 1	100	463.23	7/2 ⁺			Mult.: γ(θ) indicates D, but placement suggests E2.
760.44	5/2 ⁺	507.6 2	100	252.68	7/2 ⁺	M1		
788.12	13/2 ⁻	204.2 1	100	583.85	11/2 ⁺	D		
		208.7 1	35	579.50	9/2 ⁻	Q		

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult.&	Comments
821.08	13/2 ⁺	237 [#]		583.85	11/2 ⁺		
		301.5 1	100	519.57	9/2 ⁺	Q	
826.62	5/2 ⁻	363.6 4	0.088 15	463.23	7/2 ⁺		
		528.0 2	0.61 4	298.68	3/2 ⁺	E1	
		573.8 10	≈0.06	252.68	7/2 ⁺	E1	
		726.8 4	1.31 19	99.63	9/2 ⁻	E2	
		826.6 1	100 5	0.0	7/2 ⁻	M1	
857.30	15/2 ⁺	183 [#]		674.50	13/2 ⁺		
		345.6 1	45	511.78	11/2 ⁺	Q	
		489.2 1	100	368.10	13/2 ⁻	D	
906.84	15/2 ⁺	118.5 ^b 5	≤9 ^b	788.12	13/2 ⁻		
		323.0 1	100	583.85	11/2 ⁺	Q	
920.68	(13/2 ⁺)	187.7 2	28	732.94	11/2 ⁺		
		321.9 1	100	598.80	9/2 ⁺		
931.64	19/2 ⁻	205.2 1	100	726.42	17/2 ⁻	D	
		397.2 1	100	534.45	15/2 ⁻	Q	
1059.53	17/2 ⁺	202 [#]		857.30	15/2 ⁺		
		385.0 1	57	674.50	13/2 ⁺	Q	
		525.1 1	100	534.45	15/2 ⁻	D	
1084.41	17/2 ⁻	177.5 1	35	906.84	15/2 ⁺	D	
1096.01	(15/2 ⁺)	296.3 1	100	788.12	13/2 ⁻	Q	
		175.4 2	52	920.68	(13/2 ⁺)	D	
		363.0 2	100	732.94	11/2 ⁺		
1137.1?	(5/2,7/2) ⁻	376.6 ^{‡c} 2	100 21	760.44	5/2 ⁺	E1	
		783.9 ^{‡c} 4	46 16	353.28	7/2 ⁺		
		885.2 ^{‡c} 6	35 16	252.68	7/2 ⁺		
1167.29	21/2 ⁻	235.5 1	76	931.64	19/2 ⁻	D	
		440.9 1	100	726.42	17/2 ⁻	Q	
1210.89	17/2 ⁺	114.9 ^c 2	11	1096.01	(15/2 ⁺)		
		304 [#]		906.84	15/2 ⁺		
		389.8 1	100	821.08	13/2 ⁺	Q	
1232.85	(3/2) ⁺	808.8 ^b 3	^b	423.91	1/2 ⁻		
		980.2 2		252.68	7/2 ⁺		
		1010.8 ^b 3	^b	222.43	3/2 ⁺		
		1021.4 3		211.15	1/2 ⁺		
1240.07	(1/2,3/2,5/2) ⁺	923.0 7	22 11	316.56	5/2 ⁺		
		941.0 3	100 14	298.68	3/2 ⁺	M1	
		1018.3 4	31 14	222.43	3/2 ⁺	M1	

I_γ: no I_γ given since all 4 γ's from level are multiply placed.
 Mult.: assigned E2 ([1972Ha41](#), [1979DzZZ](#)), but γ multiply placed.
 Mult.: assigned M1 ([1979DzZZ](#)), but γ multiply placed.
 Mult.: assigned M1 ([1979DzZZ](#)), but γ multiply placed.
 Mult.: assigned M1 ([1979DzZZ](#)), but γ multiply placed.

Adopted Levels, Gammas (continued)

 $\gamma^{(161)\text{Ho}}$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult.&	Comments
1240.07	(1/2,3/2,5/2) ⁺	1029.4 ^b 6	≤35 ^b	211.15	1/2 ⁺		
1278.33	19/2 ⁺	219 [#]		1059.53	17/2 ⁺		
		421.1 1	83	857.30	15/2 ⁺		
		551.8 1	100	726.42	17/2 ⁻	D	
1311.78	19/2 ⁺	227.2 2	15	1084.41	17/2 ⁻		
		405.0 1	100	906.84	15/2 ⁺	Q	
1325.20?	(3/2,5/2) ⁺	499.1 ^{b‡c} 5	≤28 ^b	826.62	5/2 ⁻		
		799.4 ^{‡c} 3	100 21	525.92	3/2 ⁻	E1	
		951.3 ^{‡c} 6	19 12	373.24	5/2 ⁺		
		1102.6 ^{b‡c} 3	≤149 ^b	222.43	3/2 ⁺		Mult.: assigned E1 (1972Ka37), but γ multiply placed.
1394.46	(1/2 ⁺ ,3/2)	868.8 ^b 3	^b	525.92	3/2 ⁻		I _γ : no I _γ given since all 6 γ 's from level are multiply placed.
		970.4 ^b 4	^b	423.91	1/2 ⁻		Mult.: assigned M1,E2 (1972Ka37), but γ multiply placed.
		1021.4 4		373.24	5/2 ⁺		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1077.8 ^b 4	^b	316.56	5/2 ⁺		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1171.8 ^b 3	^b	222.43	3/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1183.3 ^b 5	^b	211.15	1/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
1396.95	3/2 ⁻	747.4 6	15 5	649.02	5/2 ⁻		
		804.4 2	77 19	592.66	3/2 ⁻	E2	
		871.2 5	19 6	525.92	3/2 ⁻		
		937.3 6	16 6	458.87	5/2 ⁻	(M1)	
		973.0 3	71 10	423.91	1/2 ⁻	M1	
		1098.2 ^b 3	≤74 ^b	298.68	3/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1174.6 ^b 3	≤160 ^b	222.43	3/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
1404.22	23/2 ⁻	1185.8 4	100 12	211.15	1/2 ⁺	E1	I _γ : doublet, but other component is not placed. Mult.: $\gamma(\theta)$ indicates D, but γ is doublet in in-beam study.
		236.9 1	≤64	1167.29	21/2 ⁻		
1404.35	1/2,3/2	472.7 1	100	931.64	19/2 ⁻	Q	Mult.: assigned E2 by 1972Wo08 and 1979DzZZ , and M1 by 1972Ha41 ; but γ multiply placed.
		812.1 ^b 3	≤133 ^b	592.66	3/2 ⁻		
		878.6 5	100 17	525.92	3/2 ⁻		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		980.2 ^b 2	≤50 ^b	423.91	1/2 ⁻		E _γ : placements conflict; 1972Ka37 place a 1193 γ from 1404 and 1656 levels only and 1972Wo08 place it from 1491 level only.
		1193.2 ^b 3	≤272 ^b	211.15	1/2 ⁺		
1457.67	3/2 ⁻	808.8 ^b 3	≤15 ^b	649.02	5/2 ⁻		Mult.: assigned E2 (1972Ka37 , 1979DzZZ), but γ multiply placed.
		864.9 3	100 14	592.66	3/2 ⁻		Mult.: assigned M1 (1972Ka37 , 1972Ha41 , 1972Wo08), but γ multiply placed.
		931.7 ^b 2	≤141 ^b	525.92	3/2 ⁻		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		998.8 ^b 2	2.8 ^b	458.87	5/2 ⁻		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.

