(HI,xnγ) 2001Ha47,2001He15,1987Be50

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 152, 331 (2018)	1-Apr-2018

2008Ri05: ^{92}Mo(^{54}Fe,Xγ) with E(^{54}Fe)=315 MeV. Measured Eγ, Iγ, γγ, γ(t), recoil-γ coincidences using the gas-filled recoil separator, RITU, with prompt γ rays detected in the JUROGAM array consisting of 43 Compton-suppressed HPGe detectors and delayed γ rays detected in the GREAT focal plane array using a segmented planar-Ge detector. Deduced $T_{1/2}$ of (8^-) isomeric level. Subset of results presented in 2007CuZZ.

2001Ha47: ^{105}Pd(^{35}Cl,2p2nγ) with E(^{35}Cl)=173 MeV. Measured Eγ, Iγ, γγ(θ) using the Gammasphere array consisting of 97 Compton-suppressed HPGe detectors and charged-particle-γ coincidences using the Microball array.

2001He15: ^{116}Sn(^{24}Mg,p3nγ) with E(^{24}Mg)=130 and 135 MeV. Measured Eγ, Iγ, γγ, γγ(θ) and γ(lin pol) using the Yrast ball array consisting of 18 coaxial Ge, 3 LEPS, and 4 Clover HPGe detectors.

2001St04: ^{116}Sn(^{24}Mg,p3nγ) with E(^{24}Mg)=130 MeV. Measured Eγ, Iγ, γγ using the Yrast ball array consisting of 28 Compton-suppressed Ge detectors including 5 segmented Clover detectors.

1987Be50: ^{114}Cd(^{27}Al,5nγ) with E(^{27}Al)=131 and 134 MeV; ^{116}Sn(^{24}Mg,p3nγ) with E(^{24}Mg)=133 MeV. Measured Eγ, Iγ, γγ, γ(θ) using four Compton-suppressed Ge detectors.

2001Ha47, 2001He15 and 2001St04 report only the positive parity states, providing very limited γ-ray information. These works agree well in their spin assignments. We adopt the more extensive level scheme from 2001Ha47 for the simple reason that they used a much larger number of Ge detectors and have extended the chiral doublet band to higher excitation energy. The negative parity states were reported only by 1987Be50, who also provided detailed γ-ray information.

^{136}Pm Levels

E(level)†	Jπ‡e	$T_{1/2}$	Comments
y[b]	(5^-)[c]		Additional information 1.
27.3+y *2*	(7^-)		Jπ: as proposed by 2008Ri05 based on systematics of N=77 and N=75 odd-odd nuclei.
70.0+y[#] *6*	(8^+)	1.5 μs *1*	$T_{1/2}$: from implant-γ(t) using the 42.7γ (2008Ri05).
169.2+y[@] *5*	(9^+)		
199.11+y[b] *20*	(6^-)[c]		
337.0+y[#] *5*	(10^+)		
445.8+y[b] *4*	(7^-)[c]		
622.4+y[@] *5*	(11^+)		
732.1+y[b] *3*	(8^-)[c]		
914.2+y[#] *5*	(12^+)		
927.7+y[a] *8*	(11^+)		
1057.5+y[b] *5*	(9^-)		
1215.7+y[&] *8*	(12^+)		
1322.7+y[@] *5*	(13^+)		
1352.6+y[b] *4*	(10^-)[c]		
1579.9+y[a] *7*	(13^+)		
1679.1+y[#] *5*	(14^+)		
1783.2+y?[b] *11*	(11^-)[c]		
2006.0+y[&] *8*	(14^+)		
2049.9+y[b] *4*	(12^-)[c]		
2157.5+y[@] *5*	(15^+)		
2239.2+y[b] *5*	(13^-)[c]		
2430.1+y[a] *7*	(15^+)		
2450.6+y[b] *5*	(14^-)[c]		
2575.4+y[#] *5*	(16^+)		
2696.2+y[b] *6*	(15^-)[c]		

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(HI,xnγ) 2001Ha47,2001He15,1987Be50 (continued)

