Nuclear Data Sheets for A = 141*

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Abstract: Nuclear spectroscopic information for experimentally investigated nuclides of mass 141 (Te, I, Xe, Cs, Ba, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, and Ho) has been evaluated. A summary of information obtained in various reaction and decay experiments is presented, together with data tables and adopted level schemes.

Cutoff Date: Literature available up to Jan 1, 2012 has been consulted.

General Policies and Organization of Material: see <http://www.nndc.bnl.gov/nds/NDSPolicies.pdf>.

General Comments: The statistical analysis of γ -ray data and deduced level schemes is carried out through computer codes available at NNDC, BNL website: www.nndc.bnl.gov. The direct feedings to excited states in β^- and ϵ decays have generally been computed from $I(\gamma+ce)$ intensity balances at each level; the associated $\log ft$ values are calculated using $\log ft$ code. All Q values have been adopted from 2012Wa38. Theoretical conversion coefficients are from BrIcc code: v2.2b (20-Jan-2009) (2008Ki07) with "Frozen Orbitals" approximation, and with implicit uncertainty of 1.4%.

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NUCLEAR DATA SHEETS

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Skeleton Scheme for A=141

Skeleton Scheme for A=141 (continued)

$S(n) \dots 13180\text{SY}$

Ground-State and Isomeric-Level Properties				
Nuclide	Level	$J\pi$	$T_{1/2}$	Decay Modes
141I	0.0	0.0	0.43 s 2	β^- =100; β^-n =21.2 30
141Xe	0.0	5/2(-)	1.73 s 1	β^- =100; β^-n =0.044 5
141Cs	0.0	7/2+	24.84 s 16	β^- =100; β^-n =0.035 3
141Ba	0.0	3/2-	18.27 min 7	β^- =100
141La	0.0	(7/2+)	3.92 h 3	β^- =100
141Ce	0.0	7/2-	32.511 d 13	β^- =100
141Pr	0.0	5/2+	stable	
141Nd	0.0	3/2+	2.49 h 3	ϵ + β^+ =100
	756.51	11/2-	62.0 s 8	IT>99.95; ϵ + β^+ <0.05
141Pm	0.0	5/2+	20.90 min 5	ϵ + β^+ =100
141Sm	0.0	1/2+	10.2 min 2	ϵ + β^+ =100
	175.9	11/2-	22.6 min 2	ϵ + β^+ =99.69 3; IT=0.31 3
141Eu	0.0	5/2+	40.7 s 7	ϵ + β^+ =100
	96.45	11/2-	2.7 s 3	ϵ + β^+ =13 +4-2; IT=87 +2-4
141Gd	0.0	1/2+	14 s 4	ϵ + β^+ =100; β^+p =0.03 1
	377.76	11/2-	24.5 s 5	ϵ + β^+ =89 2; IT=11 2
141Tb	0.0	(5/2-)	3.5 s 2	ϵ + β^+ =100
	0+x		7.9 s 6	ϵ + β^+ =100
141Dy	0.0	(9/2-)	0.9 s 2	ϵ + β^+ =100; β^+p =?
141Ho	0.0	(7/2-)	4.1 ms 1	p =100
142Ho	0.0	(7-, 8+)	0.4 s 1	ϵp =?; ...
145Pm	0.0	5/2+	17.7 y 4	α = 2.8×10^{-5} ; ...

Adopted Levels

$Q(\beta^-)=9420$ SY; $S(n)=2200$ SY; $S(p)=13840$ SY; $Q(\alpha)=-3120$ SY 2012Wa38.

$Q(\beta^-), S(n), \Delta S(p), Q(\alpha)$: uncertainties based on systematics are: $\Delta Q(\beta^-)=450$, $\Delta S(n)=400$, $\Delta S(p)=720$, $\Delta Q(\alpha)=640$ (2012Wa38).

Produced by Pb($^{238}\text{U}, F$), $E=750$ MeV/A (1994Be24, 1998Do08). Identification by energy loss and time-of-flight. Measured cross-section.