Adopted Levels, Gammas (continued)

 $\gamma^{(161)\text{Ho}}$ (continued)

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E _i (level)	J _i ^π	E _γ [†]	I _γ [@]	E _f	J _f ^π	Mult.	&	Comments
1457.67	3/2 ⁻	1010.8 ^b 4	≤7.6 ^b	446.83	5/2 ⁺	E1		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1158.9 2	42 4	298.68	3/2 ⁺			
		1247.2 4	21 3	211.15	1/2 ⁺			
		1456.4 ^b 9	≤2.0 ^b	0.0	7/2 ⁻			
1461.55	3/2 ⁻	812.1 ^b 4	20 ^b	649.02	5/2 ⁻	E1		Mult.: assigned E2 by 1972Wo08 and 1979DzZZ , and M1 by 1972Ha41 ; but γ multiply placed.
		868.8 ^b 3	≤60 ^b	592.66	3/2 ⁻			
		935.6 6	14 4	525.92	3/2 ⁻			
		1038.1 5	9.2 24	423.91	1/2 ⁻			
		1088.6 5	7.6 20	373.24	5/2 ⁺			
		1145.1 3	100 20	316.56	5/2 ⁺			
		1162.8 5	3.8 26	298.68	3/2 ⁺			
		1238.8 4	17 2	222.43	3/2 ⁺			
		1250.4 ^b 4	62 ^b	211.15	1/2 ⁺			
		1461.8 4	20.6 24	0.0	7/2 ⁻			
1465.62	21/2 ⁻	153.9 6	16	1311.78	19/2 ⁺	E1		I _γ : reported I _γ =32 divided by evaluator based on I _γ (153)/I _γ (252)=4.2/40 from 252 level in ¹⁶¹ Er ε decay. Mult.: $\gamma(\theta)$ indicates D, but γ is doublet.
1488.33	3/2 ⁻	381.2 1	100	1084.41	17/2 ⁻			
		839.4 4	66 14	649.02	5/2 ⁻	(M1)		Mult.: assigned M1 (1972Ka37), but γ multiply placed.
		895.7 ^b 2	≤417 ^b	592.66	3/2 ⁻			
		962.4 4	100 14	525.92	3/2 ⁻			
		1029.4 ^b 8	≤27 ^b	458.87	5/2 ⁻			
		1065.0 ^b 4	≤23 ^b	423.91	1/2 ⁻			
		1114.8 ^b 4	≤45 ^b	373.24	5/2 ⁺			
		1171.8 ^b 3	≤280 ^b	316.56	5/2 ⁺			
		1189.8 5	53 11	298.68	3/2 ⁺			
1491.17	(3/2) ⁻	1276.4 ^b 4	≤92 ^b	211.15	1/2 ⁺	E1		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1488.4 ^b 4	98 ^b	0.0	7/2 ⁻			
		842.2 4	9 4	649.02	5/2 ⁻			
		898.2 6	8 6	592.66	3/2 ⁻			
		964.5 9	5 4	525.92	3/2 ⁻			
		1117.9 3	33 4	373.24	5/2 ⁺			
		1174.6 ^b 3	100 ^b	316.56	5/2 ⁺			
		1193.2 ^b 3	≤92 ^b	298.68	3/2 ⁺			
		1268.2 ^b 3	17 ^b	222.43	3/2 ⁺			
		1280.0 3	87 6	211.15	1/2 ⁺			

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult. ^{&}	Comments
1514.03	21/2 ⁺	235 [#]		1278.33	19/2 ⁺		
		454.5 1	≤204	1059.53	17/2 ⁺		Mult.: $\gamma(\theta)$ indicates Q, but γ is doublet.
		582.5 2	100	931.64	19/2 ⁻	D	
1524.64	(5/2,7/2) ⁻	875.8 3	100 12	649.02	5/2 ⁻	M1	
		931.7 ^b 2	42 ^b	592.66	3/2 ⁻		Mult.: assigned M1 (1972Ka37 , 1972Ha41 , 1972Wo08), but γ multiply placed.
		970.4 ^b 4	≤46 ^b	554.12	(5/2 ⁻ ,7/2,9/2 ⁺)		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		998.8 ^b 2	35 ^b	525.92	3/2 ⁻		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1061.6 4	16 6	463.23	7/2 ⁺		
		1077.8 ^b 3	≤33 ^b	446.83	5/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1425.4 4	20 4	99.63	9/2 ⁻		
		1524.3 ^b 8	≤18 ^b	0.0	7/2 ⁻		
1640.45	(5/2 ⁺)	503.4 5	5.8 25	1137.1?	(5/2,7/2) ⁻		
		880.8 6	5.0 38	760.44	5/2 ⁺		
		1047.6 3	13.1 19	592.66	3/2 ⁻		Mult.: assigned as M1 (1979DzZZ), but placement suggests E1.
		1114.8 ^b 6	≤11 ^b	525.92	3/2 ⁻		
		1287.1 5	5.6 15	353.28	7/2 ⁺		
		1324.8 6	3.7 12	316.56	5/2 ⁺		
		1341.4 ^b 6	≤15 ^b	298.68	3/2 ⁺		
		1417.8 3	100 10	222.43	3/2 ⁺		
		1429.2 ^b 3	≤58 ^b	211.15	1/2 ⁺		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1640.6 ^b 4	≤4 ^b	0.0	7/2 ⁻		
1656.64	5/2 ⁻	895.7 ^b 2	21 ^b	760.44	5/2 ⁺		Mult.: assigned M1 (1972Ka37), but γ multiply placed. Placement suggests E1.
		1065.0 ^b 4	6 ^b	592.66	3/2 ⁻		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1102.6 ^b 3	≤35 ^b	554.12	(5/2 ⁻ ,7/2,9/2 ⁺)		Mult.: assigned E1 (1972Ka37), but γ multiply placed.
		1193.2 ^b 3	≤94 ^b	463.23	7/2 ⁺		E _γ : placements conflict; 1972Ka37 place a 1193 γ from 1404 and 1656 levels and 1972Wo08 place it from 1491 level only.
		1209.8 2	62 6	446.83	5/2 ⁺	E1	
		1283.6 9	3.8 15	373.24	5/2 ⁺		
		1303.2 4	62 8	353.28	7/2 ⁺	(E1)	
		1358.2 3	100 10	298.68	3/2 ⁺	E1	
		1404.4 5	2.8 10	252.68	7/2 ⁺		
		1434.5 3	33 4	222.43	3/2 ⁺		
		1656.7 4	90 8	0.0	7/2 ⁻		
1674.40	21/2 ⁺	363 [#]		1311.78	19/2 ⁺		Mult.: assigned M1 by 1972Ka37 , but E2 by 1972Wo08 .
		463.5 1	100	1210.89	17/2 ⁺	Q	
1675.31		1228.2 ^b 3	≤210 ^b	446.83	5/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1377.0 5	100 28	298.68	3/2 ⁺		
		1452.7 4	68 19	222.43	3/2 ⁺		

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult.&	Comments
1675.31		1464.4 ^b 3	≤415 ^b	211.15	1/2 ⁺		
1678.38	25/2 ⁻	274.2 1	46	1404.22	23/2 ⁻	D	Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		511.0 1	100	1167.29	21/2 ⁻		
1691.39	5/2 ⁺	554.2 ^b 4	≤35 ^b	1137.1?	(5/2,7/2) ⁻		
		1098.2 ^b 3	≤110 ^b	592.66	3/2 ⁻		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1228.2 ^b 4	≤56 ^b	463.23	7/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
		1318.2 ^b 4	≤53 ^b	373.24	5/2 ⁺		
		1338.2 3	100 15	353.28	7/2 ⁺		Mult.: assigned E1 (1972Ka37); but then decay of this γ to 7/2 ⁺ level conflicts with placement of other γ 's to 1/2 ⁺ .
		1374.9 5	26 9	316.56	5/2 ⁺		
		1392.8 ^b 3	≤40 ^b	298.68	3/2 ⁺		
		1469.0 4	39 6	222.43	3/2 ⁺		
		1480.6 4	28 6	211.15	1/2 ⁺		
		1691.7 9	3.5 35	0.0	7/2 ⁻		
1714.80	5/2 ⁻	954.7 6	19 12	760.44	5/2 ⁺		
		1268.2 ^b 3	69 ^b	446.83	5/2 ⁺		
		1341.4 ^b 5	≤62 ^b	373.24	5/2 ⁺		
		1361.4 4	84 23	353.28	7/2 ⁺		
		1492.2 3	100 15	222.43	3/2 ⁺	E1	
		1714.7 5	18 6	0.0	7/2 ⁻		
1740.42	5/2 ⁻	913.3 9	5 5	826.62	5/2 ⁻		
		980.2 ^b 2	≤26 ^b	760.44	5/2 ⁺		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1147.3 5	32 6	592.66	3/2 ⁻		
		1293.6 6	5 2	446.83	5/2 ⁺		
		1387.0 4	11 4	353.28	7/2 ⁺		
		1488.4 ^b 4	3 ^b	252.68	7/2 ⁺		
		1517.8 5	12 3	222.43	3/2 ⁺		
		1640.5 ^b 5	≤6.2 ^b	99.63	9/2 ⁻		
1745.90	(3/2 ⁺ ,5/2 ⁺)	1740.0 3	100 9	0.0	7/2 ⁻	M1	
		1299.3 6	86 43	446.83	5/2 ⁺		
		1371.8 6	100 43	373.24	5/2 ⁺		
		1392.8 ^b 3	≤376 ^b	353.28	7/2 ⁺		
		1429.2 ^b 3	≤1430 ^b	316.56	5/2 ⁺		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
		1447.2 ^b 5	≤129 ^b	298.68	3/2 ⁺		
		1524.3 ^b 7	≤224 ^b	222.43	3/2 ⁺		
		1534.6 5	62 24	211.15	1/2 ⁺		
1762.30	23/2 ⁺	249 [#]		1514.03	21/2 ⁺		
12							

