(HI,xnγ) 1994An13,1997Ri02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. J. Martin	NDS 114, 1497 (2013)	31-Aug-2013

Other: 1988Pi10.

1979Ha29, 1980Bo07, and 1980Ja16 have searched for high-spin isomers in this mass region.

1980Bo07: ^{65}Cu, ^{50}Ti beams on various targets with E=4.6 MeV/amu. Possible isomers: 1) $T_{1/2}\geq$500 ns E(ex)=7.3 MeV *8* assigned to ^{151}Ho or ^{152}Ho; 2) $T_{1/2}$=65 ns *15*, Eγ=712, assigned to ^{151}Ho or ^{152}Ho; 3) $T_{1/2}$=30 ns *15*, assigned to ^{152}Ho or ^{153}Ho.

1980Ja16: ^{12}C, ^{14}N, ^{16}O ions on ^{141}Pr, ^{144}Sm, ^{147}Sm targets with E=70-130 MeV (earlier work by 1994An13).

1979Ha29: ^{12}C on various targets with E=70-120 MeV. Possible isomers: 1) $T_{1/2}$=90 ns *40*, E(ex)=3.7 MeV *5*, J-J(g.s.)=8-14, γ′s seen: 532, 557, 577, 632; assigned to ^{152}Ho?; 2) $T_{1/2}$>200 ns, E(ex)=2.8 MeV *5*, J-J(g.s.)=8-14; γ′s seen: 349, 357, 363, 419, 428, 746, 911; assigned to ^{152}Ho or ^{153}Er.

1994An13 ^{120}Sn(^{35}Cl,5nγ) E=178, 183 MeV
^{141}Pr(^{16}O,5nγ) E=110 MeV
^{144}Sm(^{11}B,3nγ) E=50, 53, 58 MeV
Measured Eγ, Iγ, γγ, γX, γ(t), γγ(t), Excit

1997Ri02 ^{120}Sn(^{37}Cl,5nγ) E=187 MeV
Measured Eγ, Iγ, γγ, And γγ(θ) (DCO)

^{152}Ho Levels

The level scheme up to the 8.4–μs 19^- isomer at 3019 is that proposed by 1994An13. Levels above the 47-ns isomer at 5998 are from 1997Ri02. Levels between these states are from both works. 1997Ri02 report only levels above 3019 and they take the energy of this level as 3019 from 1994An13, but with no uncertainty. in this evaluation, the uncertainty is included as given by the least-squares adjustment to the Eγ data.

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	Comments
160[a]	9^+		
219.71 *9*	(8^+)		
576.22[b] *11*	(9^+)		
706.01[c] *13*	(10^+)		
919.43[a] *14*	11^+		
1345.64[b] *12*	(11^+)		
1503.44[c] *25*	(12^+)		
1631.88[a] *15*	13^+		
1968.66[b] *13*	(13^+)		
2025.47[c] *15*	(14^+)		
2236.21[b] *15*	15^+		
2285.49[c] *16*	16^+		
3019.59[e] *19*	19^-	8.4 μs *3*	Proton configuration=$(\pi,h_{11/2})^{+3}_{9/2}$.
3456.9?[@d] *4*	(18^+)		
3531.2[e] *3*	20^-		Proton configuration=$(\pi,h_{11/2})^{+3}_{11/2}$; J-1 anomaly, see 1994An13.
4235.0 *3*	21^+		Configuration=$(\pi,h_{11/2})^{+3}_{27/2}(\nu, f_{7/2})^{+3}_{15/2}$.
4270.02[&] *25*	20^+		
4298.82[d] *25*	20^+		
4484.9[&] *4*			
4685.6[d] *3*	22^+		
4883.8[d] *3*	24^+	5 ns *2*	
5697.0 *4*	25^+		

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(HI,xnγ) 1994An13,1997Ri02 (continued)

^{152}Ho Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$[#]	Comments
5749.0[e] *3*	25$^-$		Proton configuration=$(\pi,h_{11/2})^{+3}_{21/2}$.
5892.4[e] *3*	26$^-$		Proton configuration=$(\pi,h_{11/2})^{+3}_{23/2}$.
5920.4 *5*			E(level): From 1997Ri02.
5971.6 *4*	26$^-$		
5997.9[e] *4*	28$^-$	47 ns *7*	Proton configuration=$(\pi,h_{11/2})^{+3}_{27/2}$. T$_{1/2}$: from 1980Ja16. Other: 49 ns *7* (1988Pi10, assigned to a J=19, 2977 level).
6047.4 *4*	(25$^-$)		
6589.7 *5*	(27$^-$)		E(level): 6440 KeV is a misprint in Fig 4 and Table I of 1997Ri02.
6739.3 *6*			
7071.6 *5*	29$^{(+)}$		
7360.7 *5*	30$^{(+)}$		
7633.7 *6*	(29$^-$)		
8016.2 *5*	30$^{(+)}$		
8266.4 *7*			
8281.1 *5*	31$^{(+)}$		
8636.7 *5*	32$^{(+)}$		
8641.9 *7*			
8929.5 *6*	33$^{(+)}$		
8934.1 *8*			
9260.5 *8*			
9549.0 *6*			
9560.8 *6*			
9663.5 *6*	33$^{(+)}$		
9915.6 *6*	34$^{(-)}$		
10032.9 *6*	34$^{(-)}$		
10220.5 *6*	34$^{(-)}$		
10221.2 *7*			
10247.6 *6*			E(level): from table 1 of 1997Ri02, not shown in fig 4.
10397.4 *6*			
10504.7 *6*	35$^{(-)}$		
10854.4 *7*			
11004.5 *7*			
11295.0 *7*			
11540.9 *7*	(37$^-$)		
11932.6 *7*	(38)		
12451.6 *8*			
12795.1 *8*			
12939.4 *8*			
x			E(level): Transitions from E=x and higher levels with E="+X" are in prompt coincidence with the 1973γ and thus feed levels above E=7072.
837.6+x *3*			T$_{1/2}$: On the basis of the observation that the 253γ feeding this level is stronger than the deexciting 837γ, 1997Ri02 suggest that the 837+x level May be an isomer with a lifetime of roughly a few nanoseconds.
1090.6+x *5*			
1588.3+x *6*			
1862.4+x *5*			
2399.1+x *5*			
2489.2+x *6*			
2934.8+x *6*			
3633.5+x *6*			
3721.6+x *7*			
3796.1+x *7*			
4319.6+x *7*			
4362.2+x *7*			
4945.0+x *8*			

