(HI,xnγ) 2004Li49,2004Li31

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson, D. Symochko(a), M. Fadil(b), and J. K. Tuli	NDS 112, 1949 (2011)	1-Jun-2010

^{128}Te(^{19}F,5nγ).

E=75-95 MeV. Measured Eγ,Iγ,γγ with ten Compton-suppressed (BGO anti-Compton suppressors) HPGe detectors. Excitation functions were measured in 5 MeV increments at the energy range of 75-95 MeV to find the optimal beam energy. The γγ coincidence measurements were performed at 90 MeV, as this beam energy produced the greatest yield of ^{142}Pm. Energy resolution 2 to 2.5 keV at 1.33 MeV.

1998Bh08,2002Bh02: ^{133}Cs(^{13}C,4nγ) 1998Bh05: E=63 MeV Measured Eγ, Iγ, γγ, γγ(θ)(DCO) using an array of 12 Compton-suppressed Ge detectors and a multiplicity filter of 14 BGO detectors.

2002Bh02: E=60 MeV. Measured lifetimes by pulsed-beam method and generalized centroid-shift method.

All data are from 2004Li49, unless otherwise indicated. The level scheme given in 1998Bh08 is based on feeding of a 2 ms isomer at 883 keV. It is, suggested by 2004Li49 that the high-lying levels decay through the proposed 67 μs isomer at 2828 level. The level scheme of 1998Bh05 generally agrees with that of 2004Li49 if the level energies of the former are shifted upwards by 2828.5-883.

^{142}Pm Levels

E(level)[@]	J$^{\pi}$	$T_{1/2}$[#]	Comments
0.0[‡]	1+[‡]		
208.50[‡] *25*	2+[‡]		
241.00[‡] *25*	3+[‡]		
412.0[†] *2*	(3)+		
449.5[‡] *4*	5+[‡]		
460.0[†] *3*	(4)+		
883.0[‡] *5*	8−[‡]	2.0 ms *2*	
998.0[†] *3*	(5−)		
1024.0?[†] *3*	(6)−		
1190.5[†] *3*	(7)−		
1309.9 *7*	(9−)		
1765.2 *6*	(9+)		
1809.2 *7*	(10+)		
2189.9 *7*	(11+)		
2828.6 *8*	(13−)	67 μs *5*	$T_{1/2}$: 2004Li49 assign this level as the 67 μs isomer, based upon the absence of any strong coincidence between the γ-rays below and above this level.
3143.7 *8*	(14−)	<0.69 ns	
3300.1 *9*	(12+)		
3507.2 *10*			
3737.8 *9*	(13+)		
3798.1 *9*	(13+)		
3820.2 *8*	(14)	0.8 ns *5*	
3872.2 *9*	(15)		
3886.4 *8*	(14−)		
4015.1 *9*	(16)	9 ns *4*	
4061.7 *9*	(15)		
4073.0 *10*			
4185.7 *10*			
4236.4 *10*	(17)	2.8 ns *9*	
4324.9 *11*			
4339.7 *10*	(16)		
4391.5 *10*			
4640.3 *13*			
4774.1 *14*			

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(HI,xnγ) 2004Li49,2004Li31 (continued)

^{142}Pm Levels (continued)

E(level)[@]	J^π	E(level)[@]	J^π	E(level)[@]	J^π	E(level)[@]	J^π
4786.9 *12*		5031.4 *11*		5617.8 *11*	(19)	6475.4 *13*	(21)
4969.8 *10*	(16)	5356.6 *13*		5672.2 *16*		6815.1 *13*	(21)
5008.2 *11*	(18)	5615.0 *11*	(19)	5810.1 *11*	(20)	7030.0 *14*	(22)

[†] From 1998Bh08, not reported by 2004Li49 but seen in other experiments.
[‡] From figure 3 of 2004Li49; not listed in authors' table I.
[#] From 2002BH02, except for the GS which is the adopted value.
[@] From least-squares fit to Eγ's.

$\gamma(^{142}Pm)$

DCO ratios are as given by 1998Bh08. They were determined using the classical corresponding expression at the angles 153° (or 45°) and 99°.
R(ang)=Iγ(±40°,±140°)/Iγ(±90°). Stretched quadropole transitions are assigned if R(ang)>1, and ΔJ=1, dipole transitions are assumed if R(ang)<<1.