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult. &	Comments
1762.30	23/2 ⁺	483.9 2 595#	100	1278.33	19/2 ⁺	(Q)	
				1167.29	21/2 ⁻		
1776.43	(3/2,5/2) ⁺	1183.3 ^b 4 1250.4 ^b 4 1318.2 ^b 4 1352.4 6 1477.8 6 1553.8 3	≤215 ^b 15 ^b ≤82 ^b 13 7 22 7 100 12	592.66 525.92 458.87 423.91 298.68 222.43	3/2 ⁻ 3/2 ⁻ 5/2 ⁻ 1/2 ⁻ 3/2 ⁺ 3/2 ⁺		Mult.: assigned E1 (1979DzZZ), but γ multiply placed.
1786.37	23/2 ⁺	320.2 ^c 2 474.6 1	25 100	1465.62 1311.78	21/2 ⁻ 19/2 ⁺	Q	
1817.96	5/2 ⁺ ,7/2,9/2	1447.2 ^b 5 1464.4 ^b 3 1565.6 ^b 4	≤540 ^b ≤4400 ^b ≤340 ^b	370.77 353.28 252.68	9/2 ⁺ 7/2 ⁺ 7/2 ⁺		Mult.: assigned M1 (1979DzZZ), but γ multiply placed.
1829.97	3/2 ⁻ ,5/2	1236.8 9 1383.2 3 1456.4 ^b 9 1531.6 ^b 6 1818.8 9	12 9 100 11 ≤18 ^b ≤16 ^b 100 60	592.66 446.83 373.24 298.68 0.0	3/2 ⁻ 5/2 ⁺ 5/2 ⁺ 3/2 ⁺ 7/2 ⁻		
1848.0		1531.6 ^b 5 1549.7 9 1625.4 4	≤165 ^b 63 44 100 36	316.56 298.68 222.43	5/2 ⁺ 3/2 ⁺ 3/2 ⁺		
1868.7	3/2 ⁻ ,5/2,7/2 ⁻	1276.4 ^b 4 1342.9 6 1495.2 9 1867.8 6	≤270. ^b 100 33 22 16 27 7	592.66 525.92 373.24 0.0	3/2 ⁻ 3/2 ⁻ 5/2 ⁺ 7/2 ⁻		
1926.93	25/2 ⁻	461.3 1	100	1465.62	21/2 ⁻		I _γ : doublet, but other component not placed in in-beam. Mult.: $\gamma(\theta)$ indicates Q, but γ is doublet.
1938.67	27/2 ⁻	260.1 2 534.5 1	41 100	1678.38 1404.22	25/2 ⁻ 23/2 ⁻		
2023.0	25/2 ⁺	260 510 619		1762.30 1514.03 1404.22	23/2 ⁺ 21/2 ⁺ 23/2 ⁻	Q	
2192.9	25/2 ⁺	407 518		1786.37 1674.40	23/2 ⁺ 21/2 ⁺		
2239.9	29/2 ⁻	301 562		1938.67 1678.38	27/2 ⁻ 25/2 ⁻		

Adopted Levels, Gammas (continued)

 $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J ^π _i	E _γ [†]	I _γ [@]	E _f	J ^π _f	Mult.&	Comments
2292.6	27/2 ⁺	270		2023.0	25/2 ⁺		
		530		1762.30	23/2 ⁺		
		614		1678.38	25/2 ⁻		
2310.7	27/2 ⁺	383		1926.93	25/2 ⁻		
		525		1786.37	23/2 ⁺		
2462	29/2 ⁻	535		1926.93	25/2 ⁻		
2510.9	31/2 ⁻	271		2239.9	29/2 ⁻		
		572		1938.67	27/2 ⁻	Q	Mult.: quoted assuming that this γ is the same as the 573.3 γ in the (α ,2n γ) study, for which mult=Q is reported.
2569.0	29/2 ⁺	276 ^c		2292.6	27/2 ⁺		
		546		2023.0	25/2 ⁺		
2738	29/2 ⁺	545		2192.9	25/2 ⁺		
2813.8	33/2 ⁻	303		2510.9	31/2 ⁻		
		574		2239.9	29/2 ⁻		
2845.6	31/2 ⁺	277 ^c		2569.0	29/2 ⁺		
		553		2292.6	27/2 ⁺		
2863	31/2 ⁺	552		2310.7	27/2 ⁺		
3065	33/2 ⁻	603		2462	29/2 ⁻		
3079.9	35/2 ⁻	266 [#]		2813.8	33/2 ⁻		
		568.9 8	100	2510.9	31/2 ⁻	(Q)	
3125?	(33/2 ⁺)	557 ^c		2569.0	29/2 ⁺		
3277	33/2 ⁺	539		2738	29/2 ⁺		
3361.6	37/2 ⁻	282		3079.9	35/2 ⁻		
		548		2813.8	33/2 ⁻		
3392	35/2 ⁺	546		2845.6	31/2 ⁺		
3418	35/2 ⁺	555		2863	31/2 ⁺		
3630.3	39/2 ⁻	269		3361.6	37/2 ⁻		
		550		3079.9	35/2 ⁻		
3727	37/2 ⁻	662		3065	33/2 ⁻		
3824	37/2 ⁺	547		3277	33/2 ⁺		
3920.4	41/2 ⁻	290		3630.3	39/2 ⁻		
		559		3361.6	37/2 ⁻		
3981	39/2 ⁺	563		3418	35/2 ⁺		
4211.5	43/2 ⁻	291		3920.4	41/2 ⁻		
		581		3630.3	39/2 ⁻		
4402	41/2 ⁺	578		3824	37/2 ⁺		
4419	41/2 ⁻	692		3727	37/2 ⁻		
4536.0	45/2 ⁻	324		4211.5	43/2 ⁻		
		616		3920.4	41/2 ⁻		
4583	43/2 ⁺	602		3981	39/2 ⁺		
4853.4	47/2 ⁻	317		4536.0	45/2 ⁻		

Adopted Levels, Gammas (continued) $\gamma(^{161}\text{Ho})$ (continued)

E _i (level)	J _i ^π	E _γ [†]	E _f	J _f ^π
4853.4	47/2 ⁻	642	4211.5	43/2 ⁻
5223.7	49/2 ⁻	370	4853.4	47/2 ⁻
		688	4536.0	45/2 ⁻
5239	47/2 ⁺	656	4583	43/2 ⁺
5562	51/2 ⁻	709	4853.4	47/2 ⁻
5949	51/2 ⁺	710	5239	47/2 ⁺

[†] From decay-scheme studies (primarily [1972Ka37](#) and [1972Wo08](#)) and in-beam studies (primarily [1971Fu08](#) and [2004Es01](#)). Unplaced γ 's from ¹⁶¹Er ε decay and in-beam studies are not included here. γ 's listed only to the nearest keV are generally from [2004Es01](#).

[‡] See the comment on this γ in the ¹⁶¹Er ε decay data set.

[#] From [2004Es01](#), ¹⁶⁰Gd(⁷Li,6ny). γ not reported in the other in-beam studies.

[@] Average of available data from decay scheme and in-beam studies.

[&] Multipolarities are based primarily on relative internal-conversion subshell intensities ([1965Gr35](#)) and $\alpha(K)\exp$ values ([1972Ka37](#)) in ¹⁶¹Er ε decay, and $\gamma(\theta)$ from ($\alpha,2n\gamma$) study ([1971Fu08](#)). The Q are generally taken to be stretched E2. See the ¹⁶¹Er ε decay and ($\alpha,2n\gamma$) for the experimental results.

^a 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.

^b Multiply placed with undivided intensity.