^{136}Pm Levels (continued)

E(level)[†]	Jπ‡[e]	E(level)[†]	Jπ‡[e]	E(level)[†]	Jπ‡[e]	E(level)[†]	Jπ‡[e]
2889.1+y[&d] 9	(16+)	3350.4+y[b] 6	(17−)[c]	4006.2+y[@] 10	(19+)	4539.5+y[&] 13	(20+)
2997.0+y[b] 6	(16−)[c]	3550.5+y[#] 9	(18+)	4158.6+y[a] 12	(19+)	4885.7+y[@] 13	(21+)
3081.4+y[@] 8	(17+)	3724.3+y[&] 11	(18+)	4215+y?[b]	(19−)[c]	4942.5+y[a] 14	(21+)
3324.0+y[a] 10	(17+)	3748.8+y[b] 7	(18−)[c]	4448.1+y[#] 11	(20+)		

† From least-squares fit to Eγ′s, by evaluator, assuming Δ(Eγ)=1 keV when unknown.
‡ From 2001Ha47, except where noted, based on γ(θ) and systematics of nearby nuclei.
# Band(A): πh$_{11/2}$νh$_{11/2}$, α=0.
@ Band(a): πh$_{11/2}$νh$_{11/2}$, α=1.
& Band(B): Chiral doublet structure of πh$_{11/2}$νh$_{11/2}$, α=0.
a Band(b): Chiral doublet structure of πh$_{11/2}$νh$_{11/2}$, α=1.
b Band(C): Negative Parity Band.
c From 1987Be50, from γ(θ) and γ intensity pattern. In 1987Be50, the lowest positive parity state is assigned a J^{π}=(7+), in subsequent papers, however, it is given a value of (8+).
d 2001St04 tentatively assigned a 437 keV γ depopulating this level, 2001Ha47 report 2 γ′s: 459 keV and 883 keV.
e From the Adopted Levels.

γ(^{136}Pm)

Eγ[@]	Iγ	Ei(level)	J_i^{π}	Ef	J_f^{π}	Mult.	Comments
42.7 2		70.0+y	(8+)	27.3+y	(7−)	(E1)	Iγ: delayed intensity=3.0% 3 of the total delayed γγ projection spectrum. Eγ: from 2008Ri05. Mult.: M2, M3, and E3 character are excluded based on comparison to RUL. Systematics of odd-odd N=77 nuclei finds J^{π}=8+ isomers decaying by E1 transitions. Similarly, in the N=73 odd-odd nucleus ^{134}Pm, the long-lived μs isomer decays by an E1 transition (2008Ri05).
99.2[†] 2	51[†] 2	169.2+y	(9+)	70.0+y	(8+)	D	Mult.: A_2=−0.26 5, A_4=−0.01 7 (1987Be50).
167.8[†] 2	100[†] 2	337.0+y	(10+)	169.2+y	(9+)	D	Mult.: A_2=−0.34 5, A_4=0.06 8 (1987Be50).
189.3[†] 2	17[†] 2	2239.2+y	(13−)	2049.9+y	(12−)		
199.1[†] 2		199.11+y	(6−)	y	(5−)		
211.3[†] 2	23[†] 2	2450.6+y	(14−)	2239.2+y	(13−)	(D)	Mult.: A_2=−0.4 8, A_4=−0.5 1 (1987Be50).
245.6[†] 2	30[†] 3	2696.2+y	(15−)	2450.6+y	(14−)		
247[†] 1		445.8+y	(7−)	199.11+y	(6−)		
267[‡]		337.0+y	(10+)	70.0+y	(8+)		
268[†&] 1		2049.9+y	(12−)	1783.2+y?	(11−)		
285.4[†] 2	108[†] 8	622.4+y	(11+)	337.0+y	(10+)	(D)	Mult.: A_2=−0.1 4 (1987Be50).
286.3[†] 2		732.1+y	(8−)	445.8+y	(7−)		
288		1215.7+y	(12+)	927.7+y	(11+)		
291.8[†] 2	73[†] 4	914.2+y	(12+)	622.4+y	(11+)	D	Mult.: A_2=−0.4 1 (1987Be50).
295[†&] 1		1352.6+y	(10−)	1057.5+y	(9−)		
300.8[†] 2	16[†] 2	2997.0+y	(16−)	2696.2+y	(15−)		
325[†&]		1057.5+y	(9−)	732.1+y	(8−)		