Theory: 2007Ji14.

Adopted Levels

$Q(\beta^-)=8290$ SY; $S(n)=4380$ SY; $S(p)=10840$ SY; $Q(\alpha)=-2300$ SY 2012Wa38.

$Q(\beta^-), S(p), S(n), Q(\alpha)$: uncertainties based on systematics are: $\Delta Q(\beta^-)=200$, $\Delta S(n)=270$, $\Delta S(p)=200$, $\Delta Q(\alpha)=360$ (2012Wa38).

Theory: 2007Ji14.

 ^{141}I Levels

E(level)	$T_{1/2}$	Comments
0.0	0.43 s 2	<p>$\% \beta^- = 100$; $\% \beta^- n = 21.2$ 30.</p> <p>From $T_{1/2}$ consideration 1970KrZP tentatively assign gammas with $E_\gamma = 338, 414, 475$, and 572 to ^{141}I β^- decay.</p> <p>Delayed neutron emission probability = 21.2% 30 (1980Al15), 21.3% 32 (1989BrZI) Others: 39% 13 (1978Kr15), 30% 17 (1974Kr21); see also 1977Ru10, 1974Ru07, 1969ScZY.</p> <p>Observed neutron groups with $E(n) = 160, 225?, 300, 340?, 395, 450, 550, 610?, 685?$ (1974Ru07).</p> <p>$T_{1/2}$: from 1980Al15. Others: 0.41 s 8 (1974Kr21), 0.43 s 8 (1970HeZX), 0.48 s 3 (1976Lu02).</p>

Adopted Levels, Gammas

Q(β⁻)=6280 10; S(n)=3282 4; S(p)=11890 180; Q(α)=-1318 4 2012Wa38.

Measured yields from different photofission reactions: 2005Ga25, 2005Ga50, 2004Ga60, 2003Ga21, 2000Ga60, 2000Lh02.

Theory: 2007Ji14, 2006Ks01.

<r²>^{1/2}=4.8823 68 fm (2004An14).

¹⁴¹Xe Levels

Cross Reference (XREF) Flags

A ¹⁴¹I β⁻ Decay
B ²⁴⁸Cm SF Decay

E(level)	Jπ [†]	XREF	T _{1/2}	Comments
0.0 ‡	5/2 (-)	AB	1.73 s 1	%β ⁻ =100; %β ⁻ n=0.044 5. T _{1/2} : from 1969Ta04. Others: 1.72 s 3 (1976Ot03), 1.720 s 13 (1969Ca03), 1.79 s 3 (1971Kr22), 1.81 s 10 (1972Am01); see also 1967Co31. Jπ: hfs (LASER) (1989Bo03), π=- is suggested by 1989Bo03 from analogy with levels of similar μ in neighboring ¹⁴³ Ba. 1996Be06 suggest Nilsson orbital [523]5/2 assignment. Delayed neutron emission probability=0.044% 5 (1981ReZW). Others: 0.0426% 23 (1975As03), see also 1969Ta04. μ=+0.010 4 (2011StZZ,1989Bo03). Q=-0.58 2 (2011StZZ,1989Bo03). μ and Q deduced from hfs (LASER).
35.6	(7/2-)	B		
111.9 ‡	(9/2-)	B		
481.5 ‡	(13/2-)	B		
552.2	(11/2-)	B		
998.2 ‡	(17/2-)	B		
1029.1	(15/2-)	B		
1155.0 #	(13/2+)	B		
1332.7 §	(15/2+)	B		
1494.4 #	(17/2+)	B		
1670.8 §	(19/2+)	B		
1679.1 ‡	(21/2-)	B		
1972.9 #	(21/2+)	B		
2134.7 §	(23/2+)	B		
2396.5 ‡	(25/2-)	B		
2574.7 #	(25/2+)	B		
2696.7 §	(27/2+)	B		
3106.7 ‡	(29/2-)	B		
3365.7 §	(31/2+)	B		

† Based on γ-ray multipolarities obtained from γγ(0), linear pol, and band assignments in ²⁴⁸Cm SF decay.