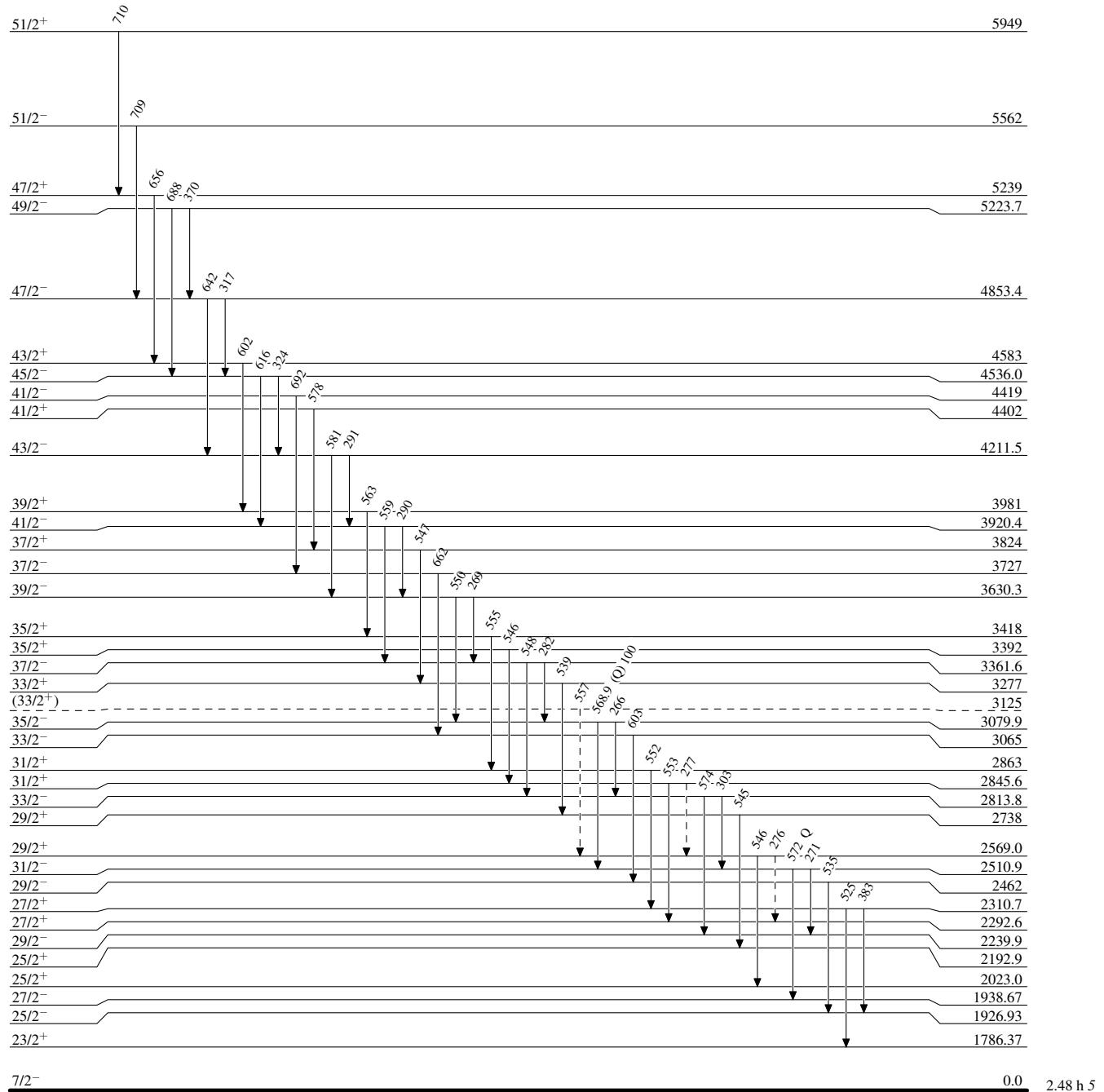
^c Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

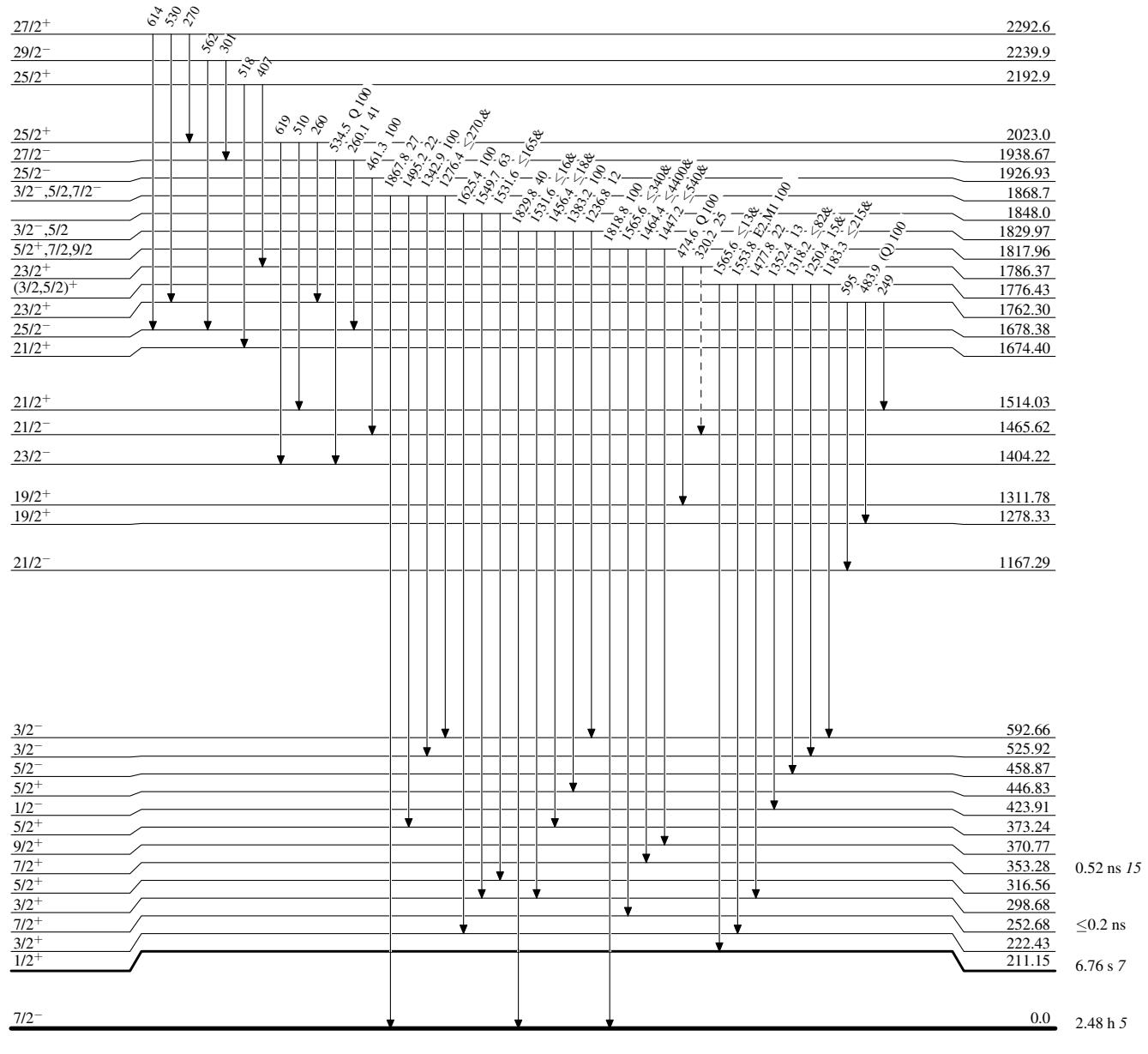
- - - - - γ Decay (Uncertain)

