^{160}Gd(^{34}S,5nγ) 1994Be27

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson, Balraj Singh	NDS 142, 1 (2017)	15-Apr-2017

1994Be27: ^{160}Gd(^{34}S,5nγ), E=159, 162 and 165 MeV. Measured Eγ, Iγ, $\gamma\gamma$ and $\gamma\gamma(\theta)$(DCO) using the Argonne-Notre Dame BGO γ-ray facility, an array consisting of 12 Compton-suppressed Ge detectors and 50 hexagonal BGO scintillators.

^{189}Hg Levels

Level scheme was first proposed by 1981Bo08 with 12 excited states and two bands, later extended by 1983Gu12 with 25 excited states and four band structures. The level scheme adopted here is from 1994Be27, which is much enhanced, yet built on levels from previous studies. Only in a few cases levels in 1983Gu12 are different from those in 1994Be27, as a result of some missing transitions in 1983Gu12 in band structures.
A, B, C, D, E, F and F′ refer to quasineutron orbitals.

E(level)[†]	J$^{\pi}$[‡]	Comments
0.0+x[@]	13/2$^+$	Additional information 1. E(level): x=80 keV *30* (2001Sc41,2017Au03).
403.3+x[@] *3*	17/2$^+$	
474.10+x *25*	15/2$^+$	
901.10+x[f] *25*	(15/2$^-$)[#]	
1030.2+x[@] *3*	21/2$^+$	
1110.4+x *3*	19/2$^+$	
1440.2+x[f] *3*	(19/2$^-$)[#]	
1691.2+x[c] *3*	21/2$^-$	
1763.2+x[@] *4*	25/2$^+$	
1917.3+x[c] *4*	25/2$^-$	
1976.4+x[b] *4*	23/2$^-$	
2034.5+x[f] *4*	(23/2$^-$)[#]	
2220.9+x[b] *4*	(27/2$^-$)	
2236.4+x *5*	(29/2$^-$)	
2245.2+x *5*	(29/2$^-$)	
2253.7+x[c] *4*	29/2$^-$	
2477.6+x[&] *5*	29/2$^+$	
2616.7+x[@] *5*	29/2$^+$	
2674.7+x[&] *5*	33/2$^+$	
2675.8+x[f] *5*	(25/2$^-$)[#]	
2682.3+x *5*	(29/2$^+$)	
2686.6+x[b] *5*	(31/2$^-$)	
2821.9+x[c] *5*	33/2$^-$	
2947.9+x *5*	(31/2$^-$)	
2949.7+x[d] *4*	(33/2$^-$)	
3123.9+x[a] *6*	(33/2$^+$)	
3154.4+x[&] *6*	37/2$^+$	
3307.7+x *6*	(33/2$^+$)	
3344.4+x[b] *5*	(35/2$^-$)	
3400.9+x[@] *5*	(33/2$^+$)	
3439.9+x[e] *6*	(37/2$^-$)	
3449.9+x *6*	(37/2$^-$)	
3467.6+x[d] *5*	(37/2$^-$)	

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^{160}Gd(^{34}S,5nγ) 1994Be27 (continued)

^{189}Hg Levels (continued)

E(level)†	Jπ‡	Comments
3541.2+x[c] 5	37/2⁻	
3793.7+x[a] 6	(37/2⁺)	
3826.5+x 6	(37/2⁺)	
3876.2+x[&] 7	41/2⁺	
3992.9+x[b] 6	(39/2⁻)	
4063.5+x 7	(41/2⁺)	
4173.2+x[c] 5	(41/2⁻)	
4228.3+x[d] 5	(41/2⁻)	
4237.9+x[e] 6	(41/2⁻)	
4329.5+x[a] 6	(41/2⁺)	
4439.0+x 7	(41/2⁺)	
4479.8+x[b] 7	(43/2⁻)	
4517.9+x 6	(43/2⁻)	Jπ: from figure 1 of 1994Be27. J^{π}=(43/2⁺) in table 1 of 1994Be27 seems a misprint.
4550.3+x 6	(39/2⁻)	Jπ: from figure 1 of 1994Be27. J=(37/2) in table 1 of 1994Be27.
4701.2+x[c] 6	(45/2⁻)	
4713.9+x[&] 8	45/2⁺	
4761.3+x[e] 6	(45/2⁻)	
4870.4+x 8	(45/2⁺)	
4960.9+x 7	(43/2⁻)	
5002.7+x[a] 7	(45/2⁺)	
5036.3+x[d] 6	(45/2⁻)	
5118.2+x[b] 7	(47/2⁻)	
5545.0+x[a] 8	(47/2⁺)	Jπ: π=+ from figure 1 of 1994Be27; π=− in table 1 of 1994Be27 seems a misprint.
5583.9+x[&] 8	49/2⁺	
5703.1+x[e] 7	(49/2⁻)	
5900.3+x[d] 6	(49/2⁻)	
5952.7+x[b] 8	(51/2⁻)	
6536.4+x[&] 9	(53/2⁺)	
6820.2+x[b] 9	(55/2⁻)	