E_γ[†]	I_γ[@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	α[b]	Comments
26.4[a] *2*		1024.0?	(6)$^-$	998.0	(5$^-$)			
32.5[‡] *3*		241.00	3$^+$	208.50	2$^+$			
44.0 *3*	21.8	1809.2	(10$^+$)	1765.2	(9$^+$)	M1+E2	27 *25*	α(L)=21 *19*; α(M)=5 *5*; α(N+..)=1.2 *11* α(N)=1.1 *10*; α(O)=0.13 *12*; α(P)=0.0006 *3* Eγ: The 44.0-keV transition is a doublet (γ and K_β) as it is much stronger than the 38 keV K_α of Pm (from 2004Li31).
52.0 *6*	5.1	3872.2	(15)	3820.2	(14)	D		DCO=1.45 *38*.
61.8 *9*		5031.4		4969.8	(16)			
88.4 *9*		3886.4	(14$^-$)	3798.1	(13$^+$)			
142.9 *3*	25.6[#]	4015.1	(16)	3872.2	(15)			R(ang)=0.89 *6*. DCO=1.09 *3*.
148.7 *9*	3.2	3886.4	(14$^-$)	3737.8	(13$^+$)	D		R(ang)=0.80 *13*.
166.5[a] *2*		1190.5	(7)$^-$	1024.0?	(6)$^-$			
171.0[a] *2*		412.0	(3)$^+$	241.00	3$^+$			
175.4 *6*	8.2	4061.7	(15)	3886.4	(14$^-$)			R(ang)=0.74 *9*.
192.3 *6*	10.1	5810.1	(20)	5615.0	(19)			R(ang)=0.82 *7*. DCO=1.03 *14*.
192.5[a] *2*		1190.5	(7)$^-$	998.0	(5$^-$)			
195.1 *6*	5.3	5810.1	(20)	5617.8	(19)			R(ang)=0.83 *10*. DCO=1.06 *6*.
203.5[a] *2*		412.0	(3)$^+$	208.50	2$^+$			
205.8 *9*	2.6	4391.5		4185.7				
208.5[‡] *3*		208.50	2$^+$	0.0	1$^+$			
208.5[‡] *3*		449.5	5$^+$	241.00	3$^+$			
214.8 *9*	2.1	7030.0	(22)	6815.1	(21)			R(ang)=0.76 *15*.
219.0[a] *2*		460.0	(4)$^+$	241.00	3$^+$			
221.3 *3*	19.7[#]	4236.4	(17)	4015.1	(16)			R(ang)=0.83 *6*. DCO=0.99 *4*.
221.4 *9*	<1	5008.2	(18)	4786.9				
241.0[‡] *3*		241.00	3$^+$	0.0	1$^+$			

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(HI,xnγ) 2004Li49,2004Li31 (continued)

γ(^{142}Pm) (continued)