Adopted Levels, Gammas

Legend

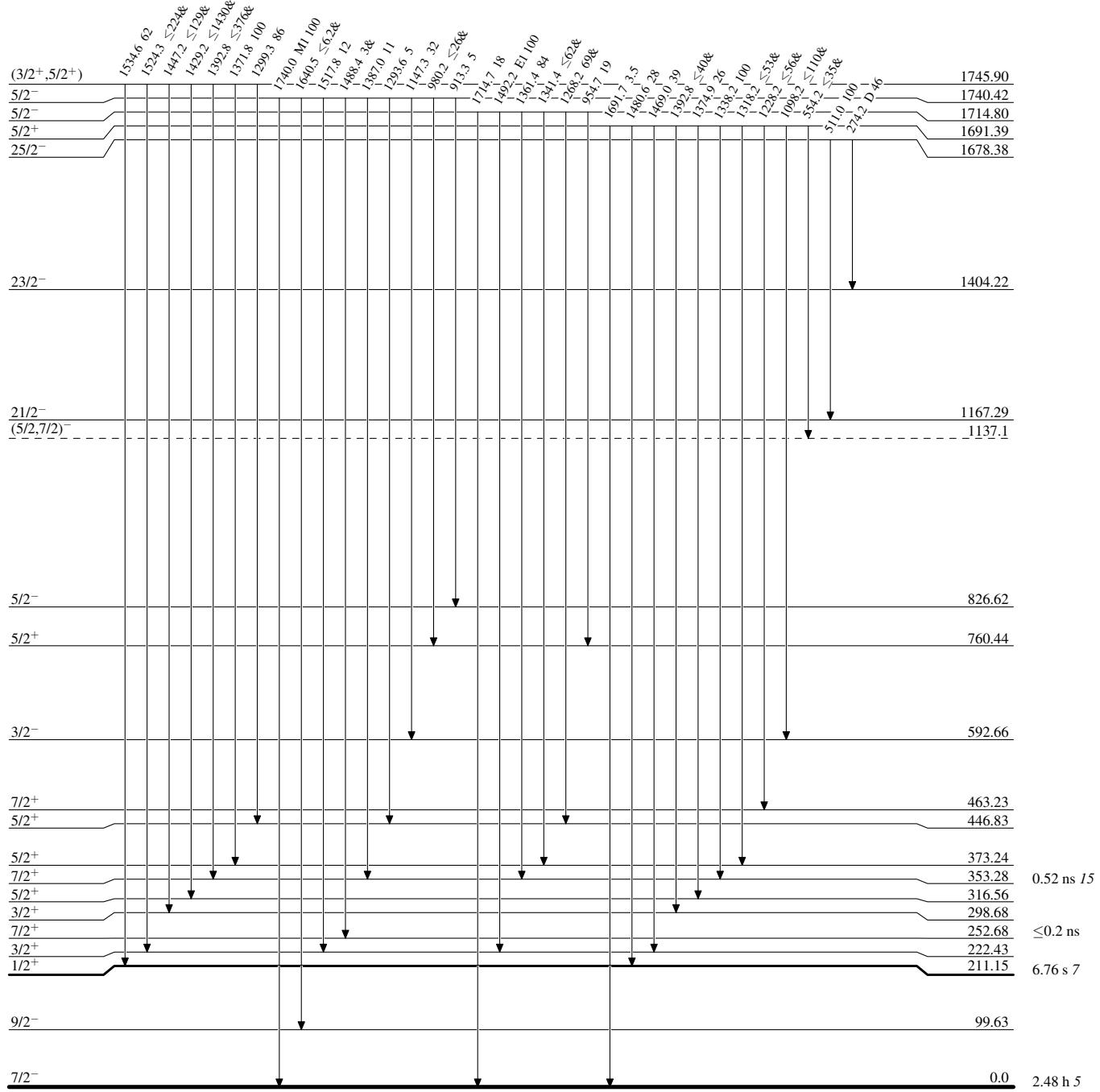
Level Scheme (continued)

Intensities: Relative photon branching from each level
 & Multiply placed: undivided intensity given

Adopted Levels, Gammas**Level Scheme (continued)**

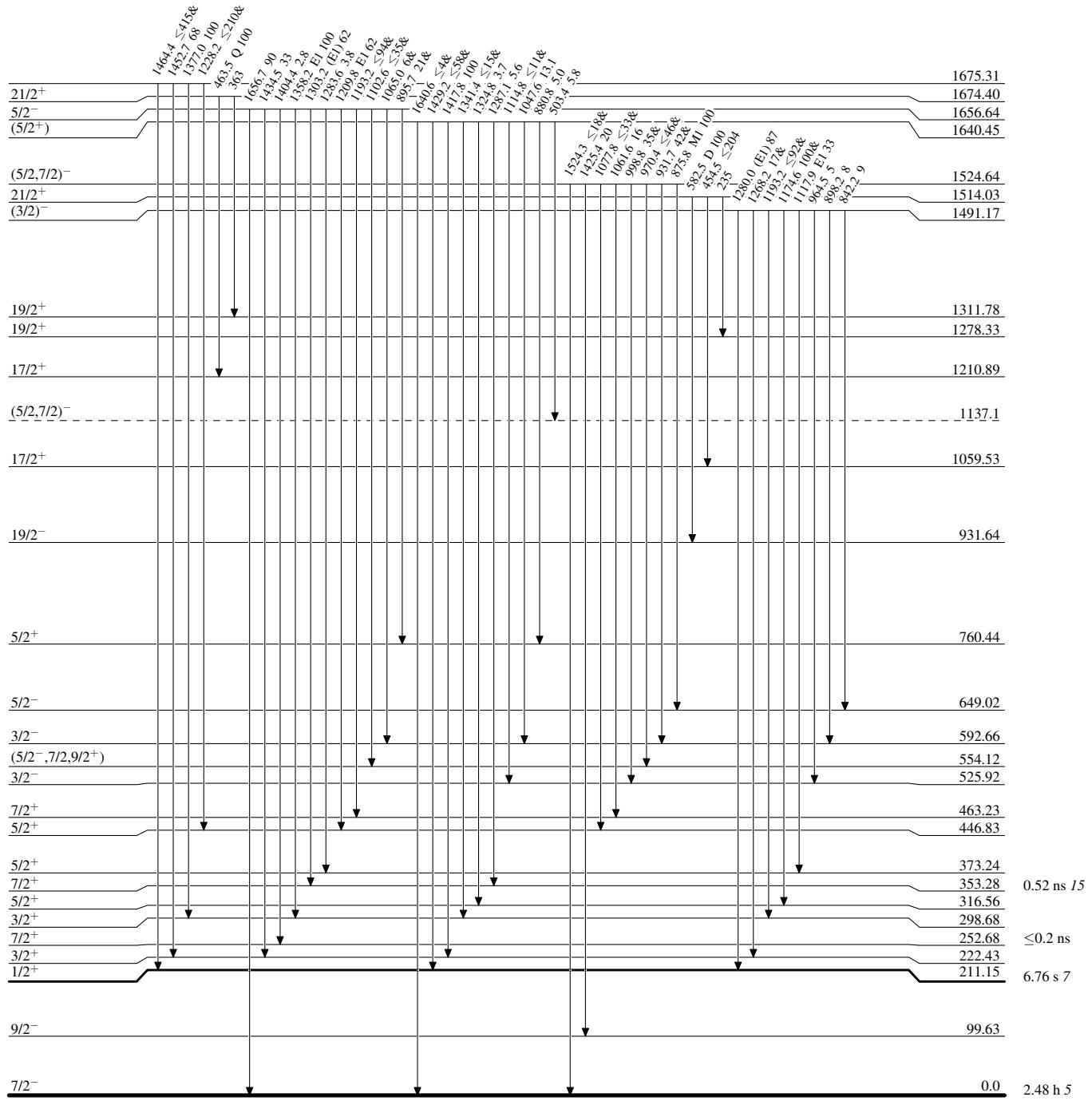
Intensities: Relative photon branching from each level
 & Multiply placed: undivided intensity given



Adopted Levels, Gammas

Level Scheme (continued)