† From least-squares fit to Eγ values.
‡ From 1994Be27 based on band structures and DCO values. Also γ(θ) and γ(pol) data from 1981Bo08 and γ(θ) data from 1983Gu12 are used in assigning multipolarities and J^{π} values.
# Parity is tentatively assigned (1994Be27).
@ Band(A): Ground state band, π=+,α=+1/2. Quasiparticle configuration A (1994Be27,1983Gu12), ABC after alignment.
& Band(B): Rotational band, π=+,α=+1/2. Quasiparticle configuration ABC (1994Be27,1983Gu12).
a Band(C): Band based on 33/2⁺. Quasiparticle configuration ACD (1983Gu12).
b Band(D): Rotational band, π=−,α=−1/2. Quasiparticle configuration ABE at low spin (1994Be27,1983Gu12), and ABCDE after crossing (1994Be27).
c Band(E): Rotational band, π=−,α=+1/2. Quasiparticle configuration ABF (1994Be27,1983Gu12).
d Band(F): Noncollective band based on 33/2⁻, π=−,α=+1/2. Quasiparticle configuration ABF′ (1994Be27).
e Band(G): Noncollective band based on 33/2⁻, π=−,α=+1/2.
f Band(H): Band based on (15/2⁻).

^{160}Gd(^{34}S,5nγ) 1994Be27 (continued)