Continued on next page (footnotes at end of table)

(HI,xnγ) 1994An13,1997Ri02 (continued)

^{152}Ho Levels (continued)

† Both 1994An13 and 1997Ri02 quote energies relative to the energy of the low-lying 9^+ set to zero. The energy of this level was known only approximately at the time of their work. The energy of this isomer has since been determined as 160 keV *1*, as given in ADOPTED levels. The evaluator has added E=160 keV to the relative excitation energies of the authors, but in order to preserve the relative accuracy of the energies, the uncertainty of 1 keV has not been included. The absolute energies are thus known to no better than 1 keV. In addition to the levels listed here, 1994An13 report levels at 3104, 3848, and 4482 defined by a cascade of weak transitions with energies of 204.0, 633.2, 743.4, and 819.4 connecting the 4686 and 2285 levels. These are not confirmed by 1997Ri02. A level At 4080 reported by 1994An13, fed by the 155γ and deexcited by a 1060.4γ, is not confirmed by 1997Ri02. The 155γ is placed by 1997Ri02 from the 6047 level, and the 1020γ is not seen. Removal of this level results In the 1060γ, and also a 606γ and a 401γ now being unplaced.

‡ Assignments for levels up to 5998 are from 1994An13 based on γ mults, excit, and analogy with neighboring nuclei. Assignments for higher levels are from 1997Ri02 based on angular distribution and DCO analysis.

From 1994An13.

@ The order of the cascading 842.0 and 1171.5 γ's has not been determined. If the order were reversed, the intermediate level would be at 3127.5 keV.

& Not reported by 1997Ri02.

a Band(A): configuration:$(\pi,h_{11/2})^{+3}_{11/2}(\nu,f_{7/2})^{+3}$) multiplet.

b Band(B): configuration:$(\pi,h_{11/2})^{+3}_{9/2}(\nu,h_{9/2})(\nu,f_{7/2})$ ++2 multiplet.

c Band(C): configuration:$(\Pi,h_{11/2})^{+3}_{11/2}(\nu,h_{9/2})(\nu,f_{7/2})^{+2}$ multiplet.

d Band(D): configuration:$(\pi,h_{11/2})^{+3}_{27/2}(n,h_{9/2})(\nu,f_{7/2})$ ++2 multiplet.

e Band(E): configuration:$(\pi,h_{11/2})^{+3}(\nu,f_{7/2})(\nu,h_{9/2})(\nu,i_{13/2})$ multiplet.

(HI,xnγ) 1994An13,1997Ri02 (continued)

γ(^{152}Ho)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ	α[j]	$I_{(\gamma+ce)}$[†@]	Comments
49.3 *1*	149 *40*	2285.49	16^+	2236.21	15^+	M1+E2	0.21 *10*	5.2 *22*		α(L)=4.1 *17*; α(M)=0.9 *4*; α(N+..)=0.24 *10* α(N)=0.21 *9*; α(O)=0.028 *10*; α(P)=0.00103 *5* Mult.: α(exp)=5.5 *18* from intensity balance.
56.8 *1*	4 *1*	2025.47	(14^+)	1968.66	(13^+)					
59.7[b] *1*	7 *3*	219.71	(8^+)	160	9^+	M1,E2		17 *6*		α(K)=6 *4*; α(L)=8 *7*; α(M)=2.0 *17*; α(N+..)=0.5 *5* α(N)=0.4 *4*; α(O)=0.05 *5*; α(P)=0.00037 *24* Mult.: α(exp)=16 *+14−5* from an intensity balance.
75.7 *3*		6047.4	(25^-)	5971.6	26^-				9 *3*	
90.1 *3*		2489.2+x		2399.1+x					9 *1*	Mult.: A_2=−0.07 *15*, A_4=+0.6 *4*.
105.5 *1*	75 *2*	5997.9	28^-	5892.4	26^-	E2		2.31	13 *3*	ce(K)/(γ+ce)=0.291 *4*; ce(L)/(γ+ce)=0.312 *5*; ce(M)/(γ+ce)=0.0753 *13*; ce(N+)/(γ+ce)=0.0190 *4* ce(N)/(γ+ce)=0.0170 *3*; ce(O)/(γ+ce)=0.00202 *4*; ce(P)/(γ+ce)=1.210×10^{-5} *21* α(L)=1.04; α(M)=0.250; α(N+..)=0.0694 E_γ: 1997Ri02 report 105.2 *3*. Mult.: α(L)exp=1.35 *15*.
129.8 *1*	35 *3*	706.01	(10^+)	576.22	(9^+)	M1,E2		1.16 *8*		α(K)=0.80 *25*; α(L)=0.28 *13*; α(M)=0.07 *4*; α(N+..)=0.017 *8* α(N)=0.015 *7*; α(O)=0.0019 *8*; α(P)=4.4×10^{-5} *21* Mult.: α(exp)=1.1 *3*.
143.4 *1*	132 *4*	5892.4	26^-	5749.0	25^-	M1(+E2)	<0.82	0.90 *4*	106 *10*	ce(K)/(γ+ce)=0.375 *25*; ce(L)/(γ+ce)=0.077 *15*; ce(M)/(γ+ce)=0.017 *4*; ce(N+)/(γ+ce)=0.0046 *10* ce(N)/(γ+ce)=0.0040 *9*; ce(O)/(γ+ce)=0.00055 *10*; ce(P)/(γ+ce)=2.2×10^{-5} *4* E_γ: 1997Ri02 report 143.5 *3*. Mult.: α(K)exp=0.80 *16*.
155.1 *3*		6047.4	(25^-)	5892.4	26^-				58 *7*	E_γ,I_γ: 1994An13 report Eγ=155.1 *1* with Iγ=8 *3*, but placed from the 4235 level. Mult.: DCO=0.92 *24*.
195.5 *2*	40 *4*	5892.4	26^-	5697.0	25^+				36 *7*	E_γ: 1997Ri02 report 196.1 *3*. I_γ: 1997Ri02 report Iγ/Iγ(143γ)=0.34 *7*. Mult.: DCO=1.18 *3*.
198.1 *1*	320 *20*	4883.8	24^+	4685.6	22^+	E2		0.252	130 *9*	ce(K)/(γ+ce)=0.1318 *17*; ce(L)/(γ+ce)=0.0534 *8*; ce(M)/(γ+ce)=0.01263 *18*; ce(N+)/(γ+ce)=0.00323 *5* ce(N)/(γ+ce)=0.00286 *5*; ce(O)/(γ+ce)=0.000357 *6*; ce(P)/(γ+ce)=6.23×10^{-6} *9* E_γ: 1997Ri02 report 198.0 *3*. Mult.: α(K)exp=0.14 *2*. DCO=1.99 15.
[x]204.0[g] *2*	14 *3*									
222.5[f] *3*		5971.6	26^-	5749.0	25^-	*h*			99 *29*	
223.4[f] *3*		5920.4		5697.0	25^+	*h*			99 *29*	