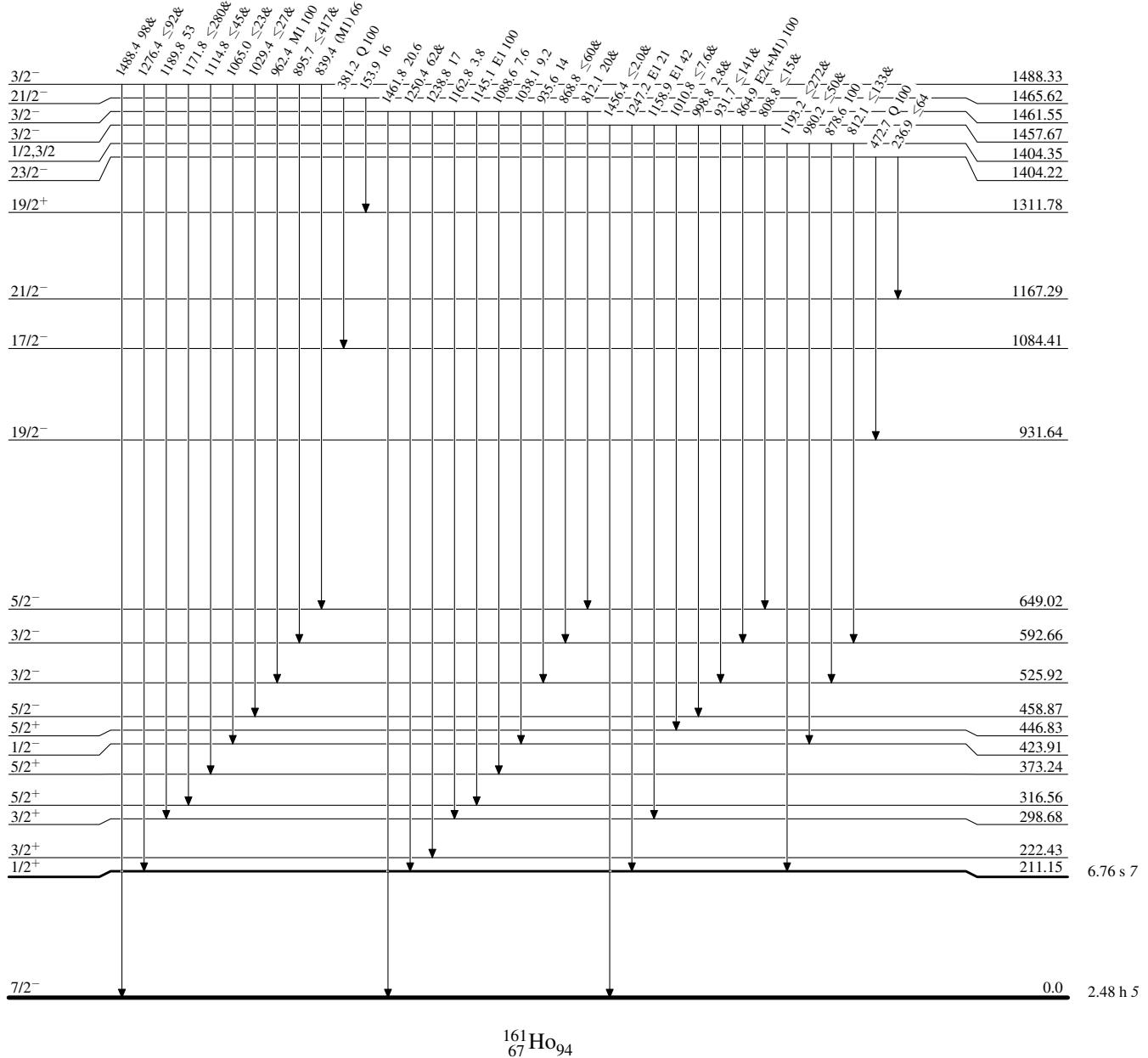
Intensities: Relative photon branching from each level
 & Multiply placed: undivided intensity given



Adopted Levels, Gammas

Level Scheme (continued)

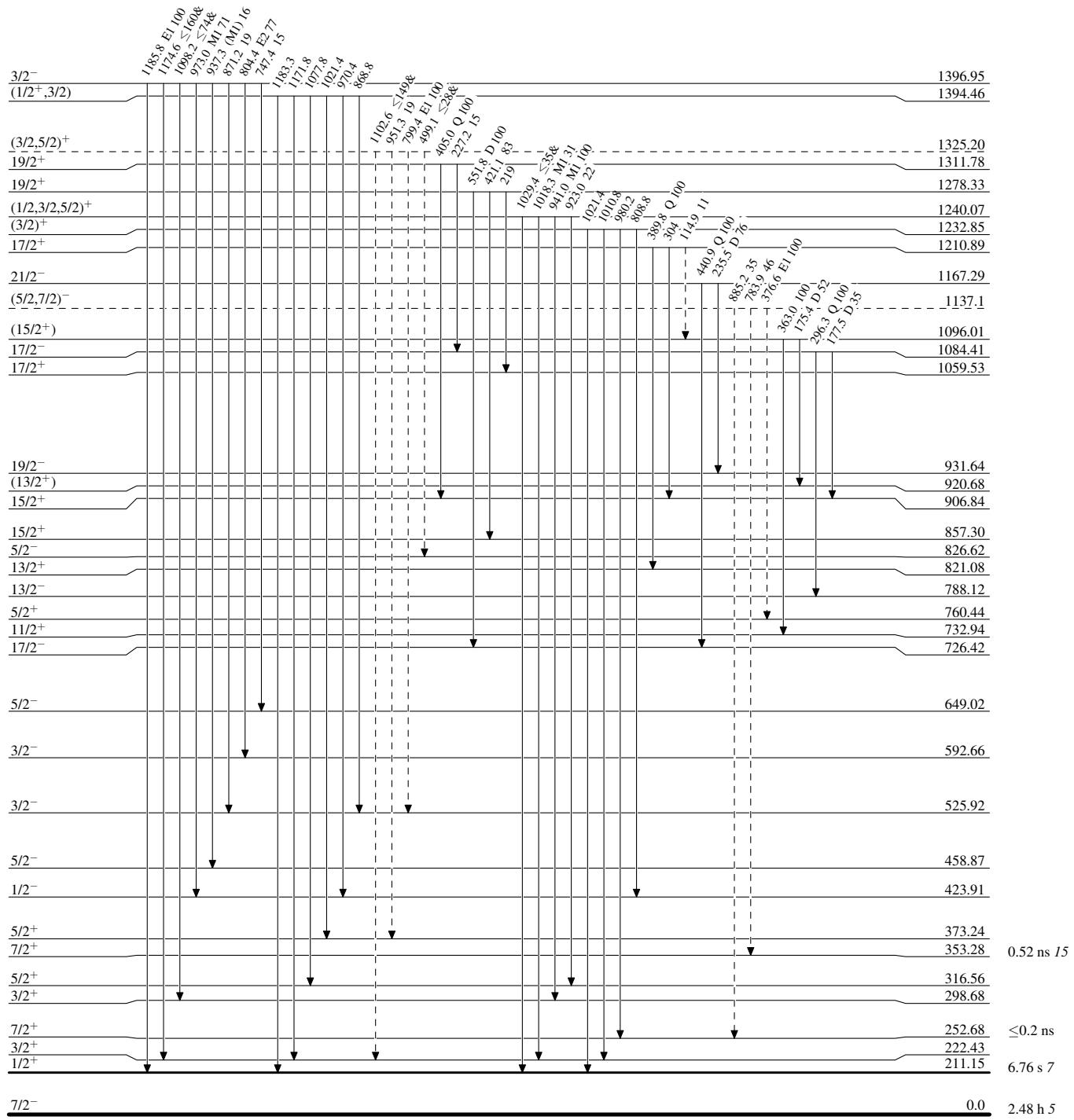
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas**Level Scheme (continued)**

Legend

Intensities: Relative photon branching from each level
 & Multiply placed: undivided intensity given