$\gamma(^{189}Hg)$

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult.†	α‡	Comments
(57.7)		2674.7+x	33/2$^+$	2616.7+x	29/2$^+$	[E2]	67.9	α(L)=50.8 *8*; α(M)=13.25 *19* α(N)=3.28 *5*; α(O)=0.541 *8*; α(P)=0.000693 *10*
154.1 *3*	0.6 *2*	1917.3+x	25/2$^-$	1763.2+x	25/2$^+$	(D)		DCO=0.76 *14* Mult.: ΔJ=0 transition.
197.2 *3*	14.1 *3*	2674.7+x	33/2$^+$	2477.6+x	29/2$^+$	(E2)	0.410	DCO=1.24 *7* α(K)=0.175 *3*; α(L)=0.176 *3*; α(M)=0.0455 *7* α(N)=0.01131 *18*; α(O)=0.00191 *3*; α(P)=2.19×10^{-5} *4*
226.1 *3*	35.4 *5*	1917.3+x	25/2$^-$	1691.2+x	21/2$^-$	(E2)	0.259	DCO=1.12 *3* α(K)=0.1257 *18*; α(L)=0.0997 *15*; α(M)=0.0256 *4* α(N)=0.00637 *10*; α(O)=0.001082 *17*; α(P)=1.580×10^{-5} *23*
243.4 *3*	1.6 *2*	4761.3+x	(45/2$^-$)	4517.9+x	(43/2$^-$)	D		DCO=0.68 *8*
244.5 *3*	6.1 *2*	2220.9+x	(27/2$^-$)	1976.4+x	23/2$^-$	(E2)	0.200	DCO=1.12 *8* α(K)=0.1038 *15*; α(L)=0.0726 *11*; α(M)=0.0186 *3* α(N)=0.00462 *7*; α(O)=0.000788 *12*; α(P)=1.312×10^{-5} *19*
251.0 *3*	1.2 *3*	1691.2+x	21/2$^-$	1440.2+x	(19/2$^-$)	D		DCO=0.80 *12*
280.0 *3*	1.7 *2*	4517.9+x	(43/2$^-$)	4237.9+x	(41/2$^-$)	D		DCO=0.69 *10*
319.1 *3*	2.8 *2*	2236.4+x	(29/2$^-$)	1917.3+x	25/2$^-$	(E2)	0.0888	DCO=1.53 *9* α(K)=0.0544 *8*; α(L)=0.0259 *4*; α(M)=0.00656 *10* α(N)=0.001633 *24*; α(O)=0.000283 *4*; α(P)=7.04×10^{-6} *10*
327.9 *3*	2.8 *2*	2245.2+x	(29/2$^-$)	1917.3+x	25/2$^-$	(E2)	0.0821	DCO=1.43 *6* α(K)=0.0509 *8*; α(L)=0.0235 *4*; α(M)=0.00592 *9* α(N)=0.001475 *22*; α(O)=0.000256 *4*; α(P)=6.61×10^{-6} *10*
331.5 *3*	0.9 *2*	2947.9+x	(31/2$^-$)	2616.7+x	29/2$^+$	D		DCO=0.66 *26*
336.4 *3*	23.9 *5*	2253.7+x	29/2$^-$	1917.3+x	25/2$^-$	(E2)	0.0763	DCO=1.44 *4* α(K)=0.0479 *7*; α(L)=0.0214 *3*; α(M)=0.00539 *8* α(N)=0.001342 *20*; α(O)=0.000233 *4*; α(P)=6.23×10^{-6} *9*
403.3 *3*	100.0 *2*	403.3+x	17/2$^+$	0.0+x	13/2$^+$	(E2)	0.0464	DCO=1.37 *3* α(K)=0.0314 *5*; α(L)=0.01132 *17*; α(M)=0.00282 *4* α(N)=0.000703 *10*; α(O)=0.0001235 *18*; α(P)=4.13×10^{-6} *6*
432.9 *3*	1.3 *2*	2686.6+x	(31/2$^-$)	2253.7+x	29/2$^-$	D+Q		DCO=0.91 *8*
441.4# *3*	0.5 *2*	3123.9+x	(33/2$^+$)	2682.3+x	(29/2$^+$)	(E2)	0.0367	DCO=1.19 *16*
457.7 *3*	8.9 *5*	2220.9+x	(27/2$^-$)	1763.2+x	25/2$^+$	D		DCO=0.67 *6*
465.7 *3*	10.4 *6*	2686.6+x	(31/2$^-$)	2220.9+x	(27/2$^-$)	(E2)	0.0321	DCO=1.43 *5*
470.0 *3*	1.3 *3*	2947.9+x	(31/2$^-$)	2477.6+x	29/2$^+$	D		DCO=0.65 *24*
474.1 *3*	1.0 *3*	474.10+x	15/2$^+$	0.0+x	13/2$^+$	D+Q		DCO=0.67 *7*
479.7 *3*	13.6 *5*	3154.4+x	37/2$^+$	2674.7+x	33/2$^+$	(E2)	0.0298	DCO=1.40 *3*
486.9 *3*	2.7 *2*	4479.8+x	(43/2$^-$)	3992.9+x	(39/2$^-$)	(E2)	0.0287	DCO=1.46 *9*
503.0 *3*	1.8 *4*	4329.5+x	(41/2$^+$)	3826.5+x	(37/2$^+$)	(E2)	0.0265	DCO=1.41 *12*
517.8 *3*	8.5 *7*	3467.6+x	(37/2$^-$)	2949.7+x	(33/2$^-$)	(E2)	0.0248	DCO=1.39 *5*
523.4 *3*	1.0 *2*	4761.3+x	(45/2$^-$)	4237.9+x	(41/2$^-$)	(E2)	0.0241	DCO=0.99 *14*

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^{160}Gd(^{34}S,5nγ) 1994Be27 (continued)

