^{141}Pr(α,2nγ) 1980Pr02,1986En06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 113, 715 (2012)	31-May-2011

E=22.4, 24.4, 27.0 MeV; Iγ at E(α)=27.0 MeV (1980Pr06).

Measured: γ, $\gamma\gamma$, γ(t), $\gamma(\theta)$, ce, linear polarization of γ rays, $\gamma(\theta$,H,t), excitation function (1980Pr02,1986En06); nuclear penetration effects on ce (1980OhZU), γ rays, ce (1977Na07). Other: 2005Af02, measured reaction cross-section.

^{143}Pm Levels

E(level)	J$^{\pi}$[†]	$T_{1/2}$	Comments
0.0	$5/2^+$		
272.0 *1*	$7/2^+$		
959.7 *1*	$11/2^-$	24.0 ns *10*	g=+1.14 *9*. $T_{1/2}$: from 1980Pr02; other: 24.4 ns *14* (1975Fr18).
1056.5	$3/2^+$		
1173.1	$1/2^+$		
1259.8	(9/2)		
1286.7? *3*	(3/2,5/2)		
1456.4 *1*	$9/2^+$		
1558.7 *3*			E(level): from (p,2nγ) (1981Ko16).
1565.8	$(5/2)^+$		
1566.0	$(9/2)^+$		
1663.4 *2*	$11/2^+$		
1852.8 *5*			
1898.3 *6*	$15/2^+$	11.0 ns *7*	g=+1.00 *7*
1950.7 *3*	$13/2^-$		
2007.2? *3*			
2060.2 *5*	$13/2^-$		
2287.9 *5*	$17/2^+$		
2436.9 *5*	$15/2^-$		
2881.9	$17/2^-$		
2929.8 *5*	$19/2^-$		
3013.2	$21/2^-$		
3061.0? *7*			
3075.6	$19/2^-$		
3376.7	$21/2^-$		
3389.7	$(21/2^-)$		
3524.1			
3601.5	$(23/2)^-$		
4280.9	$(23/2^+)$		
4385.9			
4580.1	$(25/2^-)$		

[†] From Adopted Levels.

^{141}Pr(α,2nγ) 1980Pr02,1986En06 (continued)

$\gamma(^{143}Pm)$

ΔE=0.1-0.3 keV; ΔIγ=5%−30% (1980Pr02).