E_γ[†]	I_γ[@]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[&]	α[b]	Comments
241.2 *9*	2.3	4061.7	(15)	3820.2	(14)			DCO=1.03 *14*.
248.8 *9*	2.5	4640.3		4391.5				
251.9 *9*	1.2	4324.9		4073.0				
277.9 *6*	5.6	4339.7	(16)	4061.7	(15)			R(ang)=0.80 *10*. DCO=1.14 *12*.
315.1 *3*	24.4[#]	3143.7	(14^-)	2828.6	(13^-)			R(ang)=1.04 *7*.
315.6 *9*	4.0	5672.2		5356.6				
324.7 *9*	1.8	4339.7	(16)	4015.1	(16)			
325.2 *6*	6.6	5356.6		5031.4				DCO=1.47 *19*.
329.8 *9*	4.1	4391.5		4061.7	(15)			R(ang)=0.95 *11*. DCO=1.89 *40*.
380.8 *3*	100.0[#]	2189.9	(11^+)	1809.2	(10^+)			R(ang)=0.86 *8*.
426.8 *6*	10.8	1309.9	(9^-)	883.0	8^-			R(ang)=0.84 *10*. Positive parity of final level, as reported in table I of 2004Li49, seems to be a misprint.
433.5[‡] *3*		883.0	8^-	449.5	5^+			
437.6 *9*	3.1	3737.8	(13^+)	3300.1	(12^+)	D		R(ang)=0.81 *14*.
447.3 *9*	<1	4786.9		4339.7	(16)			
449.2 *9*	1.9	4774.1		4324.9				
455.2 *6*	10[#]	1765.2	(9^+)	1309.9	(9^-)			R(ang)=1.27 *10*.
498.0 *9*	1.9	3798.1	(13^+)	3300.1	(12^+)			R(ang)=0.87 *15*.
519.3 *6*	7.0	4391.5		3872.2	(15)			R(ang)=1.11 *8*.
526.8 *9*	1.1	4324.9		3798.1	(13^+)			
538.0[a] *2*		998.0	(5^-)	460.0	$(4)^+$			
554.7 *9*	4.3	7030.0	(22)	6475.4	(21)			R(ang)=0.86 *11*.
565.7 *9*	<1	4073.0		3507.2				
574.5[a] *2*		1024.0?	$(6)^-$	449.5	5^+			
609.6 *9*	4.5	5617.8	(19)	5008.2	(18)			R(ang)=0.85 *11*. DCO=2.21 *27*.
638.6 *3*	89.7[#]	2828.6	(13^-)	2189.9	(11^+)	[M2+E3]	0.024 *8*	α(K)=0.020 *7*; α(L)=0.0033 *6*; α(M)=0.00072 *12*; α(N+..)=0.00019 *4* α(N)=0.00016 *3*; α(O)=2.4×10^{-5} *5*; α(P)=1.3×10^{-6} *5*
665.3 *6*	9.0	6475.4	(21)	5810.1	(20)			R(ang)=0.65 *8*. DCO=1.78 *25*.
691.6 *9*	4.0	5031.4		4339.7	(16)			
728.5 *6*	10.1	3872.2	(15)	3143.7	(14^-)			R(ang)=0.79 *8*. DCO=0.94 *3*.
742.8 *6*	5.6	3886.4	(14^-)	3143.7	(14^-)			R(ang)=1.23 *12*.
771.7 *9*	4.2	5008.2	(18)	4236.4	(17)			R(ang)=0.70 *12*. DCO=2.21 *27*.
772.9 *9*	<1	4073.0		3300.1	(12^+)			
882.2 *3*	144.9[#]	1765.2	(9^+)	883.0	8^-			R(ang)=0.77 *8*.
991.6 *3*	68[#]	3820.2	(14)	2828.6	(13^-)			R(ang)=0.82 *5*.
1005.0 *6*	6.8	6815.1	(21)	5810.1	(20)			R(ang)=0.76 *9*.
1019.4	22.5	2828.6	(13^-)	1809.2	(10^+)	[E3]	0.00481 *7*	α=0.00481 *7*; α(K)=0.00399 *6*; α(L)=0.000640 *9*; α(M)=0.0001385 *20*; α(N+..)=3.59×10^{-5} *5* α(N)=3.10×10^{-5} *5*; α(O)=4.57×10^{-6} *7*; α(P)=2.50×10^{-7} *4*
1042.1 *6*	7.7[#]	4185.7		3143.7	(14^-)			
1057.9 *6*	5.8[#]	3886.4	(14^-)	2828.6	(13^-)	M1+E2	0.0026 *6*	α=0.0026 *6*; α(K)=0.0023 *5*; α(L)=0.00030

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(HI,xnγ) 2004Li49,2004Li31 (continued)

γ(^{142}Pm) (continued)

Eγ[†]	Iγ[@]	Ei(level)	J^π_i	Ef	J^π_f	Mult.[&]	α[b]	Comments
								6; α(M)=6.4×10^{-5} 12; α(N+..)=1.7×10^{-5} 4 α(N)=1.5×10^{-5} 3; α(O)=2.2×10^{-6} 5; α(P)=1.4×10^{-7} 4 R(ang)=0.95 12. δ: positive mixing ratio by 2004Li49.
1097.7 6	6.9	4969.8	(16)	3872.2	(15)			R(ang)=0.93 9. DCO=1.11 19.
1110.4 9	4.4	3300.1	(12$^+$)	2189.9	(11$^+$)	M1+E2	0.0024 5	α=0.0024 5; α(K)=0.0020 5; α(L)=0.00027 5; α(M)=5.8×10^{-5} 11; α(N+..)=1.6×10^{-5} 3 α(N)=1.30×10^{-5} 24; α(O)=2.0×10^{-6} 4; α(P)=1.2×10^{-7} 3; α(IPF)=5.00×10^{-7} 22 R(ang)=0.45 11. δ: negative mixing ratio assigned by 2004Li49.
1317.2 9	<1	3507.2		2189.9	(11$^+$)			
1378.6 6	11.2	5615.0	(19)	4236.4	(17)			R(ang)=1.31 7. DCO=2.21 27.
1381.4 6	12.4	5617.8	(19)	4236.4	(17)			R(ang)=1.32 8.
1490.6 9	<1	3300.1	(12$^+$)	1809.2	(10$^+$)			
1548.0 9	2	3737.8	(13$^+$)	2189.9	(11$^+$)	Q		R(ang)=1.13 16.
1608.2 9	1.1	3798.1	(13$^+$)	2189.9	(11$^+$)			R(ang)=1.23 18.

[†] An uncertainty range of 0.3-0.9 keV is assigned by 2004Li49. Evaluators have assigned 0.3 keV for Iγ>15, 0.6 keV for Iγ=5-15 and 0.9 keV for Iγ<5.