$^{152}_{67}Ho_{85}$-4

(HI,xnγ) 1994An13,1997Ri02 (continued)

γ(^{152}Ho) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ	α[j]	$I_{(\gamma+ce)}$[†@]	Comments
[x]236.2 *3*	8 *2*									
[x]246.8[a] *3*	11 *2*									
250.1[i] *3*	14 *2*	4484.9		4235.0	21^+					
252.0 *3*		9915.6	$34^{(-)}$	9663.5	$33^{(+)}$				76 *6*	Mult.: A_2=−0.03 *25*, A_4=+0.7 *4*.
253.0 *3*		1090.6+x		837.6+x					152 *6*	Mult.: A_2=+0.17 *9*, A_4=+0.01 *15*.
260.0 *1*	107 *8*	2285.49	16^+	2025.47	(14^+)					
265.2 *3*		8281.1	$31^{(+)}$	8016.2	$30^{(+)}$				92 *3*	Mult.: DCO=0.81 *10*, A_2=−0.06 *22*, A_4=+0.06 *40*.
267.6 *1*	65 *8*	2236.21	15^+	1968.66	(13^+)					
284.3 *3*		10504.7	$35^{(-)}$	10220.5	$34^{(-)}$				101 *12*	Mult.: A_2=−0.25 *18*, A_4=−0.01 *35*.
289.1 *3*		7360.7	$30^{(+)}$	7071.6	$29^{(+)}$				855 *29*	Mult.: DCO=1.02 *3*, A_2=−0.14 *6*, A_4=+0.07 *13*.
292.9 *3*		8929.5	$33^{(+)}$	8636.7	$32^{(+)}$				289 *19*	Mult.: DCO=1.03 *4*, A_2=−0.09 *8*, A_4=+0.06 *17*.
[x]304.0[a] *3*	17 *2*									
336.8 *3*	15 *2*	1968.66	(13^+)	1631.88	13^+					
343.5 *3*		12795.1		12451.6					6 *1*	
349.6 *3*		10854.4		10504.7	$35^{(-)}$				49 *4*	
355.9 *3*		8636.7	$32^{(+)}$	8281.1	$31^{(+)}$				420 *11*	Mult.: DCO=1.18 *6*, A_2=−0.09 *4*, A_4=+0.17 *6*.
356.5 *1*	111 *8*	576.22	(9^+)	219.71	(8^+)	M1(+E2)	<0.8	0.070 *8*		α(K)=0.059 *7*; α(L)=0.0090 *5*; α(M)=0.00201 *9*; α(N+..)=0.00053 *3* α(N)=0.000465 *21*; α(O)=6.7×10^{-5} *4*; α(P)=3.5×10^{-6} *5* Mult.: α(K)exp=0.064 *12*.
[x]375.8[a] *3*	13 *5*									
386.8[c] *2*	<105	4685.6	22^+	4298.82	20^+	E2		0.0316	27 *2*	ce(K)/(γ+ce)=0.0238 *4*; ce(L)/(γ+ce)=0.00534 *8*; ce(M)/(γ+ce)=0.001225 *18*; ce(N+)/(γ+ce)=0.000319 *5* ce(N)/(γ+ce)=0.000281 *4*; ce(O)/(γ+ce)=3.74×10^{-5} *6*; ce(P)/(γ+ce)=1.284×10^{-6} *18* E_γ: 1997Ri02 report 386.0 *3*. I_γ: 1994An13 report Iγ<103 *2*. Mult.: α(K)exp=0.024 *3*.
391.9 *3*		11932.6	(38)	11540.9	(37^-)				46 *2*	Mult.: DCO=1.10 *29*, A_2=−0.15 *10*, A_4=+0.07 *19*.
393.4[b] *3*	[e]	2025.47	(14^+)	1631.88	13^+					
399.0[bi] *3*	[e]	4883.8	24^+	4484.9						
[x]401[g] *1*										
415.6[i] *2*	54 *2*	4685.6	22^+	4270.02	20^+	E2		0.0259		α(K)=0.0203 *3*; α(L)=0.00435 *7*; α(M)=0.000995 *14*; α(N+..)=0.000260 *4* α(N)=0.000228 *4*; α(O)=3.06×10^{-5} *5*; α(P)=1.105×10^{-6} *16* Mult.: α(K)exp=0.016 *3*.
445.6 *3*		2934.8+x		2489.2+x					109 *3*	Mult.: DCO=1.45 *19*.
450.6 *1*	260 *5*	4685.6	22^+	4235.0	21^+	M1(+E2)	<0.8	0.038 *5*	144 *9*	ce(K)/(γ+ce)=0.031 *4*; ce(L)/(γ+ce)=0.0046 *4*;

$^{152}_{67}Ho_{85}$-5

(HI,xnγ) 1994An13,1997Ri02 (continued)