$\gamma(^{189}Hg)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[‡]	Comments
528.0 *3*	0.5 *2*	4701.2+x	(45/2$^-$)	4173.2+x	(41/2$^-$)	(E2)	0.0236	DCO=1.12 *12*
535.8 *3*	1.1 *2*	4329.5+x	(41/2$^+$)	3793.7+x	(37/2$^+$)	(E2)	0.0228	DCO=1.41 *12*
539.1 *3*	0.6 *2*	1440.2+x	(19/2$^-$)	901.10+x	(15/2$^-$)			
542.3 *3*	0.9 *2*	5545.0+x	(47/2$^+$)	5002.7+x	(45/2$^+$)	D		DCO=0.74 *10*
557.3 *3*	0.5 *2*	4550.3+x	(39/2$^-$)	3992.9+x	(39/2$^-$)			
568.2 *3*	14.5 *5*	2821.9+x	33/2$^-$	2253.7+x	29/2$^-$	(E2)	0.0199	DCO=1.37 *5*
580.8 *2*	21.7 *5*	1691.2+x	21/2$^-$	1110.4+x	19/2$^+$	D		DCO=0.70 *6*
594.3 *3*	4.0 *6*	2034.5+x	(23/2$^-$)	1440.2+x	(19/2$^-$)			
618.0 *3*	0.5 *2*	3439.9+x	(37/2$^-$)	2821.9+x	33/2$^-$	Q		DCO=1.41 *14*
626.9 *3*	100.0 *14*	1030.2+x	21/2$^+$	403.3+x	17/2$^+$	Q		DCO=1.26 *3*
628.0 *3*	0.5 *3*	3449.9+x	(37/2$^-$)	2821.9+x	33/2$^-$			
632.0 *3*	0.8 *2*	4173.2+x	(41/2$^-$)	3541.2+x	37/2$^-$	Q		DCO=1.37 *11*
636.3 *3*	15.6 *5*	1110.4+x	19/2$^+$	474.10+x	15/2$^+$	Q		DCO=1.25 *5*
638.4 *3*	0.7 *2*	5118.2+x	(47/2$^-$)	4479.8+x	(43/2$^-$)	Q		DCO=1.45 *14*
641.3 *3*	3.4 *3*	2675.8+x	(25/2$^-$)	2034.5+x	(23/2$^-$)	D		DCO=0.73 *18*
645.3 *3*	1.1 *3*	4439.0+x	(41/2$^+$)	3793.7+x	(37/2$^+$)	Q		DCO=1.37 *7*
645.8 *3*	0.5 *2*	3467.6+x	(37/2$^-$)	2821.9+x	33/2$^-$	Q		DCO=1.63 *20*
646.3 *3*	8.4 *4*	3123.9+x	(33/2$^+$)	2477.6+x	29/2$^+$	Q		DCO=1.37 *4*
648.5 *3*	5.5 *4*	3992.9+x	(39/2$^-$)	3344.4+x	(35/2$^-$)	Q		DCO=1.36 *5*
657.8 *3*	8.8 *5*	3344.4+x	(35/2$^-$)	2686.6+x	(31/2$^-$)	Q		DCO=1.38 *11*
661.0 *3*	22.4 *8*	1691.2+x	21/2$^-$	1030.2+x	21/2$^+$	D		DCO=1.33 *5* Mult.: ΔJ=0 transition.
669.8 *3*	3.7 *3*	3793.7+x	(37/2$^+$)	3123.9+x	(33/2$^+$)	Q		DCO=1.39 *10*
673.2 *3*	1.2 *3*	5002.7+x	(45/2$^+$)	4329.5+x	(41/2$^+$)	Q		DCO=1.41 *28*
687.1 *3*	0.5 *2*	4228.3+x	(41/2$^-$)	3541.2+x	37/2$^-$	Q		DCO=1.24 *15*
696.0 *3*	2.7 *3*	2949.7+x	(33/2$^-$)	2253.7+x	29/2$^-$	Q		DCO=1.41 *11*
702.6 *3*	4.4 *3*	3826.5+x	(37/2$^+$)	3123.9+x	(33/2$^+$)	Q		DCO=1.49 *9*
704.5 *3*	3.5 *3*	2949.7+x	(33/2$^-$)	2245.2+x	(29/2$^-$)	Q		DCO=1.44 *5*
705.7 *3*	3.9 *3*	4173.2+x	(41/2$^-$)	3467.6+x	(37/2$^-$)	Q		DCO=1.44 *5*
707.1 *3*	13.0 *5*	1110.4+x	19/2$^+$	403.3+x	17/2$^+$	D+Q		DCO=0.68 *5*
713.3 *3*	3.4 *3*	2949.7+x	(33/2$^-$)	2236.4+x	(29/2$^-$)	Q		DCO=1.35 *7*
714.2 *3*	37.9 *7*	2477.6+x	29/2$^+$	1763.2+x	25/2$^+$	Q		DCO=1.26 *3*
719.3 *3*	8.4 *6*	3541.2+x	37/2$^-$	2821.9+x	33/2$^-$	Q		DCO=1.48 *6*
721.8 *3*	6.8 *5*	3876.2+x	41/2$^+$	3154.4+x	37/2$^+$	Q		DCO=1.41 *10*
733.0 *3*	64.0 *14*	1763.2+x	25/2$^+$	1030.2+x	21/2$^+$	Q		DCO=1.40 *3*
760.8 *3*	1.9 *4*	4228.3+x	(41/2$^-$)	3467.6+x	(37/2$^-$)	Q		DCO=1.38 *9*
784.0 *3*	0.9 *3*	3400.9+x	(33/2$^+$)	2616.7+x	29/2$^+$	Q		DCO=1.39 *15*
788.0 *3*	1.1 *3*	4237.9+x	(41/2$^-$)	3449.9+x	(37/2$^-$)	Q		DCO=1.68 *10*
798.0 *3*	1.1 *3*	4237.9+x	(41/2$^-$)	3439.9+x	(37/2$^-$)	Q		DCO=1.64 *13*
808.0 *3*	0.6 *2*	5036.3+x	(45/2$^-$)	4228.3+x	(41/2$^-$)			
830.1 *3*	1.6 *2*	3307.7+x	(33/2$^+$)	2477.6+x	29/2$^+$	Q		DCO=1.62 *26*
834.5 *3*	0.8 *2*	5952.7+x	(51/2$^-$)	5118.2+x	(47/2$^-$)	Q		DCO=1.00 *12*
837.7 *3*	2.1 *5*	4713.9+x	45/2$^+$	3876.2+x	41/2$^+$	Q		DCO=1.39 *9*
853.7 *3*	7.0 *5*	2616.7+x	29/2$^+$	1763.2+x	25/2$^+$	Q		DCO=1.44 *12*
863.1 *3*	0.6 *2*	5036.3+x	(45/2$^-$)	4173.2+x	(41/2$^-$)	Q		DCO=1.46 *19*
864.0 *3*	0.5 *2*	5900.3+x	(49/2$^-$)	5036.3+x	(45/2$^-$)	Q		DCO=1.46 *19*
867.5 *3*	0.5 *2*	6820.2+x	(55/2$^-$)	5952.7+x	(51/2$^-$)	Q		DCO=1.40 *23*
870.0 *3*	0.7 *2*	5583.9+x	49/2$^+$	4713.9+x	45/2$^+$	Q		DCO=1.32 *8*
901.1 *3*	1.0 *3*	901.10+x	(15/2$^-$)	0.0+x	13/2$^+$	D		DCO=0.70 *22*
909.1 *3*	0.8 *3*	4063.5+x	(41/2$^+$)	3154.4+x	37/2$^+$	Q		DCO=1.09 *14*
919.1 *3*	4.2 *5*	2682.3+x	(29/2$^+$)	1763.2+x	25/2$^+$	Q		DCO=1.33 *11*
923.5 *3*	0.6 *2*	3400.9+x	(33/2$^+$)	2477.6+x	29/2$^+$	(Q)		DCO=0.85 *31*
941.8 *3*	1.4 *3*	5703.1+x	(49/2$^-$)	4761.3+x	(45/2$^-$)	Q		DCO=1.20 *10*
946.2 *3*	7.9 *4*	1976.4+x	23/2$^-$	1030.2+x	21/2$^+$	D		DCO=0.75 *8*
952.5 *3*	0.5 *2*	6536.4+x	(53/2$^+$)	5583.9+x	49/2$^+$	Q		DCO=0.91 *20*
968.0 *3*	0.7 *3*	4960.9+x	(43/2$^-$)	3992.9+x	(39/2$^-$)			