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(HI,xnγ) 2001Ha47,2001He15,1987Be50 (continued)

γ(^{136}Pm) (continued)

E_γ [@]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
353.4[†] *2*	15[†] *2*	3350.4+y	(17$^-$)	2997.0+y	(16$^-$)		
356.4[†] *2*	24[†] *2*	1679.1+y	(14$^+$)	1322.7+y	(13$^+$)	D	Mult.: A_2=−0.2 *1* (1987Be50).
364		1579.9+y	(13$^+$)	1215.7+y	(12$^+$)	M1	Mult.: D from DCO in 2001He15 (no details provided), M1 from POL=−0.08 *16* (2001He15).
381[‡]		4539.5+y	(20$^+$)	4158.6+y	(19$^+$)		
398.4[†] *2*	3[†] *2*	3748.8+y	(18$^-$)	3350.4+y	(17$^-$)		
400[‡]		3724.3+y	(18$^+$)	3324.0+y	(17$^+$)		
403[‡]		4942.5+y	(21$^+$)	4539.5+y	(20$^+$)		
408.5[†] *2*	40[†] *4*	1322.7+y	(13$^+$)	914.2+y	(12$^+$)		
417.7[†] *4*		2575.4+y	(16$^+$)	2157.5+y	(15$^+$)		
424		2430.1+y	(15$^+$)	2006.0+y	(14$^+$)		
426		2006.0+y	(14$^+$)	1579.9+y	(13$^+$)		
430[†&] *1*		1783.2+y?	(11$^-$)	1352.6+y	(10$^-$)		
434[‡]		4158.6+y	(19$^+$)	3724.3+y	(18$^+$)		
435[‡]		3324.0+y	(17$^+$)	2889.1+y	(16$^+$)		
437[‡]		4885.7+y	(21$^+$)	4448.1+y	(20$^+$)		
442[‡]		4448.1+y	(20$^+$)	4006.2+y	(19$^+$)		
446[†] *1*		445.8+y	(7$^-$)	y	(5$^-$)		
452.9[†] *7*	7[†] *2*	622.4+y	(11$^+$)	169.2+y	(9$^+$)		
456[†] *1*		2239.2+y	(13$^-$)	1783.2+y?	(11$^-$)		
456		4006.2+y	(19$^+$)	3550.5+y	(18$^+$)		
459[‡]		2889.1+y	(16$^+$)	2430.1+y	(15$^+$)		
468[†&] *1*		4215+y?	(19$^-$)	3748.8+y	(18$^-$)		
469		3550.5+y	(18$^+$)	3081.4+y	(17$^+$)		
478.2[†] *3*	10[†] *2*	2157.5+y	(15$^+$)	1679.1+y	(14$^+$)		
506		3081.4+y	(17$^+$)	2575.4+y	(16$^+$)		
533.0[†] *2*		732.1+y	(8$^-$)	199.11+y	(6$^-$)		
577.2[†] *3*	30[†] *2*	914.2+y	(12$^+$)	337.0+y	(10$^+$)		
591		927.7+y	(11$^+$)	337.0+y	(10$^+$)		
593		1215.7+y	(12$^+$)	622.4+y	(11$^+$)	M1	Mult.: D from R(DCO)=0.63 *3* (2001Ha47), M1 from POL=−0.01 *12* (2001He15).
611.7[†] *3*	5[†] *1*	1057.5+y	(9$^-$)	445.8+y	(7$^-$)		
620.5[†] *2*	6[†] *1*	1352.6+y	(10$^-$)	732.1+y	(8$^-$)		
653		1579.9+y	(13$^+$)	927.7+y	(11$^+$)		
665		1579.9+y	(13$^+$)	914.2+y	(12$^+$)		
683		2006.0+y	(14$^+$)	1322.7+y	(13$^+$)	M1	Mult.: D from DCO in 2001He15 (no details provided), M1 from POL=−0.18 *22* (2001He15).
697.3[†] *2*	8[†] *1*	2049.9+y	(12$^-$)	1352.6+y	(10$^-$)	Q	Mult.: A_2=0.45 *26*, A_4=0.07 *26* (1987Be50).
700.3[†] *2*	16[†] *2*	1322.7+y	(13$^+$)	622.4+y	(11$^+$)	Q	Mult.: A_2=+0.45 *15*, A_4=0.14 *18* (1987Be50).
725[†&] *1*		1783.2+y?	(11$^-$)	1057.5+y	(9$^-$)		
751[#]		2430.1+y	(15$^+$)	1679.1+y	(14$^+$)		
759		927.7+y	(11$^+$)	169.2+y	(9$^+$)		
764.9[†] *2*	25[†] *3*	1679.1+y	(14$^+$)	914.2+y	(12$^+$)		
784[‡]		4942.5+y	(21$^+$)	4158.6+y	(19$^+$)		
790		2006.0+y	(14$^+$)	1215.7+y	(12$^+$)		
815[‡]		4539.5+y	(20$^+$)	3724.3+y	(18$^+$)		
834.8[†] *3*	16[†] *3*	2157.5+y	(15$^+$)	1322.7+y	(13$^+$)		
835[‡]		3724.3+y	(18$^+$)	2889.1+y	(16$^+$)		