γ(^{152}Ho) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ	α[j]	$I_{(\gamma+ce)}$[†@]	Comments
										ce(M)/(γ+ce)=0.00102 *7*; ce(N+)/(γ+ce)=0.000271 *20*
										ce(N)/(γ+ce)=0.000235 *17*; ce(O)/(γ+ce)=3.4×10^{-5} *3*; ce(P)/(γ+ce)=1.85×10^{-6} *24*
										E_γ: 1997Ri02 report 451.0 *3*.
										Mult.: α(K)exp=0.033 *5*, α(L)exp=0.0044 *7*. DCO=1.00 15.
471.7 *3*		10504.7	35$^{(-)}$	10032.9	34$^{(-)}$				22 *3*	
471.9 *3*		10032.9	34$^{(-)}$	9560.8					40 *9*	
487.8 *3*		12939.4		12451.6					21 *3*	
511.7[b] *3*		3531.2	20$^-$	3019.59	19$^-$	M1(+E2)	<0.48	0.0289 *15*		α(K)=0.0244 *14*; α(L)=0.00354 *14*; α(M)=0.00078 *3*; α(N+..)=0.000209 *8*
										α(N)=0.000181 *7*; α(O)=2.63×10^{-5} *11*; α(P)=1.47×10^{-6} *9*
										E_γ: Deduced from γγ. 1997Ri02 report 512.1 *3*.
										Mult.: α(K)exp=0.029 *6* deduced assuming I(511.7γ)=I(703.8γ) DCO=1.00 15.
519.0 *3*		12451.6		11932.6	(38)				33 *4*	
522.1 *3*	<91	2025.47	(14$^+$)	1503.44	(12$^+$)					I_γ: Mixed transition. 1994An13 report Iγ<84 *7*.
542.3 *3*		6589.7	(27$^-$)	6047.4	(25$^-$)				243 *24*	Mult.: DCO=1.78 *42*.
546.0[b] *3*	23 *7*	706.01	(10$^+$)	160	9$^+$					
557.7 *3*		10221.2		9663.5	33$^{(+)}$				51 *3*	
604.3 *1*	824 *20*	2236.21	15$^+$	1631.88	13$^+$	E2		0.00983		α(K)=0.00801 *12*; α(L)=0.001418 *20*; α(M)=0.000319 *5*; α(N+..)=8.40×10^{-5} *12*
										α(N)=7.34×10^{-5} *11*; α(O)=1.018×10^{-5} *15*; α(P)=4.52×10^{-7} *7*
										I_γ: intensity corrected for a contaminating line.
										Mult.: α(K)exp=0.0089 *17*.
x606[g] *1*										
607.1 *3*		11004.5		10397.4					61 *3*	
618.6 *3*		9260.5		8641.9					44 *12*	
619.5 *3*		9549.0		8929.5	33$^{(+)}$				34 *4*	
620.3 *3*		8636.7	32$^{(+)}$	8016.2	30$^{(+)}$				63 *8*	
623.0 *1*	69 *3*	1968.66	(13$^+$)	1345.64	(11$^+$)					
626.9 *3*		2489.2+x		1862.4+x					105 *4*	Mult.: DCO=0.98 *10*.
632.7 *3*		8266.4		7633.7	(29$^-$)				108 *14*	
x633.2[g] *4*										
639.6 *3*	<52	1345.64	(11$^+$)	706.01	(10$^+$)					I_γ: Mixed transition. 1994An13 report Iγ<48 *4*.
648.4 *3*		8929.5	33$^{(+)}$	8281.1	31$^{(+)}$				243 *4*	Mult.: DCO=1.82 *17*, A_2=+0.34 *8*, A_4=+0.02 *16*.
667.7 *3*		8934.1		8266.4					58 *12*	
686.1 *3*		4319.6+x		3633.5+x					19 *3*	
x700[f]										
703.8 *1*	266 *3*	4235.0	21$^+$	3531.2	20$^-$	E1		0.00259	168 *8*	ce(K)/(γ+ce)=0.00220 *3*; ce(L)/(γ+ce)=0.000299 *5*;

(HI,xnγ) 1994An13,1997Ri02 (continued)

γ(^{152}Ho) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	α[j]	$I_{(\gamma+ce)}$[†@]	Comments
									ce(M)/(γ+ce)=6.54×10^{-5} *10*; ce(N+)/(γ+ce)=1.743×10^{-5} *25* ce(N)/(γ+ce)=1.512×10^{-5} *22*; ce(O)/(γ+ce)=2.18×10^{-6} *3*; ce(P)/(γ+ce)=1.205×10^{-7} *17*
712.4 *1*	839 *6*	1631.88	13$^+$	919.43	11$^+$	E2	0.00667		E_γ: 1997Ri02 report 704.1 *3*. Mult.: α(K)exp=0.0021 *4*. DCO=1.36 15. α(K)=0.00550 *8*; α(L)=0.000914 *13*; α(M)=0.000204 *3*; α(N+..)=5.41×10^{-5} *8* α(N)=4.71×10^{-5} *7*; α(O)=6.61×10^{-6} *10*; α(P)=3.13×10^{-7} *5*
728.7 *3*		4362.2+x		3633.5+x				23 *3*	Mult.: α(K)exp=0.0058 *9*.
734.1 *1*	1000 *7*	3019.59	19$^-$	2285.49	16$^+$	E3	0.01510		α(K)=0.01172 *17*; α(L)=0.00262 *4*; α(M)=0.000602 *9*; α(N+..)=0.0001581 *23* α(N)=0.0001385 *20*; α(O)=1.89×10^{-5} *3*; α(P)=7.23×10^{-7} *11* Mult.: α(K)exp=0.0103 *16*, α(L)exp=0.0026 *5*.
x743.4[g] *3*									
759.5 *2*	860 *12*	919.43	11$^+$	160	9$^+$	E2	0.00577		α(K)=0.00478 *7*; α(L)=0.000777 *11*; α(M)=0.0001733 *25*; α(N+..)=4.59×10^{-5} *7* α(N)=4.00×10^{-5} *6*; α(O)=5.64×10^{-6} *8*; α(P)=2.72×10^{-7} *4* Mult.: α(K)exp=0.0046 *7*.
769.4 *1*	42 *3*	1345.64	(11$^+$)	576.22	(9$^+$)				
771.8 *3*		1862.4+x		1090.6+x				128 *4*	Mult.: DCO=0.85 *11*, A_2=−0.32 *10*, A_4=−0.04 *20*.
786.8 *3*		3721.6+x		2934.8+x				61 *3*	
797.5 *3*	55 *6*	1503.44	(12$^+$)	706.01	(10$^+$)				
813.5 *3*	71 *3*	5697.0	25$^+$	4883.8	24$^+$	M1	0.00948	202 *23*	ce(K)/(γ+ce)=0.00796 *11*; ce(L)/(γ+ce)=0.001119 *16*; ce(M)/(γ+ce)=0.000246 *4*; ce(N+)/(γ+ce)=6.59×10^{-5} *10* ce(N)/(γ+ce)=5.71×10^{-5} *8*; ce(O)/(γ+ce)=8.34×10^{-6} *12*; ce(P)/(γ+ce)=4.79×10^{-7} *7* E_γ: 1997Ri02 report 813.4 *3*. Mult.: α(K)exp=0.0095 *14*. DCO=1.47 25.
818.9 *3*		6739.3		5920.4				55 *15*	
x819.4[g] *3*	12 *1*								
837.6 *3*		837.6+x		x				104 *5*	Mult.: DCO=0.90 *20*, A_2=−0.36 *6*, A_4=+0.01 *10*.
842.0[dik] *5*	*e*	4298.82	20$^+$	3456.9?	(18$^+$)				
861.3 *3*		3796.1+x		2934.8+x				71 *6*	E_γ,$I_{(\gamma+ce)}$: unresolved multiplet.
x864[f]									
865.2 *1*	311 *3*	5749.0	25$^-$	4883.8	24$^+$	E1	1.72×10^{-3}	502 *35*	ce(K)/(γ+ce)=0.001465 *21*; ce(L)/(γ+ce)=0.000197 *3*; ce(M)/(γ+ce)=4.30×10^{-5} *6*;