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡#	δ	α†	Comments
83.4 *1*	42	3013.2	21/2$^-$	2929.8	19/2$^-$	[M1]		2.61	α(K)=2.21 *4*; α(L)=0.312 *5*; α(M)=0.0666 *10*; α(N+..)=0.0174 *3* Mult.: A_2=−0.30 *4*, A_4=−0.18 *7*; α=1.3-4.0 from Iγ balance.
97.6 *3*	1	1663.4	11/2$^+$	1566.0	(9/2)$^+$				
105.0 *3*	5	4385.9		4280.9	(23/2$^+$)	D			Mult.: A_2=−0.16 *13*, A_4=+0.08 *20*.
x123.3@ *3*	2								
134.4@ *3*	5	3524.1		3389.7	(21/2$^-$)				
145.6@ *2*	24	3075.6	19/2$^-$	2929.8	19/2$^-$				Mult.: A_2=+0.13 *6*, A_4=−0.02 *11*.
x153.9 *3*	3								
193.6 *3*	15	3075.6	19/2$^-$	2881.9	17/2$^-$	(M1+E2)	+0.11 *4*	0.242	α(K)=0.205 *3*; α(L)=0.0288 *5*; α(M)=0.00616 *11*; α(N+..)=0.00161 *3* Mult.: A_2=−0.01 *16*, A_4=−0.24 *26*; p=−0.14 *40*.
x206.9 *3*	5								Mult.: A_2=−0.01 *16*, A_4=−0.24 *26*.
x219.6 *3*	4								
x225.1 *3*	2								
234.9 *1*	490	1898.3	15/2$^+$	1663.4	11/2$^+$	E2		0.1187	B(E2)(W.u.)=1.45 *10* α(K)=0.0897 *13*; α(L)=0.0227 *4*; α(M)=0.00506 *8*; α(N+..)=0.001272 *18* Mult.: A_2=+0.17 *2*, A_4=−0.01 *3*; E2 from α(K)exp; p=+0.28 *1*.
x261.5 *3*	3								
272.0 *1*	1000	272.0	7/2$^+$	0.0	5/2$^+$	M1+(E2)	<0.22	0.0959 *15*	α(K)=0.0816 *13*; α(L)=0.01134 *17*; α(M)=0.00242 *4*; α(N+..)=0.000633 *10* Mult.: A_2=+0.02 *1*, A_4=+0.02 *1*. Mult.: α(K)exp=0.0941 *28* (normalized to α(K)(E2) for γ rays from 2$^+$ to 0$^+$ in ^{166}Er,^{172}Hf,^{178}Hf) (1980OhZU).
287.3 *1*	34	1950.7	13/2$^-$	1663.4	11/2$^+$	E1+(M2)	≤−0.4	0.040 *25*	α(K)=0.033 *20*; α(L)=0.005 *4*; α(M)=0.0011 *8*; α(N+..)=0.00030 *20* Mult.: A_2=−0.19 *3*, A_4=+0.01 *7*; p=−0.06 *6*; 1980Pr02 proposed mult M1+(E2) with δ=−0.57 *54*.
301.1 *1*	29	3376.7	21/2$^-$	3075.6	19/2$^-$	M1+E2	−0.27 *24*	0.072 *3*	α(K)=0.061 *3*; α(L)=0.00863 *14*; α(M)=0.00184 *4*; α(N+..)=0.000481 *8* Mult.: A_2=−0.24 *3*, A_4=−0.09 *5*; M1 is from α(K)exp; p=−0.17 *9*.
x355.9 *3*	4								
x357.3 *3*	6								
363.5 *1*	17	3376.7	21/2$^-$	3013.2	21/2$^-$				Mult.: A_2=+0.48 *7*, A_4=−0.10 *9*.
376.5& *2*	73&	2436.9	15/2$^-$	2060.2	13/2$^-$				
376.5& *1*	73&	3389.7	(21/2$^-$)	3013.2	21/2$^-$	M1+E2	+1.1 *1*	0.0335 *8*	α(K)=0.0279 *8*; α(L)=0.00443 *7*; α(M)=0.000957 *15*; α(N+..)=0.000247 *4* Mult.: A_2=+0.27 *2*, A_4=+0.15 *4*; p=+0.07 *4*.
389.0 *1*	366	2287.9	17/2$^+$	1898.3	15/2$^+$	M1		0.0377	α(K)=0.0321 *5*; α(L)=0.00437 *7*; α(M)=0.000931 *13*;

$^{143}_{61}Pm_{82}$-2

^{141}Pr(α,2nγ) 1980Pr02,1986En06 (continued)