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(HI,xnγ) 2001Ha47,2001He15,1987Be50 (continued)

γ(^{136}Pm) (continued)

E_γ [@]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
835[‡]		4158.6+y	(19$^+$)	3324.0+y	(17$^+$)		
850		2430.1+y	(15$^+$)	1579.9+y	(13$^+$)		
878		1215.7+y	(12$^+$)	337.0+y	(10$^+$)	Q	Mult.: R(DCO)=1.13 *28* (2001Ha47).
880[‡]		4885.7+y	(21$^+$)	4006.2+y	(19$^+$)		
883[‡]		2889.1+y	(16$^+$)	2006.0+y	(14$^+$)		
894[‡]		3324.0+y	(17$^+$)	2430.1+y	(15$^+$)		
896.5[†] *3*	15[†] *2*	2575.4+y	(16$^+$)	1679.1+y	(14$^+$)		
897[‡]		4448.1+y	(20$^+$)	3550.5+y	(18$^+$)		
916.6[†] *2*	9[†] *2*	2239.2+y	(13$^-$)	1322.7+y	(13$^+$)	D	Mult.: A_2=−0.16 *30*, A_4=−0.05 *40* (1987Be50).
924		3081.4+y	(17$^+$)	2157.5+y	(15$^+$)		
925		4006.2+y	(19$^+$)	3081.4+y	(17$^+$)		
975		3550.5+y	(18$^+$)	2575.4+y	(16$^+$)		
1092[#&]		2006.0+y	(14$^+$)	914.2+y	(12$^+$)		
1108[#]		2430.1+y	(15$^+$)	1322.7+y	(13$^+$)		
1135.7[†] *2*	9[†] *2*	2049.9+y	(12$^-$)	914.2+y	(12$^+$)	D	Mult.: A_2=−0.15 *20*, A_4=0.23 *30* (1987Be50).

[†] From 1987Be50.
[‡] Observed by 2001Ha47 only.
[#] Observed by 2001He15 only.
[@] From 2001Ha47, except where noted.
[&] Placement of transition in the level scheme is uncertain.