‡ (A): π=- band. Band built on 9/2-, 111.9 level.

§ (B): simplex=-i.

(C): simplex=+i.

γ(¹⁴¹Xe)

All data are from ²⁴⁸Cm SF decay (2000Ur04), unless stated otherwise.

E(level)	Eγ	Mult.	α	Comments
35.6	35.6	M1+E2		Mult.: from α(K)exp=14 1. Other: 15.0 5 (1996Be06).
111.9	76.3	M1(+E2)		α(exp)=1.4 4. Mult.: from α(exp), γγ(0).
	111.9	(E2)	1.21	Mult.: stretched Q from γγ(0), most likely E2.
481.5	369.6	E2	0.0217	Mult.: from γγ(0), lin pol=+0.25 9.
552.2	516.5			
998.2	515.8	E2		Mult.: from γγ(0), lin pol=+0.20 6.
1029.1	477.7			
	547.6	D		Mult.: stretched D from γγ(0), lin pol=-0.30 15.
1155.0	602.8			
	673.5			
1332.7	850.5			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Xe})$ (continued)

E(level)	E γ	Mult.	Comments
1494.4	339.4		
	465.3		
	497.0		
1670.8	338.5	[E2]	
	672.6	E1	Mult.: stretched D from $\gamma\gamma(0)$, lin pol=+0.30 12.
1679.1	681.8	E2	Mult.: from $\gamma\gamma(0)$, lin pol=+0.20 10.
1972.9	478.5		
2134.7	454.7		
	463.9	[E2]	
2396.5	717.4		
2574.7	601.8		
2696.7	562.0	[E2]	
3106.7	709.2		
3365.7	668.8	[E2]	

(A) $\pi=-$ band. Band
built on 9/2-, 111.9
level.

(B) simplex=-i.

(C) simplex=+i.

$^{141}_{54}\text{Xe}_{87}$ **^{141}I β^- Decay 1980Al15,1974Ru07**

Parent ^{141}I : E=0.0; $J\pi=?$; $T_{1/2}=0.43$ s 2; Q(g.s.)=8290 200; % β^- decay=100.

Measured: delayed neutrons ($T_{1/2}(n)$ (1980Al15,1976Lu02,1974Kr21,1970HeZX), emission probability (1980Al15,1978Kr15,1974Kr21), E(n) (1974Ru07)); γ (1970KrZP).

Delayed neutron emission probability=21.2% 30 (1980Al15); others: 39% 13 (1978Kr15), 30% 17 (1974Kr21); see also 1974Ru07, 1969ScZY.

Observed neutron groups with E(n)=160, 225?, 300, 340?, 395, 450, 550, 610?, 685? (1974Ru07).

From $T_{1/2}$ consideration 1970KrZP tentatively assign γ 's: 338, 414, 475, 574 to ^{141}I β^- decay.

 ^{141}Xe Levels

E(level)

0.0

^{248}Cm SF Decay 2000Ur04

Parent ^{248}Cm : $E=0.0$; $J\pi=0+$; $T_{1/2}=3.48\times 10^5$ y 6; %SF decay=8.39 16.

2000Ur04: Eurogam2, measured $\gamma\gamma\gamma$, $X\gamma\gamma$, $\gamma(\theta)$, directional polarization, Ge, LEPS.

1996Be06 (same authors as 2000Ur04): Eurogam with 5 LEPS, 45 Compton-suppressed large volume Ge detectors.

Measured $\gamma\gamma\gamma$, $X\gamma\gamma$.