$\gamma(^{143}Pm)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡#]	δ	α[†]	Comments
									α(N+..)=0.000244 *4* Mult.: A_2=−0.07 *1*, A_4=−0.02 *2*; M1 from α(K)exp; p=−0.12 *3*, M1+(E2) with δ<0.1.
396.8 *1*	29	2060.2	13/2$^-$	1663.4	11/2$^+$	E1		0.00708 *10*	α=0.00708 *10*; α(K)=0.00606 *9*; α(L)=0.000804 *12*; α(M)=0.0001704 *24*; α(N+..)=4.42×10^{-5} *7* Mult.: A_2=−0.22 *11*, A_4=−0.21 *15*; p=+0.25 *8*.
447.0 *2*	9	3376.7	21/2$^-$	2929.8	19/2$^-$				Mult.: A_2=−0.23 *10*, A_4=−0.17 *17*.
492.9 *2*	17	2929.8	19/2$^-$	2436.9	15/2$^-$				Mult.: A_2=+0.44 *5*, A_4=−0.01 *8* for 492.9γ+493.9γ.
[x]493.9 *3*	10								
588.3 *1*	25	3601.5	(23/2)$^-$	3013.2	21/2$^-$	M1+(E2)	+0.13 *4*	0.01313 *20*	α(K)=0.01122 *17*; α(L)=0.001507 *22*; α(M)=0.000320 *5*; α(N+..)=8.39×10^{-5} *13* Mult.: A_2=−0.02 *5*, A_4=+0.05 *8*; p=−0.54 *20*.
[x]608.9 *3*	3								Mult.: A_2=−0.06 *25*, A_4=−0.02 *4*.
[x]617.9 *3*	10					Q			Mult.: A_2=+0.14 *9*, A_4=−0.13 *14*.
[x]623.9 *3*	9								
642.5 *1*	254	2929.8	19/2$^-$	2287.9	17/2$^+$	E1		0.00238 *4*	α=0.00238 *4*; α(K)=0.00204 *3*; α(L)=0.000265 *4*; α(M)=5.61×10^{-5} *8*; α(N+..)=1.461×10^{-5} *21* Mult.: A_2=−0.17 *2*, A_4=−0.04 *4*; E1 from α(K)exp; p=+0.28 *3*.
[x]649.4 *3*	10								
671.9[a] *3*	3	3601.5	(23/2)$^-$	2929.8	19/2$^-$				
687.7 *1*	202	959.7	11/2$^-$	272.0	7/2$^+$	M2		0.0253	B(M2)(W.u.)=0.250 *11* α(K)=0.0213 *3*; α(L)=0.00313 *5*; α(M)=0.000673 *10*; α(N+..)=0.0001762 *25* Mult.: A_2=+0.05 *2*, A_4=+0.06 *3*; p=−0.06; M2 from α(K)exp (1977Na07).
[x]728.5 *3*	4								
788.5 *2*	19	3075.6	19/2$^-$	2287.9	17/2$^+$	E1		0.001558 *22*	α=0.001558 *22*; α(K)=0.001339 *19*; α(L)=0.0001724 *25*; α(M)=3.64×10^{-5} *6*; α(N+..)=9.50×10^{-6} Mult.: A_2=−0.15 *7*, A_4=+0.01 *10*; p=+0.39 *29*.
796.3 *3*	2	1852.8		1056.5	3/2$^+$				
[x]835.0 *2*	25								Mult.: A_2=−0.02 *8*, A_4=−0.24 *14*.
891.2 *2*	19	4280.9	(23/2$^+$)	3389.7	(21/2$^-$)	E1		0.001224 *18*	α=0.001224 *18*; α(K)=0.001053 *15*; α(L)=0.0001349 *19*; α(M)=2.85×10^{-5} *4*; α(N+..)=7.43×10^{-6} Mult.: A_2=−0.22 *8*, A_4=−0.11 *12*; p=+0.68 *46*.
[x]945.5 *3*	11								Mult.: A_2=−0.09 *12*, A_4=−0.19 *20*.
959.8 *1*	41	959.7	11/2$^-$	0.0	5/2$^+$	E3		0.00557 *8*	B(E3)(W.u.)=9.2 *4* α=0.00557 *8*; α(K)=0.00461 *7*; α(L)=0.000756 *11*; α(M)=0.0001642 *23*; α(N+..)=4.25×10^{-5} *6* Mult.: A_2=+0.13 *4*, A_4=+0.10 *6*; E3 from α(K)exp (1977Na07).
983.6 *1*	50	2881.9	17/2$^-$	1898.3	15/2$^+$	E1		0.001013 *15*	α=0.001013 *15*; α(K)=0.000872 *13*; α(L)=0.0001113 *16*; α(M)=2.35×10^{-5} *4*; α(N+..)=6.14×10^{-6} Mult.: A_2=−0.12 *4*, A_4=+0.11 *6*; p=+0.28 *17*.
1000.8 *3*	4	3061.0?		2060.2	13/2$^-$				

$^{143}_{61}Pm_{82}$-3

^{141}Pr(α,2nγ) 1980Pr02,1986En06 (continued)