(HI,xnγ) 2001Ha47,2001He15,1987Be50

Level Scheme

Intensities: Relative I_γ

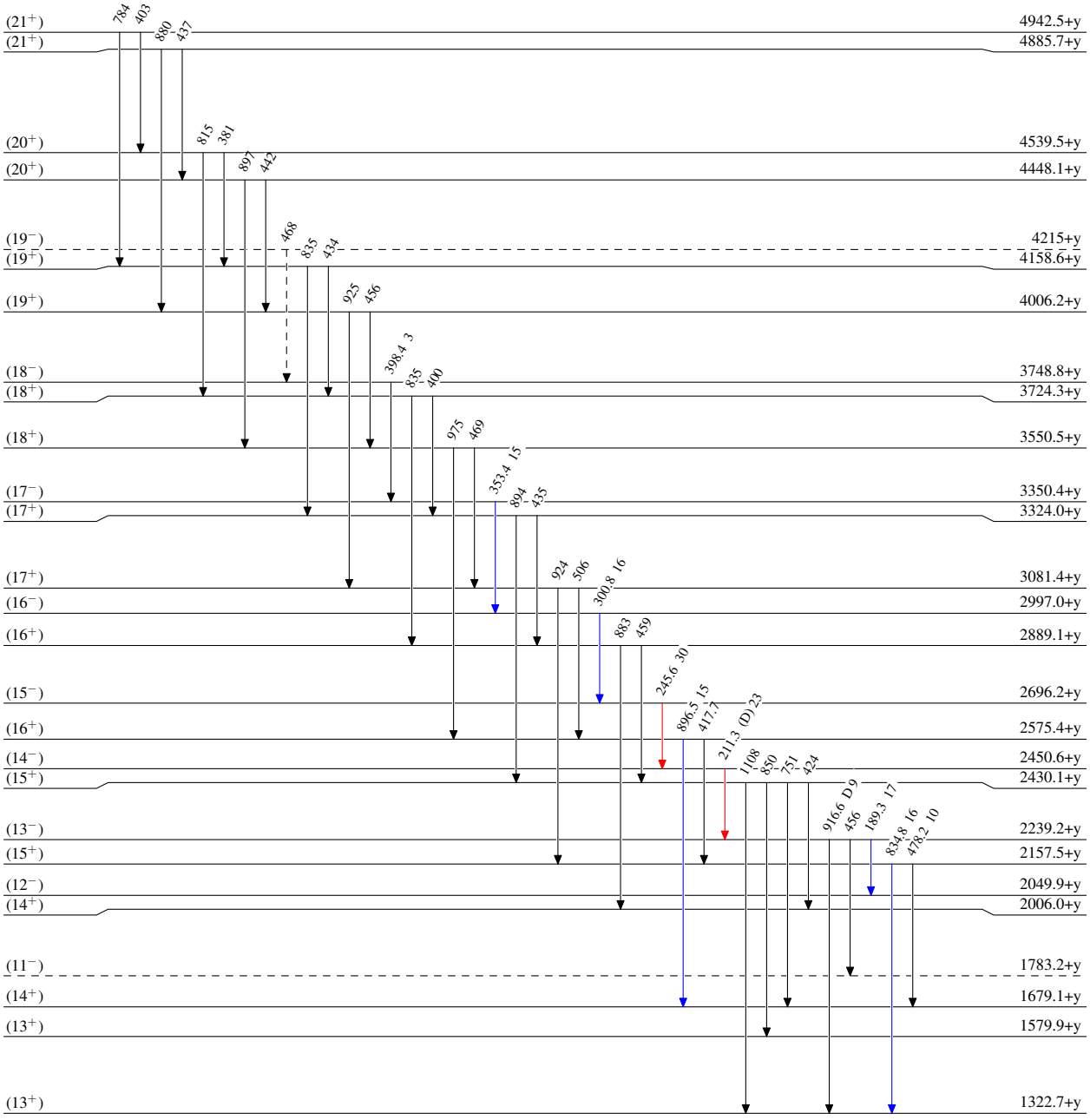
Legend

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

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

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

γ Decay (Uncertain)