 ^{141}Xe Levels

E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
0.0	5/2(-)	1155.0 [#]	(13/2+)	2396.5 [‡]	(25/2-)
35.6	(7/2-)	1332.7 [§]	(15/2+)	2574.7 [#]	(25/2+)
111.9 [‡]	(9/2-)	1494.4 [#]	(17/2+)	2696.7 [§]	(27/2+)
481.5 [‡]	(13/2-)	1670.8 [§]	(19/2+)	3106.7 [‡]	(29/2-)
552.2	(11/2-)	1679.1 [‡]	(21/2-)	3365.7 [§]	(31/2+)
998.2 [‡]	(17/2-)	1972.9 [#]	(21/2+)		
1029.1	(15/2-)	2134.7 [§]	(23/2+)		

[†] Based on γ -ray multiplicities obtained from $\gamma\gamma(\theta)$, linear pol, and band assignments.

[‡] (A): $\pi=-$ band. Band built on (9/2-), 111.9 level.

[§] (B): simplex=-i.

[#] (C): simplex=+i.

 $\gamma(^{141}\text{Xe})$

E_γ	E(level)	$I_\gamma^\dagger$	Mult.	α	Comments
35.6	35.6		M1+E2		Mult.: from $\alpha(K)(\text{exp})=14$ 1. Other: 15.0 5 (1996Be06).
76.3	111.9		M1(+E2)		$\alpha(\text{exp})=1.4$ 4.
					Mult.: from $\alpha(\text{exp})$, $\gamma\gamma(\theta)$.
111.9	111.9		(E2)	1.21	Mult.: stretched Q from $\gamma\gamma(\theta)$, most likely E2.
338.5	1670.8		[E2]		
339.4	1494.4				
369.6	481.5	98 3	E2	0.0217	Mult.: from $\gamma\gamma(\theta)$, lin pol=+0.25 9.
454.7	2134.7				
463.9	2134.7	18 1	[E2]		
465.3	1494.4				
477.7	1029.1				
478.5	1972.9				
497.0	1494.4				
515.8	998.2	100 3	E2		Mult.: from $\gamma\gamma(\theta)$, lin pol=+0.20 6.
516.5	552.2				
547.6	1029.1		D		Mult.: stretched D from $\gamma\gamma(\theta)$, lin pol=-0.30 15.
562.0	2696.7	14 1	[E2]		
601.8	2574.7				
602.8	1155.0				
668.8	3365.7		[E2]		
672.6	1670.8	24 1	E1		Mult.: stretched D from $\gamma\gamma(\theta)$, lin pol=+0.30 12.
673.5	1155.0				
681.8	1679.1	26 1	E2		Mult.: from $\gamma\gamma(\theta)$, lin pol=+0.20 10.
709.2	3106.7				
717.4	2396.5	8 1			
850.5	1332.7				

[†] Intensity in coincidence with the 370.1 γ from 1996Be06.

Adopted Levels, Gammas

Q(β⁻)=5256 10; S(n)=5498 12; S(p)=8780 9; Q(α)=-546 12 2012Wa38.
<r²>^{1/2}=4.8678 109 fm (2004An14).