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^{160}Gd(^{34}S,5nγ) 1994Be27 (continued)

$\gamma(^{189}Hg)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. †	Comments
994.2 *3*	0.9 *3*	4870.4+x	$(45/2^+)$	3876.2+x	$41/2^+$	Q	DCO=1.53 *15*
1004.3 *3*	2.6 *9*	2034.5+x	$(23/2^-)$	1030.2+x	$21/2^+$	D	DCO=0.64 *15*
1036.9 *3*	3.7 *5*	1440.2+x	$(19/2^-)$	403.3+x	$17/2^+$	D	DCO=0.81 *11*
1205.9 *3*	1.3 *4*	4550.3+x	$(39/2^-)$	3344.4+x	$(35/2^-)$		DCO=0.82 *16*

† From 1994Be27, except as noted. Multipolarities are based on DCO data in 1994Be27, mult=Q indicates stretched quadrupole (most likely E2 for intraband transitions), mult=D indicates ΔJ=1, dipole (M1 or M1+E2 for all intraband transitions; E1 or M1 or M1+E2 for interband transitions). For stretched quadrupole transitions, (E2) is assigned here for Eγ<600 keV based on assumed level half-life <20 ns (typical coincidence resolving time) and RUL for E2 and M2.

‡ From BrIcc code (2008Ki07), "Frozen Orbitals" appr.

Placement of transition in the level scheme is uncertain.