[‡] From figure 3 of 2004Li49; not listed in authors′ table I; uncertainty of 0.3 keV assigned by the evaluators.

[#] Obtained from γ singles spectrum.

[@] At 90 MeV. Uncertainties are within 15% depending on the intensity.

[&] Mult=Q is for ΔJ=2 and mult=d for ΔJ=1 transitions.

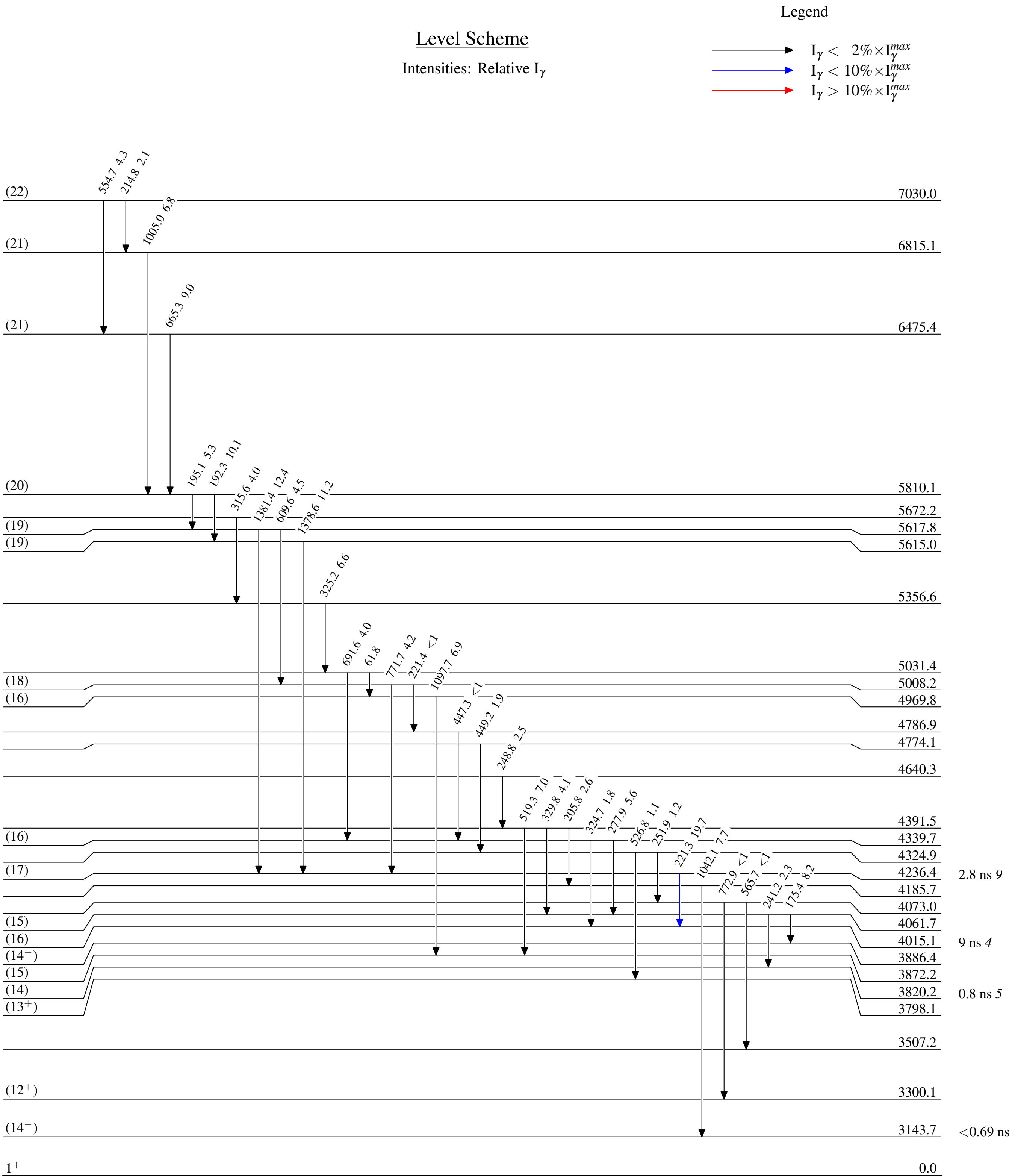
[a] From 1998Bh08, not reported by 2004Li49 but seen in other experiments.

[b] 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.

(HI,xnγ) 2004Li49,2004Li31

Level Scheme

Intensities: Relative I_γ



$^{142}_{61}Pm_{81}$

(HI,xnγ) 2004Li49,2004Li31

Level Scheme (continued)

Intensities: Relative I_γ