¹⁴¹Cs Levels

Cross Reference (XREF) Flags

A ¹⁴¹Xe β⁻ Decay
B ²⁴⁸Cm, ²⁵²Cf SF Decay

E(level)	Jπ [†]	XREF	T _{1/2}	Comments
0.0 [@]	7/2+	AB	24.84 s 16	%β ⁻ =100; %β ⁻ n=0.035 3. μ=+2.438 10 (2011StZZ,1979Bo01). μ: from hfs (1979Bo01). Others: 2.42 3 (1979Ek02), 2.41 1 (1981Th06). Jπ: from hfs (1979Bo01,1979Ek02), π from analysis of μ (1979Ek02). Configuration=(π 1g _{7/2}). Q=-0.36 4 (2011StZZ,1979Bo01). Q: from hfs (1979Bo01). Other: -0.45 7 (1981Th06). %β ⁻ n from 1993Ru01. Others: 0.029% 2 (1980Lu04), 0.043% 7 (1977Re05), 0.0529% 29 (1975As03), 0.073% 11 (1969Ta04). T _{1/2} : weighted average: 24.34 s 12 (1993Ru01), 24.94 s 6 (1976Ot03), 24.98 s 13 (1986Ok03). Others: 24.8 s 8 (1980Lu04), 25.6 s 3 (1974Gr29); see also 1972Ta29, 1971Kr22, 1970OsZZ, 1969Ta04.
69.05 3	(3/2)+	AB	23.3 ns 7	T _{1/2} : from ¹⁴¹ Xe β ⁻ decay (1975Mo03). Other: 22 ns 6 (²⁵² Cf SF decay) (1974ClZX).
105.94 ^{&} 1	5/2+	AB	8.7 ns 2	Jπ: γ to 7/2+ is E2, log ft=6.1 via 5/2(-) parent. T _{1/2} : from ¹⁴¹ Xe β ⁻ decay (1975Mo03). Other: 14 ns 1 (²⁵² Cf SF decay) (1974ClZX).
116.82 7		A		Jπ: M1+E2 γ to 7/2+, g.s. and γ to (3/2)+, 69.
187.76 4	+	A	<1.9 ns	Jπ: γ to 7/2+ is E2,(M1).
206.65 6		A	<2.1 ns	T _{1/2} : from 1975Mo03 (¹⁴¹ Xe β ⁻ decay).
369.5 [@] 1	11/2+ [‡]	AB		T _{1/2} : from 1975Mo03 (¹⁴¹ Xe β ⁻ decay).
389.00 ^{&} 4	9/2+	AB		Jπ: E2 γ to 5/2+, 106 and band assignment.
468.00 4	+	A		Jπ: γ to 7/2+ is M1,E2.
492.80 6		A		
557.1 2	+	A		Jπ: γ to 7/2+ is M1,E2.
644.2 2	+	A		Jπ: γ to 5/2+, 105 is M1,E2.
668.7 4		A		
801.0 3		A		
843.1 4		A		
850.7 [@] 4	15/2+	B		Jπ: E2 γ to 11/2+, 370 and band assignment.
862.4 ^{&} 3	13/2+ [‡]	B		
975.2 7		A		
979.8 3		A		
1097.1 3	7/2(-), 5/2(-)	A		Jπ: log ft=5.3 via 5/2(-) parent, γ to 7/2+.
1121.0 1		A		
1134.3 4		A		
1195.5 6		A		
1338.7 7		A		
1482.9 [@] 4	19/2+	B		Jπ: E2 γ to 15/2+, 851.
1488.9 ^{&} 4	17/2+	B		Jπ: E2 γ to 13/2+, 862.
1549.9 ^a 4	(15/2-) [§]	B		
1556.6 8	5/2(-), 7/2(-)	A		Jπ: log ft=5.4 via 5/2(-) parent, γ to 7/2+.
1577.2 5		B		
1632.3 ^b 4	(17/2-) [§]	B		
1661.0 4	(17/2)	B		Jπ: D γ to 15/2+.
1941.5 ^a 4	(19/2-) [§]	B		Jπ: D γ to 17/2+, 1489 (compatible with the assignment based on similar ¹⁴³ Cs level scheme).
2000.8 ^c 4	(19/2) [#]	B		
2086.8 ^b 4	21/2(-) [§]	B		Jπ: D γ to 19/2+, 1483 (compatible with the assignment based on similar ¹⁴³ Cs level scheme).
2113.5 ^{&} 4	21/2+	B		Jπ: E2 γ to 17/2+, 1489.
2131.3 [@] 4	23/2+	B		Jπ: E2 γ to 19/2+, 1483.
2285.4 5	(23/2+) [#]	B		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
¹⁴¹Cs Levels (continued)

E(level)	Jπ [†]	XREF	E(level)	Jπ [†]	XREF	E(level)	Jπ [†]	XREF
2466.0 ^a 4	(23/2-) [§]	B	2994.9 ^a 4	(27/2-) [§]	B	3504.5 ^{&} 6	(29/2+) [‡]	B
2649.5 ^c 4	(23/2) [#]	B	3056.6 ^c 5	(27/2+) [#]	B	3603.2 ^a 5	(31/2-) [§]	B
2675.5 ^b 4	25/2(-) [§]	B	3332.8 ^c 5	(27/2) [#]	B	4273.0 ^a 6	(35/2-) [§]	B
2784.6 ^{&} 5	(25/2+) [‡]	B	3345.5 ^b 5	29/2(-) [§]	B	4345.7 [@] 7	(35/2+) [‡]	B
2789.5 [@] 5	(27/2+) [‡]	B	3501.8 [@] 6	(31/2+)	B			

[†] For levels seen in SF decay only, Jπ are from band assignments.