^{160}Gd(^{34}S,5nγ) **1994Be27**

Level Scheme

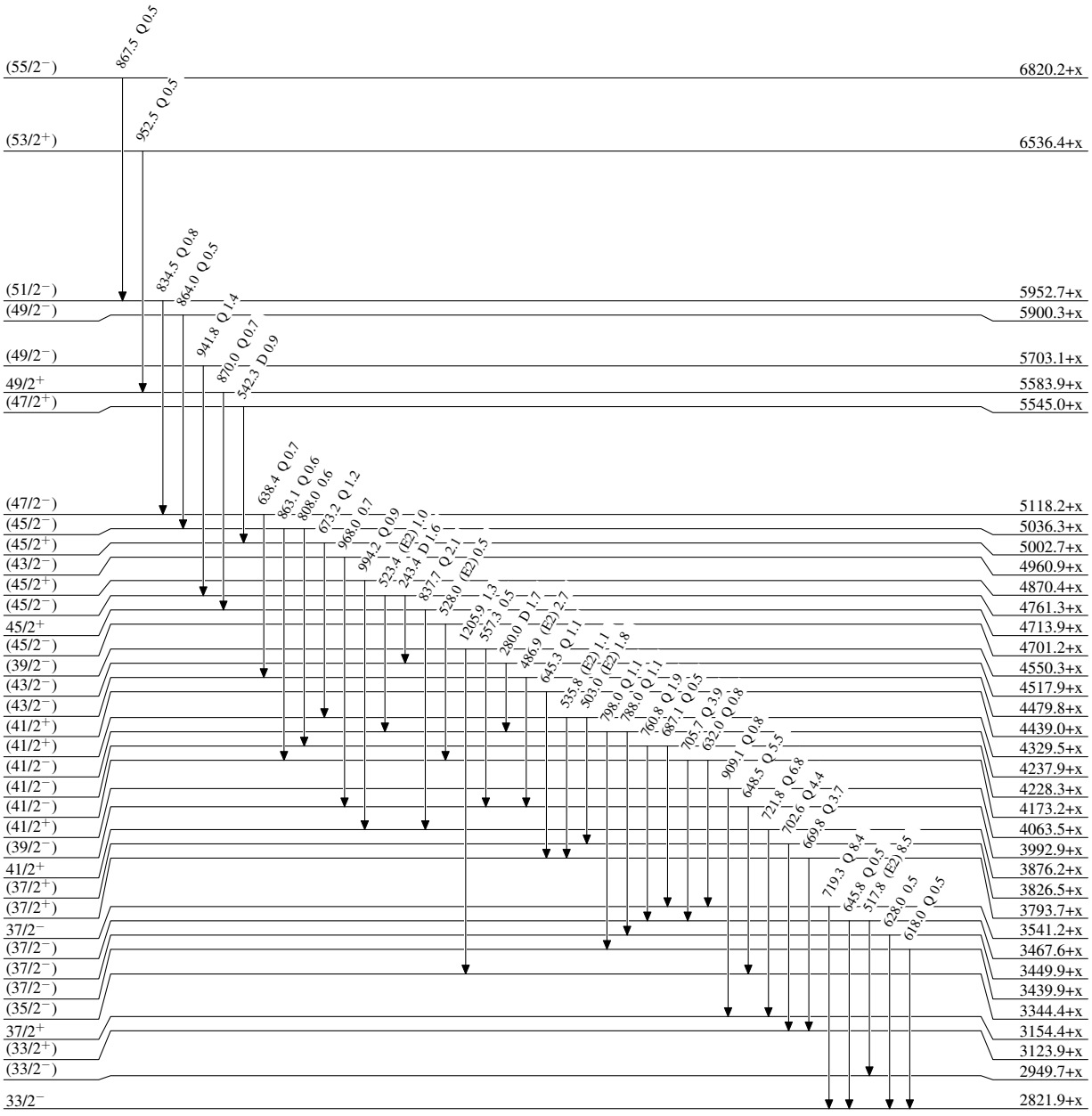
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



$^{189}_{80}Hg_{109}$

^{160}Gd(^{34}S,5nγ) 1994Be27

Level Scheme (continued)