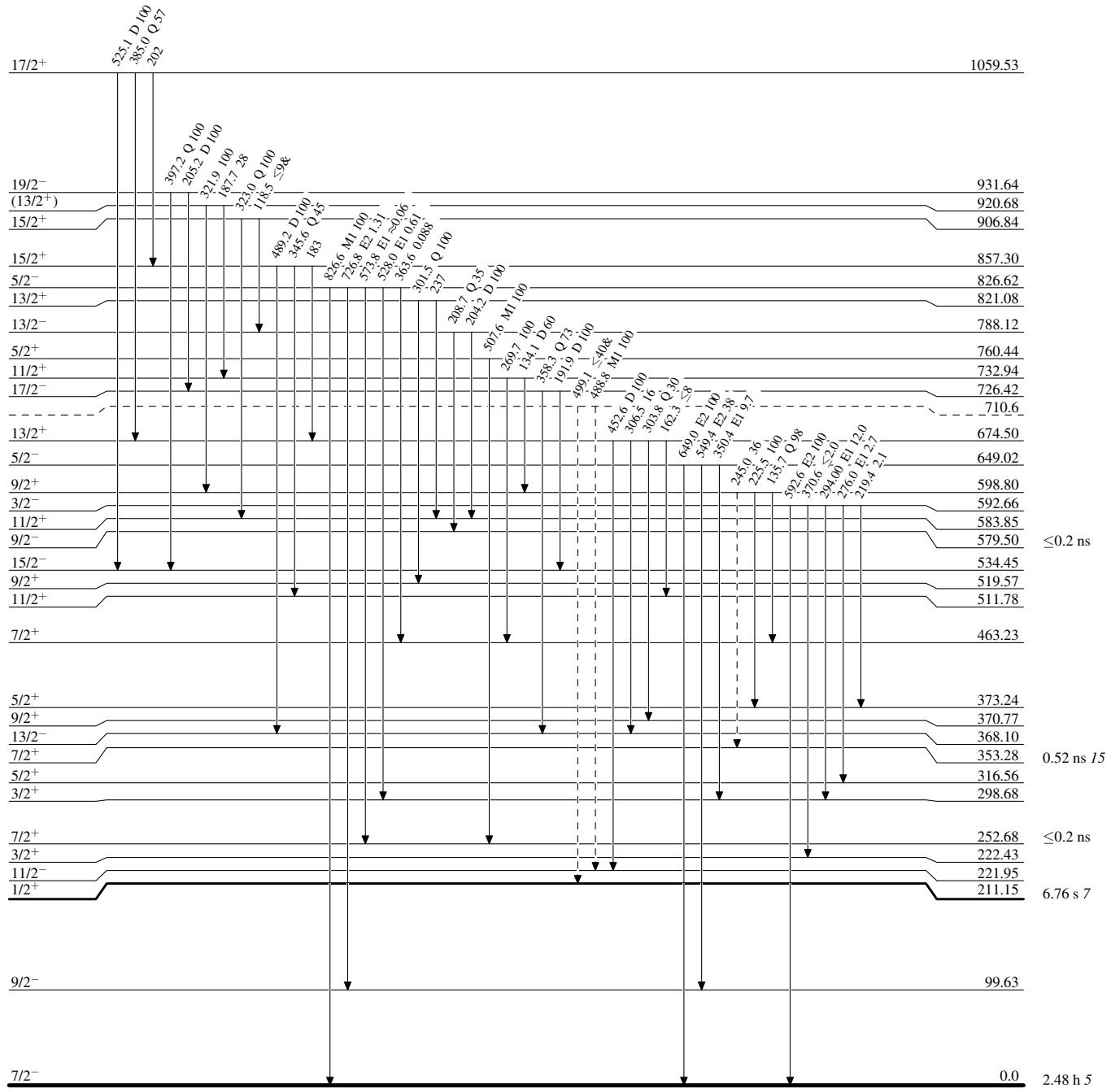
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

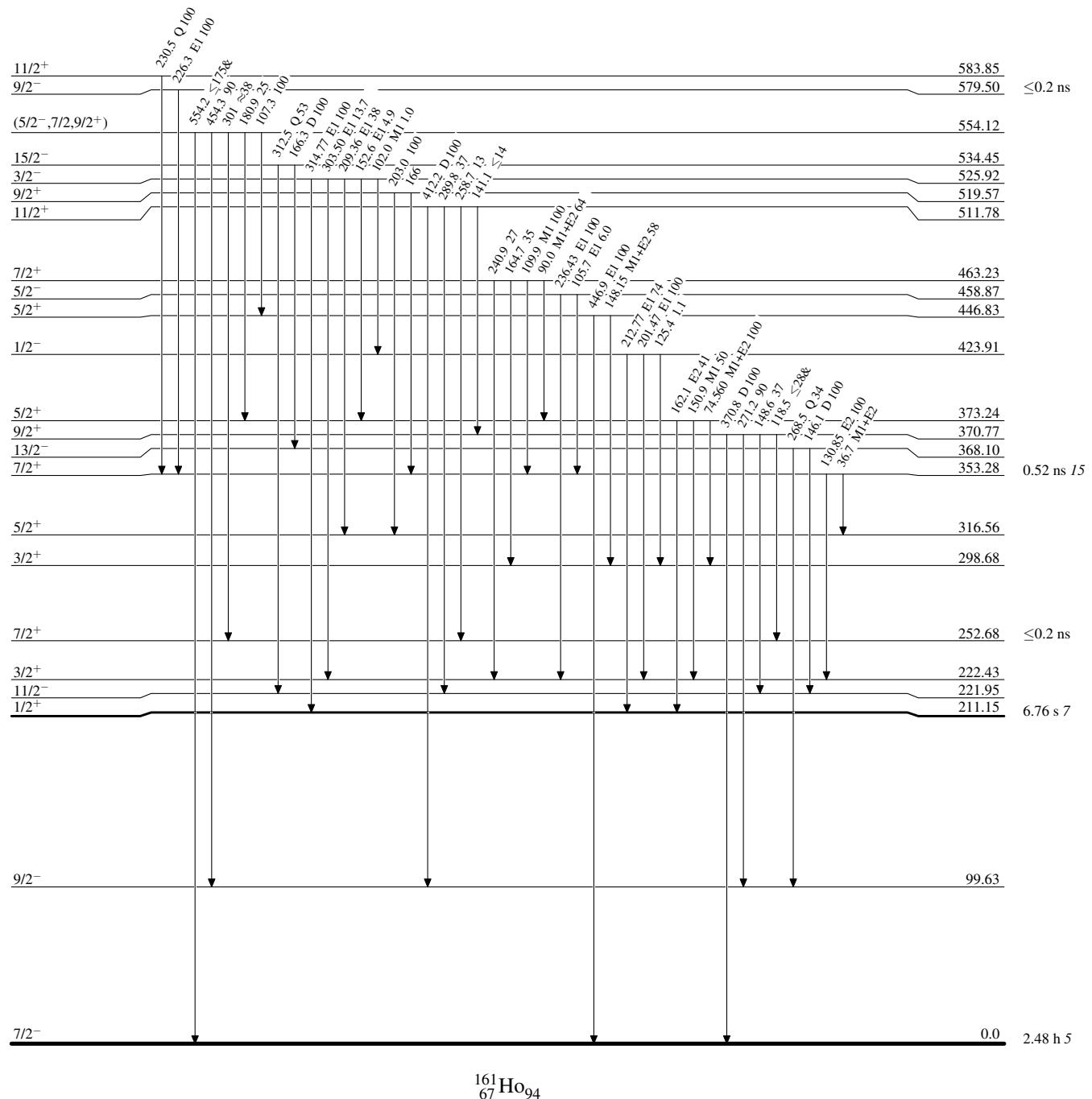
& Multiply placed: undivided intensity given

- - - - - ► γ Decay (Uncertain)

Adopted Levels, Gammas

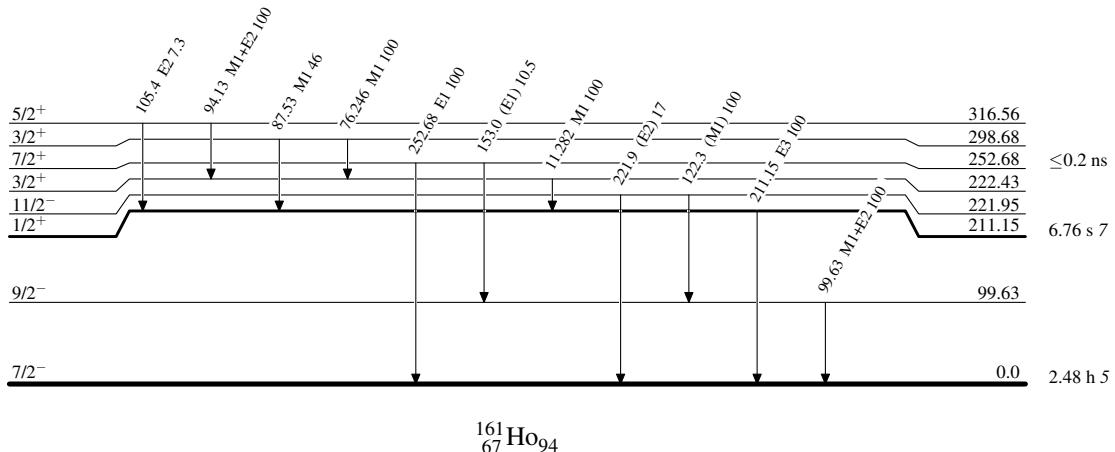
Level Scheme (continued)