(HI,xnγ) 1994An13,1997Ri02 (continued)

γ(^{152}Ho) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	$I_{(\gamma+ce)}$[†@]	Comments
							ce(N+)/(γ+ce)=1.149×10^{-5} *16* ce(N)/(γ+ce)=9.96×10^{-6} *14*; ce(O)/(γ+ce)=1.443×10^{-6} *21*; ce(P)/(γ+ce)=8.07×10^{-8} *12* E_γ: 1997Ri02 report 865.9 *3*. Mult.: α(K)exp=0.0017 *3*.
897.6 *3*		11295.0		10397.4		20 *4*	
900.9 *3*		2489.2+x		1588.3+x		60 *5*	
920.4 *3*		8281.1	31$^{(+)}$	7360.7	30$^{(+)}$	493 *8*	Mult.: DCO=0.96 *6*, A_2=−0.22 *3*, A_4=+0.08 *4*.
924.0 *3*		9560.8		8636.7	32$^{(+)}$	59 *6*	
944.6 *3*		8016.2	30$^{(+)}$	7071.6	29$^{(+)}$	170 *7*	Mult.: DCO=1.15 *16*.
986.2 *3*		9915.6	34$^{(-)}$	8929.5	33$^{(+)}$	67 *5*	Mult.: DCO=0.95 *22*.
1008.2 *3*		8641.9		7633.7	(29$^-$)	104 *17*	
1026.7 *3*		9663.5	33$^{(+)}$	8636.7	32$^{(+)}$	75 *3*	Mult.: DCO=1.28 *18*, A_2=−0.11 *8*, A_4=−0.56 *12*.
1036.3 *3*		11540.9	(37$^-$)	10504.7	35$^{(-)}$	55 *3*	Mult.: A_2=+0.10 *9*, A_4=−0.51 *14*.
1044.0 *3*		7633.7	(29$^-$)	6589.7	(27$^-$)	180 *20*	Mult.: DCO=1.88 *4*.
1049.5 *2*	26 *2*	1968.66	(13$^+$)	919.43	11$^+$		
x1060.4[g] *2*	41 *3*						
1073.7 *3*		7071.6	29$^{(+)}$	5997.9	28$^-$	1000 *30*	Mult.: DCO=1.02 *6*, A_2=−0.22 *3*, A_4=−0.03 *4*.
1078.0 *3*		11932.6	(38)	10854.4		43 *4*	
x1095[f]							
1103.4 *3*		10032.9	34$^{(-)}$	8929.5	33$^{(+)}$	52 *4*	Mult.: DCO=1.19 *18*, A_2=−0.22 *11*, A_4=−0.26 *16*.
1144.3 *3*		3633.5+x		2489.2+x		47 *4*	
1171.5[k] *4*	7 *2*	3456.9?	(18$^+$)	2285.49	16$^+$		
1185.6 *2*	11 *4*	1345.64	(11$^+$)	160	9$^+$		
1209.4 *3*		8281.1	31$^{(+)}$	7071.6	29$^{(+)}$	86 *4*	Mult.: DCO=1.72 *38*, A_2=+0.58 *7*, A_4=+0.37 *10*.
x1213[f]							
1215.3[k] *3*	4 *1*	4235.0	21$^+$	3019.59	19$^-$		E_γ,I_γ: Reported only by 1994An13. The transition is listed in the authors′ table as connecting a 3915 level with the 2860 level; however, the energy difference does not agree with Eγ, and no such level or transition is shown in the authors′ level scheme. The energy agrees with placement from the 4235 level to the 3019 level, in which case one has Iγ/Iγ(704γ)=0.015 *4*.
1223.4 *3*		4945.0+x		3721.6+x		33 *3*	
1250.4[i] *2*	23 *2*	4270.02	20$^+$	3019.59	19$^-$		
1276.0 *3*		8636.7	32$^{(+)}$	7360.7	30$^{(+)}$	184 *6*	Mult.: DCO=1.96 *35*, A_2=+0.32 *5*, A_4=−0.08 *7*.
1279.2 *2*	36 *2*	4298.82	20$^+$	3019.59	19$^-$		E_γ: 1997Ri02 report 1279.5 *3*.
1291.2 *3*		10220.5	34$^{(-)}$	8929.5	33$^{(+)}$	154 *5*	Mult.: DCO=0.98 *15*, A_2=−0.37 *5*, A_4=−0.10 *7*.
1308.4 *3*		2399.1+x		1090.6+x		62 *5*	Mult.: DCO=1.44 *34*, A_2=−0.35 *16*, A_4=−0.47 *23*.
1467.9 *3*		10397.4		8929.5	33$^{(+)}$	61 *4*	Mult.: DCO=0.63 *20*.
1610.9 *3*		10247.6		8636.7	32$^{(+)}$	19 *2*	