Intensities: Relative I_γ

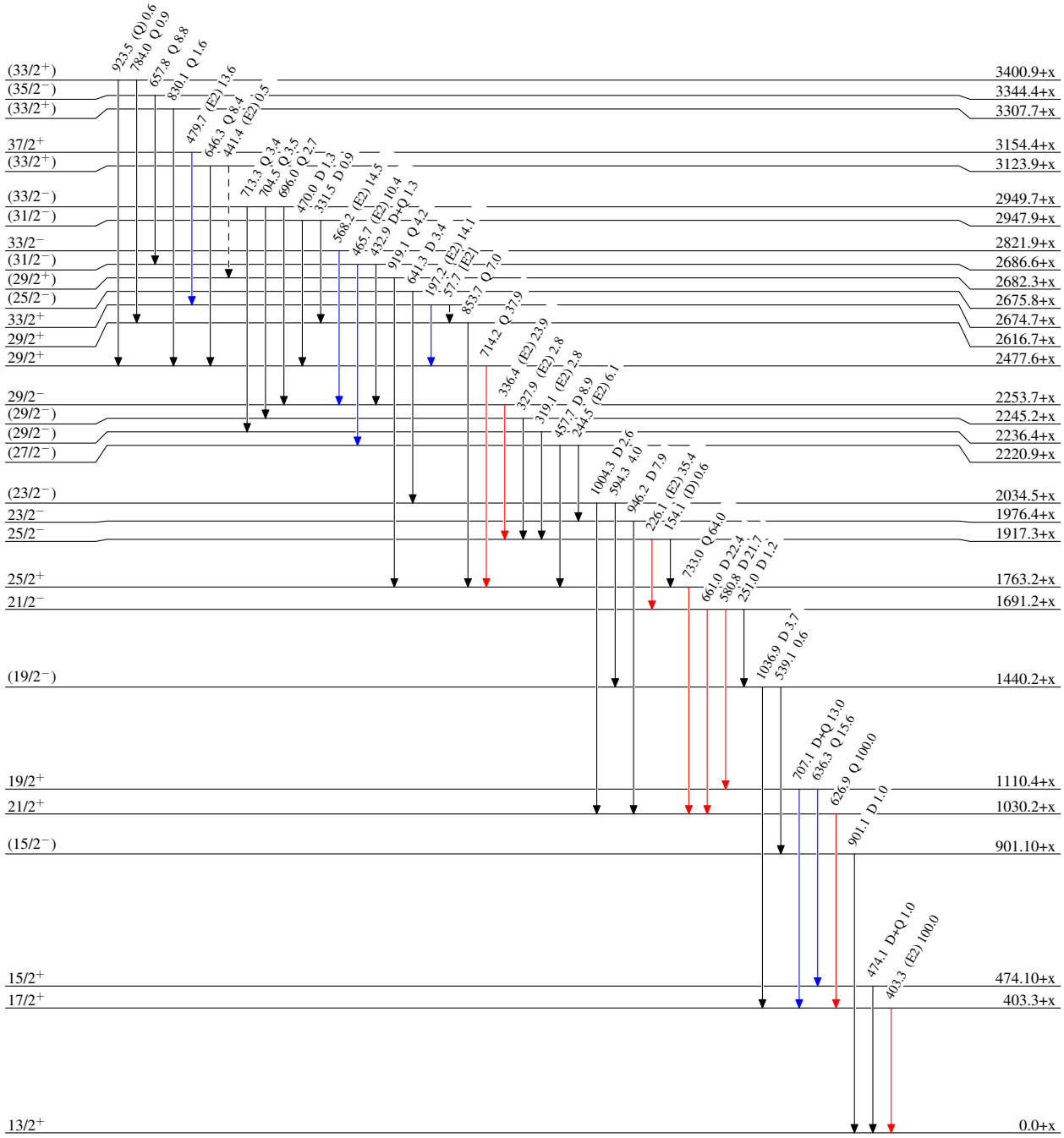
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