$\gamma(^{143}Pm)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡#]	α[†]	Comments
1014.5 *3*	18	1286.7?	(3/2,5/2)	272.0	7/2$^+$			
1056.5 *1*	15	1056.5	3/2$^+$	0.0	5/2$^+$	Q+D		Mult.: A_2=−0.17 *15*, A_4=+0.06 *24*; p=−0.95 *60*.
[x]1150.8 *3*	5							
1173.1 *2*	9	1173.1	1/2$^+$	0.0	5/2$^+$	Q		Mult.: A_2=+0.13 *7*, A_4=−0.22 *12*.
1190.4 *2*	22	4580.1	(25/2$^-$)	3389.7	(21/2$^-$)			Mult.: A_2=+0.13 *7*, A_4=−0.22 *12*.
1259.8 *3*		1259.8	(9/2)	0.0	5/2$^+$			
[x]1278.8 *2*	23							Mult.: A_2=−0.05 *8*, A_4=−0.07 *13*.
1286.7[&] *3*	6[&]	1286.7?	(3/2,5/2)	0.0	5/2$^+$			
1286.7[&] *3*	6[&]	1558.7		272.0	7/2$^+$			
1293.8 *2*	23	1565.8	(5/2)$^+$	272.0	7/2$^+$	(M1)	0.00202 *3*	α=0.00202 *3*; α(K)=0.001718 *24*; α(L)=0.000225 *4*; α(M)=4.76×10^{-5} *7*; α(N+..)=3.30×10^{-5} *5* Mult.: A_2=−0.33 *15*, A_4=−0.02 *27*; p=−0.34 *36*; M1 or E3 from α(K)exp, pol exclude E3.
[x]1342.4 *2*	15							Mult.: A_2=−0.02 *15*, A_4=+0.12 *22*.
1391.4 *1*	614	1663.4	11/2$^+$	272.0	7/2$^+$	E2	0.001249 *18*	α=0.001249 *18*; α(K)=0.001033 *15*; α(L)=0.0001375 *20*; α(M)=2.92×10^{-5} *4*; α(N+..)=4.97×10^{-5} Mult.: A_2=+0.20 *2*, A_4=+0.02 *4*; E2 from α(K)exp in (1977Na07).
1456.4 *1*	34	1456.4	9/2$^+$	0.0	5/2$^+$	E2	0.001166 *17*	α=0.001166 *17*; α(K)=0.000946 *14*; α(L)=0.0001253 *18*; α(M)=2.66×10^{-5} *4*; α(N+..)=6.84×10^{-5} Mult.: M1+E2 from A_2=+0.17 *10*, A_4=+0.25 *16*. E2 from ΔJ^π.
1477.2 *1*	58	2436.9	15/2$^-$	959.7	11/2$^-$	(E2)	0.001143 *16*	α=0.001143 *16*; α(K)=0.000921 *13*; α(L)=0.0001218 *17*; α(M)=2.58×10^{-5} *4*; α(N+..)=7.49×10^{-5} Mult.: A_2=+0.24 *4*, A_4=−0.10 *6*; p=+0.05 *37*.
[x]1544.7 *3*	4							
1566.0 *2*	9	1566.0	(9/2)$^+$	0.0	5/2$^+$	Q		Mult.: A_2=+0.12 *20*, A_4=+0.22 *33*.
1735.2 *2*	19	2007.2?		272.0	7/2$^+$			Mult.: A_2=+0.41 *22*, A_4=−0.05 *32*.