[‡] Based on E2-band assignment.

[§] Tentative Jπ assignments for bands 3 and 4 based on similar ¹⁴³Cs level scheme (²⁴⁸Cm, ²⁵²Cf SF decay, 2010Lu02).

[#] Postulated by 2010Lu02 in ²⁴⁸Cm, ²⁵²Cf SF decay based on level scheme arguments.

[@] (A): Band 1: based on 7/2+ g.s. Bands 1 and 4 form a parity doublet with s=-i.

[&] (B): Band 2: based on 5/2+. Bands 2 and 3 form a parity doublet with s=+i.

^a (C): Band 3: based on (15/2-).

^b (D): Band 4: based on (17/2-).

^c (E): Band 5: based on (19/2).

^γ(¹⁴¹Cs)

E(level)	E _γ [†]	I _γ [†]	Mult. [‡]	α	Comments
69.05	69.05 3	100	(E2)	7.07	Mult.: from intensity balance in γγ 69γ may be pure E2 or E2(+M1) (with small admixture of M1). B(E2)(W.u.)=44.0 15.
105.94	37 1		[M1]	16.48	
	105.942 6		M1+E2	1.1 4	α(exp)=1.5 2. Mult.: from α(exp) (²⁴⁸ Cm, ²⁵² Cf SF decay).
116.82	47.78 5	100	[M1]	7.61	
187.76	81.826 2	20.9 15	[M1]	1.599	B(M1)(W.u.)>0.0017.
	118.705 4	100 7			
	187.69 4	17.6 12	E2, (M1)	0.18 3	B(M1)(W.u.)>7.3×10 ⁻⁵ ; B(E2)(W.u.)>1.2.
206.65	89.80 4	17.7 18			The discrepancy between T _{1/2} for 89.9γ in ¹⁴¹ Xe β decay (T _{1/2} <2.1 ns) and in ²⁵² Cf SF decay (T _{1/2} =12 ns) suggests that this γ may be a doublet in SF decay with unknown placement of T _{1/2} =12 ns component.
	100.721 2	100 7			
	137.63 4	30.1 18			
369.5	369.5 1	100			
389.00	283.05 [§] 4	33 3	E2	0.0524	
	320.2 5	≤3.7			
	389.11 4	100 10	M1, E2	0.0211 17	Mult.: based on α(K)exp=0.02 1 in β ⁻ decay.
468.00	261.3 5	1.3 6			
	280.26 7	2.5 8			
	361.96 5	40 3	M1, E2	0.0258 17	Mult.: based on α(K)exp=0.024 15 in β ⁻ decay.
	398.9 2	11.7 8			
	467.81 4	100 8	M1, E2	0.0128 15	Mult.: based on α(K)exp=0.015 6 in β ⁻ decay.
492.80	122.5 8	2.3 12			
	286.0 [§] 1	≤11.5			
	304.9 3	8.1 12			
	387.00 6	29.1 23			
	423.89 5	100 8			
	492.85 6	32.6 35			
557.1	89.10 6	5.7 7			
	167.6 4	1.4 4			
	369.5 1	≤57			
	451.5 4	8.6 21			
	556.8 1	100 7	M1, E2		Mult.: based on α(K)exp=0.008 3 in β ⁻ decay.
644.2	255.24 [§] 5	64 6			
	437.7 4	7.6 19			
	456.8 3	37.7 38			
	538.4 1	100 8	M1, E2		
	644.2 2	47.2 38			Mult.: based on α(K)exp(538γ+540γ)=0.011 3 in β ⁻ decay.
668.7	462.10 4	100 13			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Cs})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. [‡]	α	Comments
668.7	480.1	31.25			
	599.73	44.13			
	669.34	31.13			
801.0	333.03	10.2			
	412.57	4.2			
	594.21	42.4			
	613.064	100.2			
	731.928	46.6			
	801.03	16.4			
843.1	286.0§ 1	≤66			
	473.14	47.13			
	842.72	100.13			
850.7	481.0	100	E2	0.01048	
862.4	473.4	100.6			
	492.7	30.617	D		
975.2	482.22	100.22			
	507.64	56.22			
979.8	335.47	2.111			
	422.42	18.153			
	511.94	22.343			
	772.95	100.6			
	791.91	16.021			
	873.84	4.311			
	979.73	70.7			
	254.1§ 6	≤0.47			
1097.1	453.22	2.34			
	540.124	22.2	(E1)		Mult.: from $\alpha(K)\exp(540\gamma+538\gamma)=0.0113$ in β^- decay.
	604.32	2.32			
	628.83	2.53			
	708.67	0.42			
	909.235	100.7			
	1097.418	0.366			
	320.2§ 5	≤5.4			
1121.0	476.65	10.944			
	913.45	52.20			
	933.1	8.787			
	1015.01	28.322			
	1051.969	100.9			
	1121.11	61.7			
	641.197	100.17			
1134.3	744.93	13.333			
	946.16	8.317			
	1028.257	85.7			
	1134.84	15.033			
1195.5	551.71	100.10			
	807.04	40.10			
	988.95	40.10			
	1007.61	95.15			
1338.7	1089.65	30.10			
	1132.06	22.9			
	1150.63	39.9			
	1232.91	100.13			
1482.9	1270.45	13.044			
	632.2	100	E2		
	626.5	100.6	E2		
1488.9	638.2	5.43			
1549.9	687.5	100			
1556.6	422.4§ 2	7.422			
	435.63	3.04			
	459.304	100.9	M1, E2	0.013516	
	576.42	7.09			
	755.326	24.422			
	999.86	2.69			