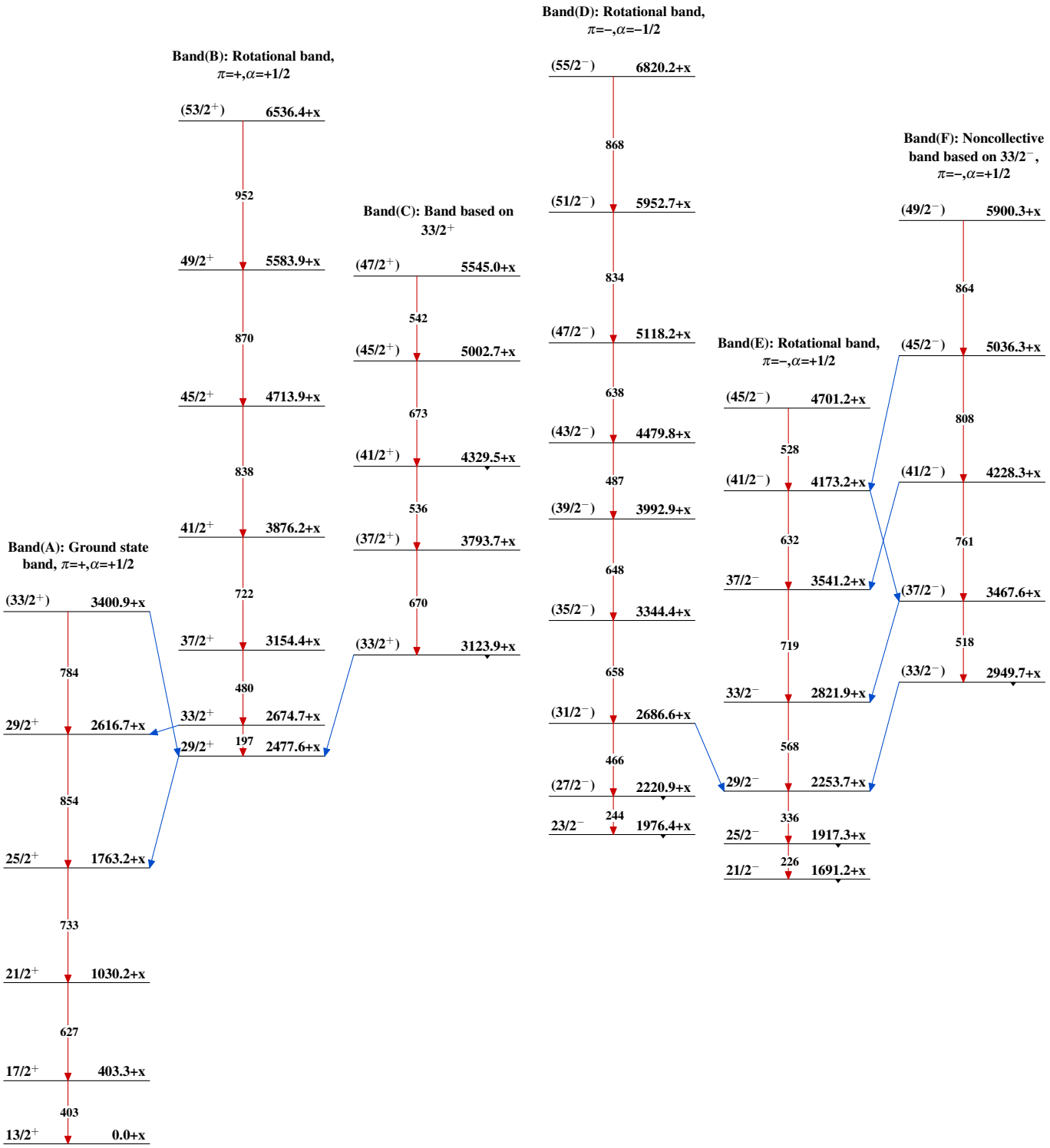
$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



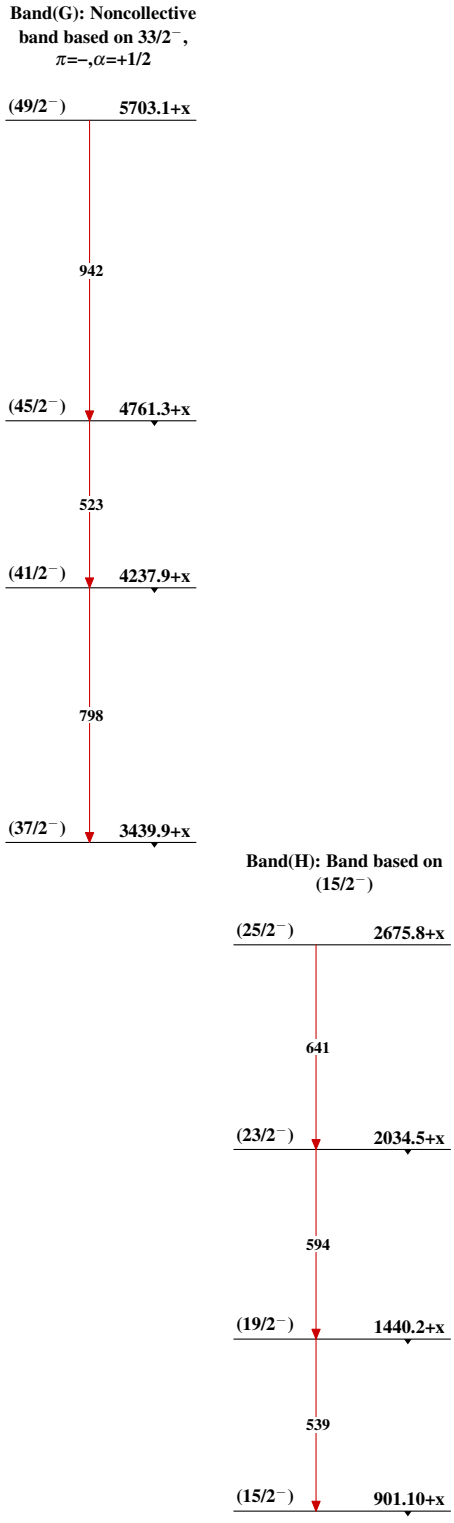
$^{189}_{80}Hg_{109}$

^{160}Gd(^{34}S,5nγ) 1994Be27



$^{189}_{80}Hg_{109}$

^{160}Gd(^{34}S,5nγ) 1994Be27 (continued)



$^{189}_{80}Hg_{109}$