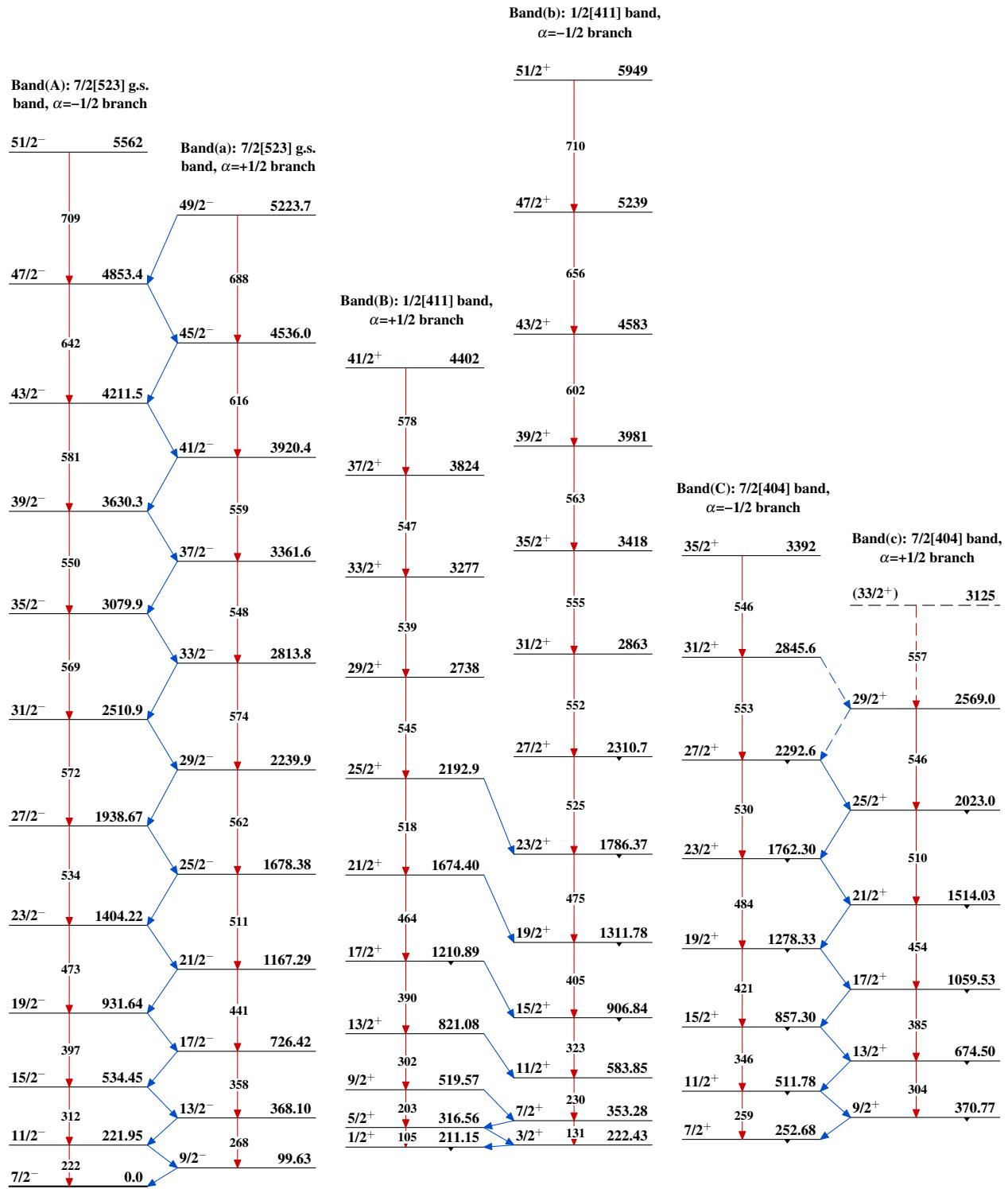
Intensities: Relative photon branching from each level
 & Multiply placed: undivided intensity given

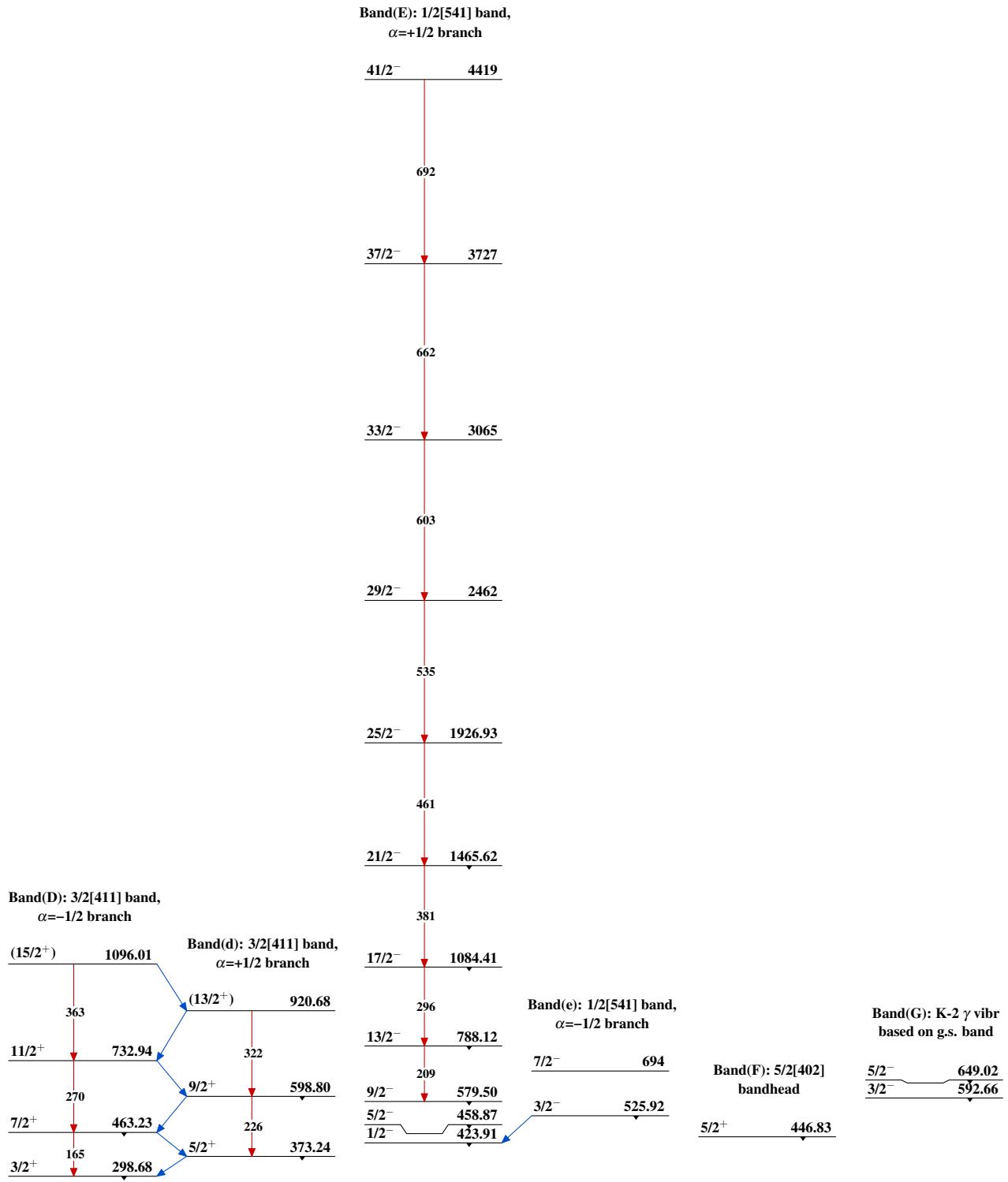


Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)**Band(M): 1/2[420] band**

$(3/2^+)$	<u>1545</u>
$(5/2^+)$	<u>1529</u>

$(1/2^+)$	<u>1436</u>
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**Band(L): 9/2[514]
bandhead**

$(11/2^-)$	<u>1280</u>
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Band(I): 5/2[532] band

$11/2^-$	<u>1128</u>
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**Band(K): K-2 γ vibr
based on 5/2[402]**

$1/2^+$	<u>1100</u>
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$(9/2^-)$	<u>1030</u>
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Band(H): 5/2[413] band

$(9/2^+)$	<u>992</u>
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**Band(J): K-2 γ vibr
based on 7/2[404]**

$3/2^+$	<u>955</u>
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$7/2^-$	<u>906</u>
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$7/2^+$	<u>860</u>
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$5/2^-$	<u>826.62</u>
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$5/2^+$	<u>760.44</u>
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