[†] Additional information 1.
[‡] α(K)exp were normalized to α(K) for 687.7γ M2. The values are given only in a figure in 1980Pr02; some α(K)exp are from 1977Na07.
[#] From $\gamma(\theta)$, α(K)exp and linear pol data (1980Pr02).
[@] Doublet.
[&] Multiply placed with undivided intensity.
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

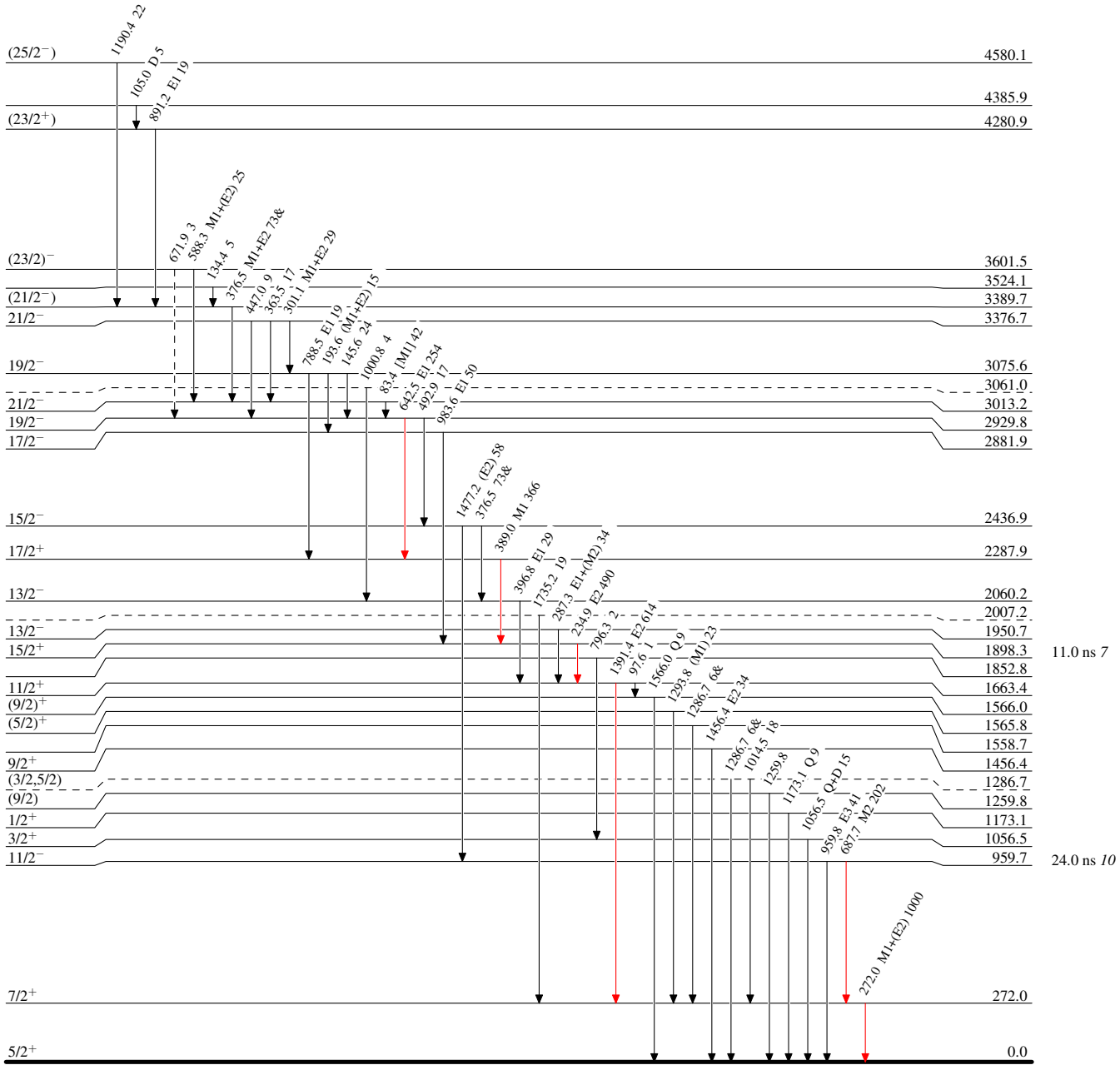
$^{143}_{61}Pm_{82}$-4

^{141}Pr(α,2nγ) 1980Pr02,1986En06

Level Scheme

Intensities: Type not specified
& Multiply placed: undivided intensity given

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)



$^{143}_{61}Pm_{82}$