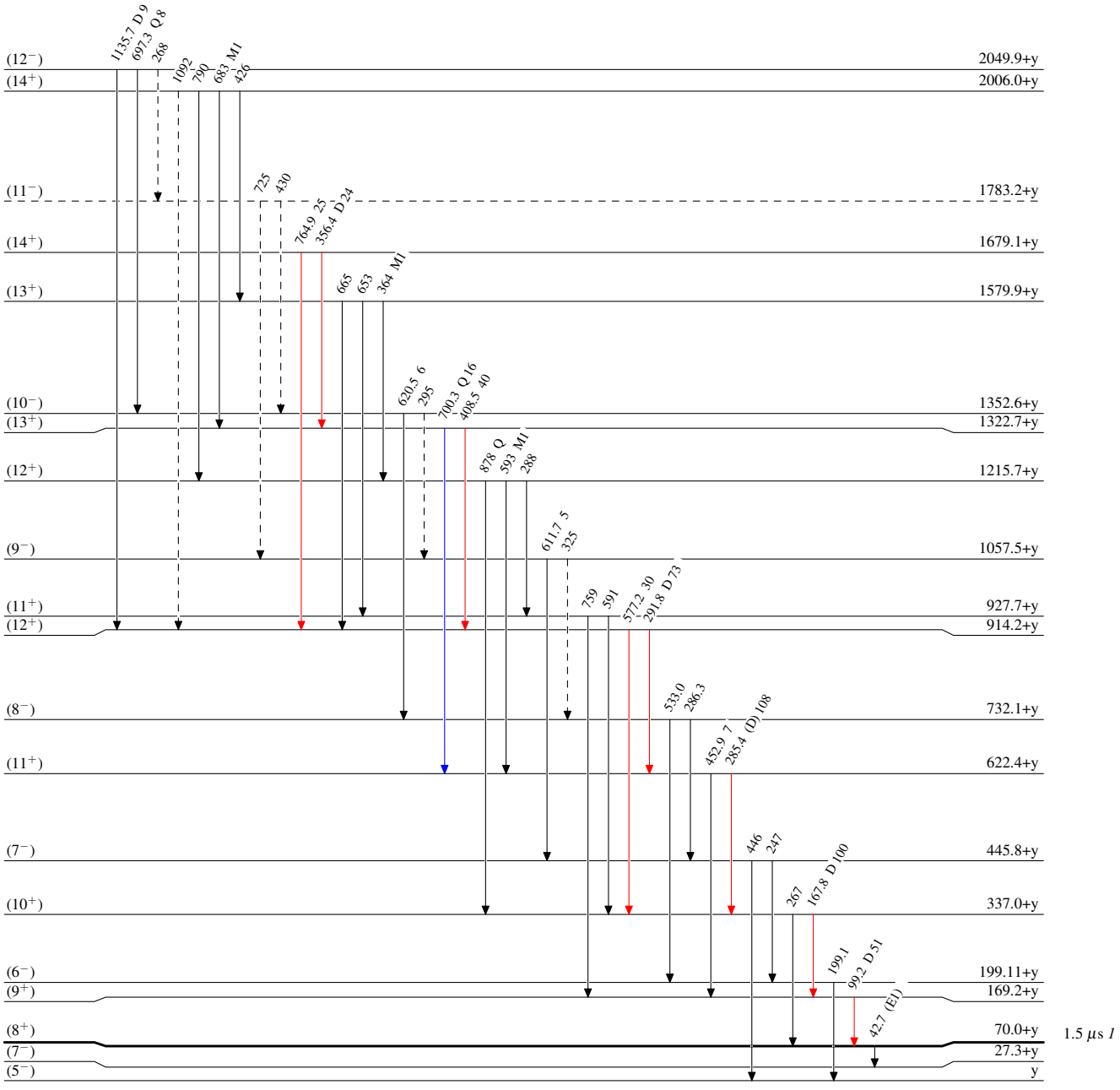
$^{136}_{61}Pm_{75}$

(HI,xnγ) 2001Ha47,2001He15,1987Be50

Level Scheme (continued)