(HI,xnγ) 1994An13,1997Ri02 (continued)

$\gamma(^{152}Ho)$ (continued)

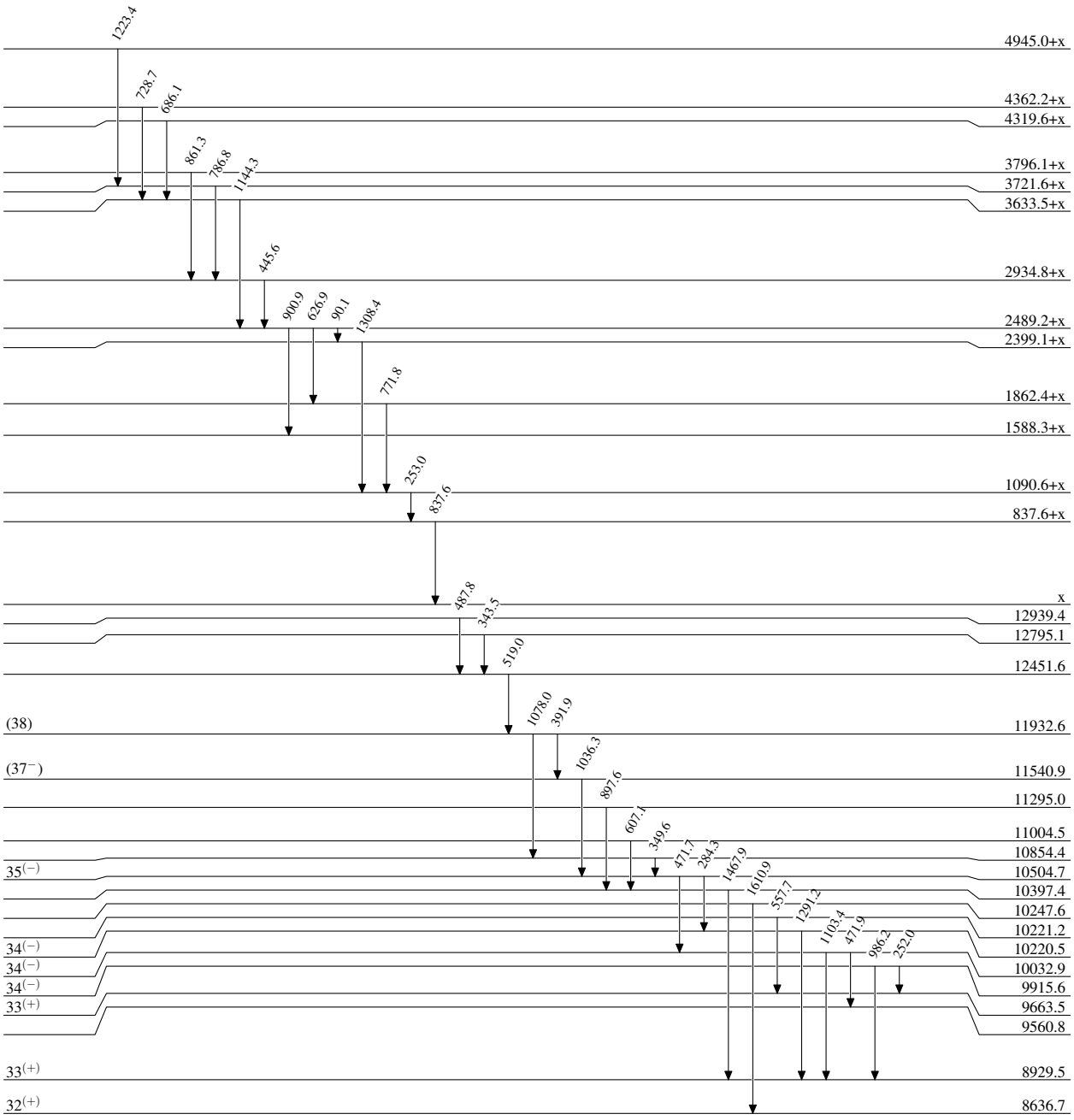
† Label=Iγ.
‡ From 1994An13 for levels up to 5998, except for the 5920 level. energies of 1997Ri02 are given in comments. Values for the 5920 level and for the higher levels are from 1997Ri02.
# Relative Iγ from 1994An13 taken with the $^{120}Sn(^{35}Cl,3n\gamma)$ reaction at E=178 MeV and normalized to 1000 for the 734γ. The authors also present data from $^{144}Sm(^{11}B,3n\gamma)$ at E=50 MeV.
@ Relative intensities from 1997Ri02 normalized to 1000 for the 1073.7γ. The uncertainties do not include the uncertainty in normalization between different portions of the level scheme. these additional uncertainties are 5% or 10% depending on the structures being compared. See the paper for details.
& The DCO ratios and angular distribution coefficients are from 1997Ri02. The experimental conversion data are from 1994An13.
a Member of a weak γ cascade between the 706 and 1632 levels. No details are given by 1994an13.
b From coin spectra.
c Transition observed in coin only.
d The order of the cascading 842.0 and 1171.5 γ's has not been determined. If the order were reversed, the intermediate level would be at 3127.32 keV.
e Weak line under a strong contaminating line.
f From 1997Ri02.
g See footnote on E(level).
h 1994An13 report α(K)exp=0.21 *2* for Eγ=222.1 *1* with Iγ=42 *2*. this transition could correspond to the 222.3γ from the 5760 level and/or the 222.5γ from the 5811 level, as reported by 1997Ri02.
i Not reported by 1997Ri02.
j 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.
k Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

$^{152}_{67}Ho_{85}$-9

(HI,xnγ) 1994An13,1997Ri02

Level Scheme

Intensities: Relative I_γ

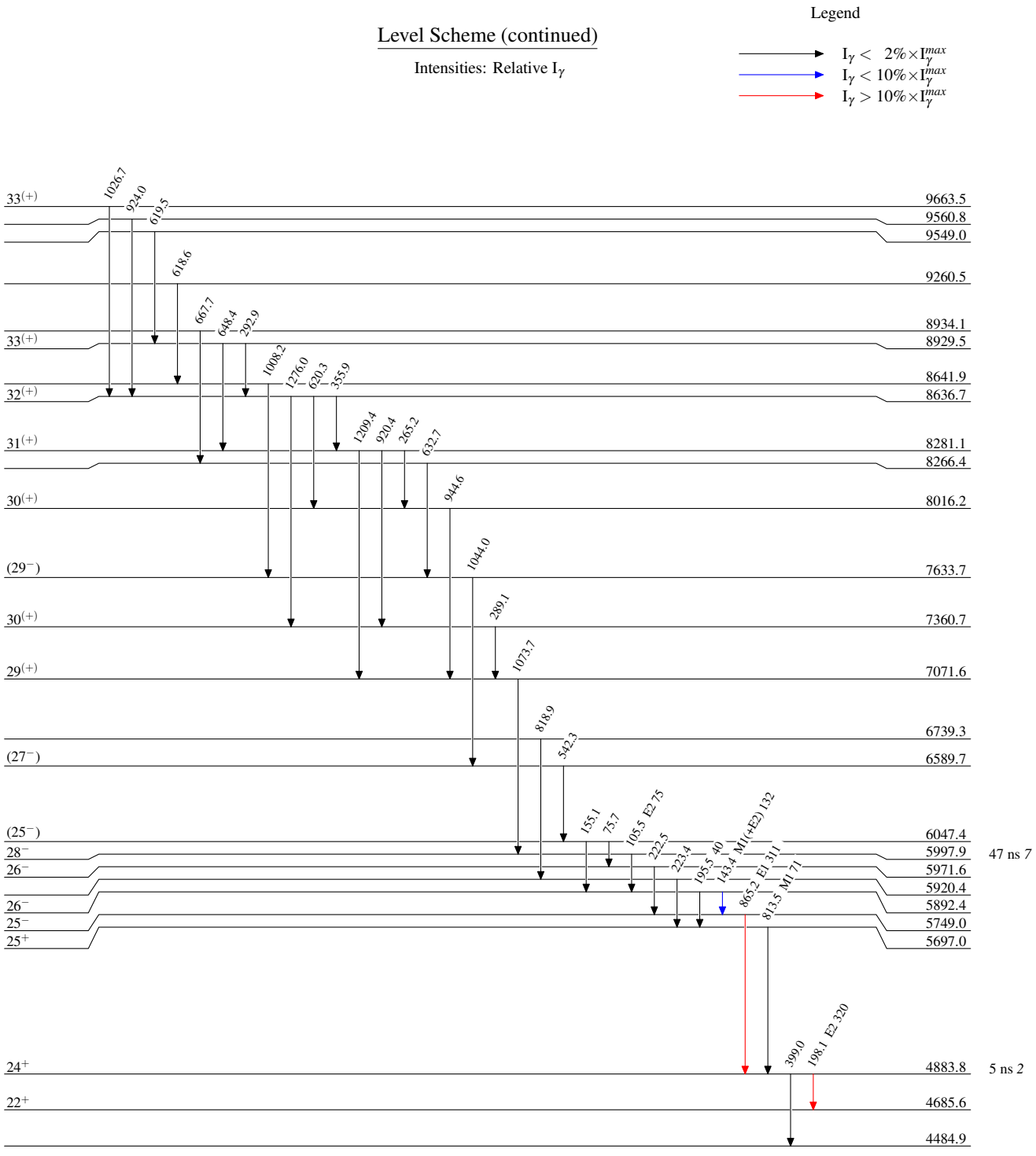


$^{152}_{67}Ho_{85}$

(HI,xnγ) 1994An13,1997Ri02

Level Scheme (continued)

Intensities: Relative I_γ



$^{152}_{67}Ho_{85}$

(HI,xnγ) 1994An13,1997Ri02

Level Scheme (continued)