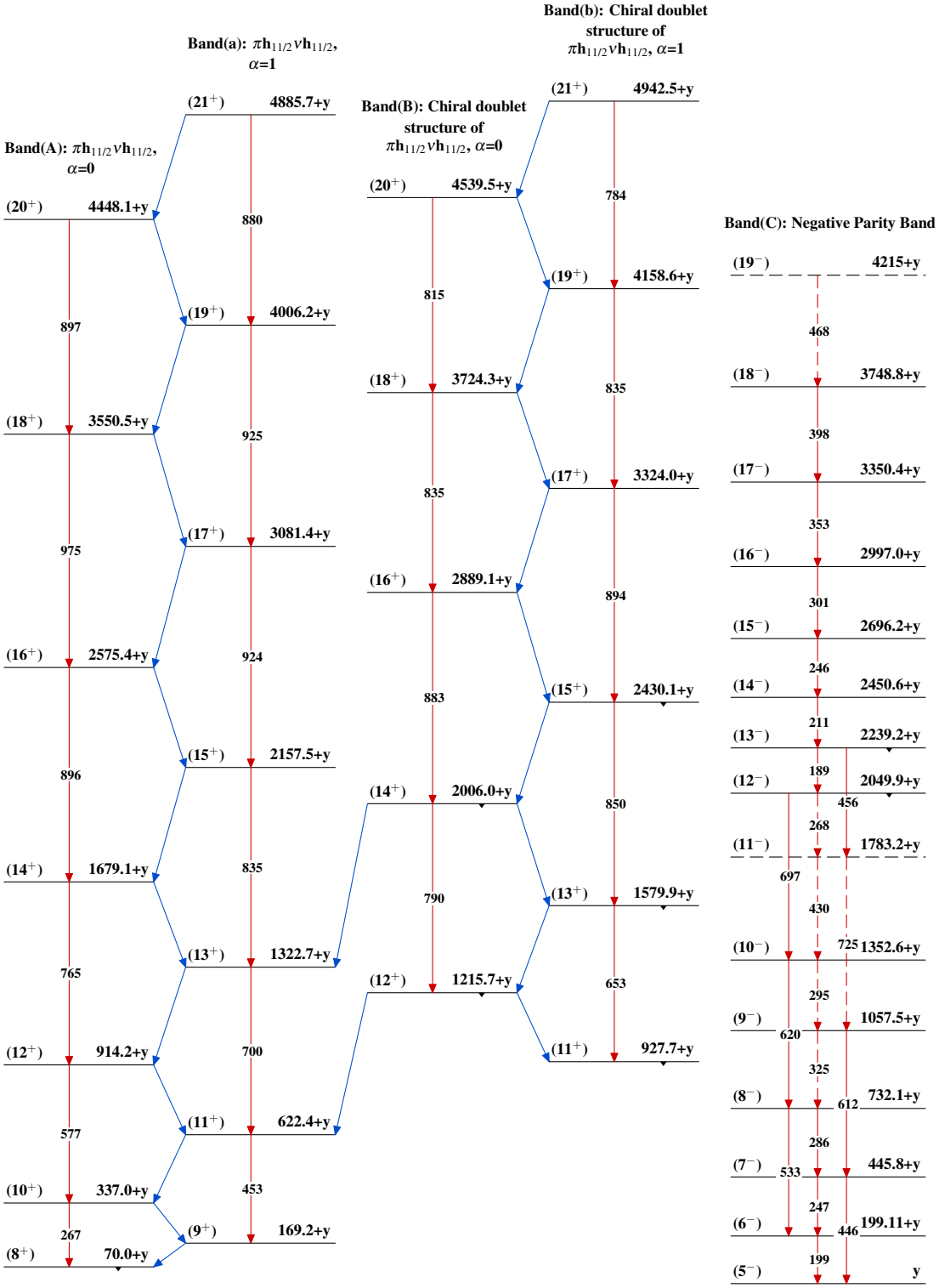
Intensities: Relative I_γ

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)



$^{136}_{61}Pm_{75}$

(HI,xnγ) 2001Ha47,2001He15,1987Be50



$^{136}_{61}Pm_{75}$