Intensities: Relative I_γ

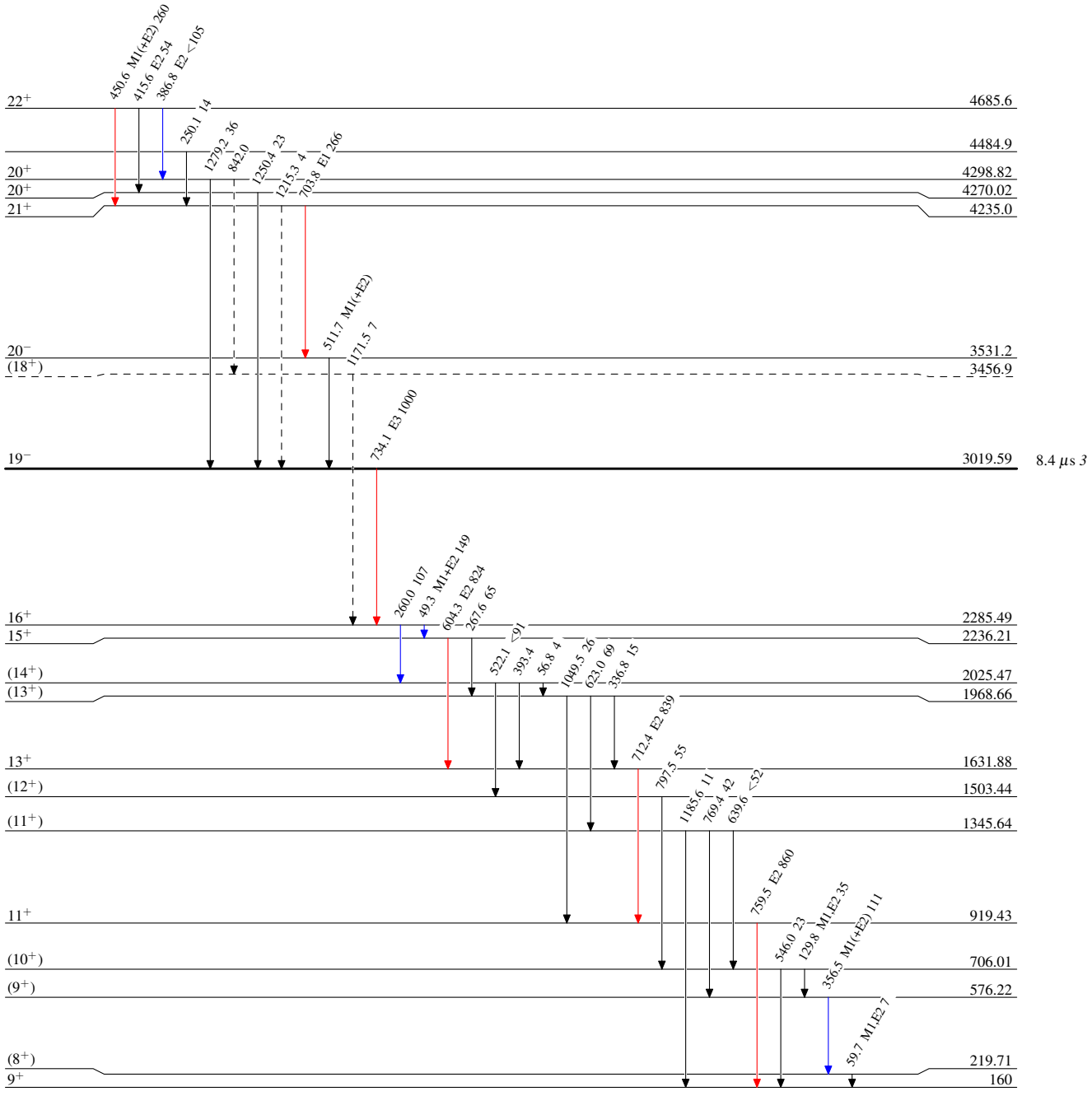
Legend

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

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

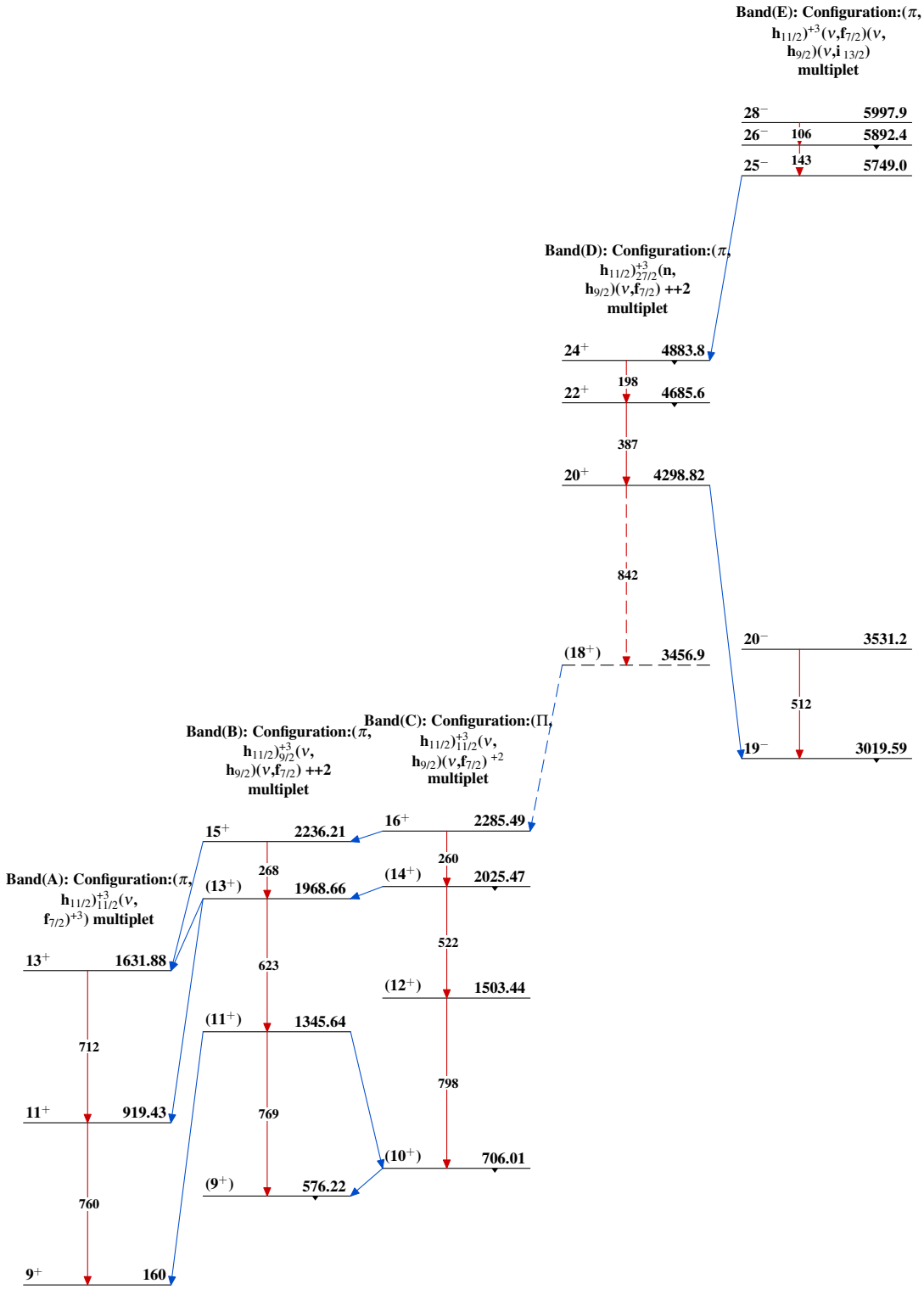
$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{152}_{67}Ho_{85}$

(HI,xnγ) 1994An13,1997Ri02



$^{152}_{67}Ho_{85}$