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Cs})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡
1556.6	1064.62 7	14.4 13	
	1168 1	0.9 4	
	1368.8 1	23.0 26	
	1556.66 8	52.2 44	
1577.2	726.5	100	
1632.3	781.6	100	
1661.0	810.3	100	D
1941.5	391.6	12 5	
	452.6	100 7	D
2000.8	339.8	20 7	
	511.9	100 7	
	517.9	89 9	
2086.8	454.5	22 6	
	603.9	100 6	D
2113.5	452.5	21 3	
	624.6	100 11	E2
	630.6	3.6 4	
2131.3	648.4	100	E2
2285.4	198.6 [#]		
	802.5	100	
2466.0	352.5	32 8	
	465.2	21 5	
	524.5	100 11	
2649.5	518.2	15 3	
	648.7	100 22	
2675.5	390.1	14 4	
	544.2	63 16	
	588.7	100 26	
2784.6	671.1	100	
2789.5	658.2	100	
2994.9	210.3	32 11	
	345.4	29 10	
	528.9	100 33	E2
3056.6	381.1	96	
	771.2	100	
3332.8	683.3	100	
3345.5	288.9 [#]		
	555.9	36.3	
	670.0	100	
3501.8	712.3	100	
3504.5	719.9	100	
3603.2	270.4	<8.4	
	608.3	100	
4273.0	669.8	100	
4345.7	843.9	100	

[†] From β^- decay for γ 's coming from this dataset alone or together with $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay dataset; from $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay for γ 's coming only from this dataset.

[‡] For γ 's from $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay, from angular correlations measured: Mult=Q, E2 since $T_{1/2}(\text{level}) < 10$ ns is for $\Delta J=2$; mult=D for $\Delta J=1$ or 0.

[§] Multiply placed.

[#] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)(A) Band 1: based
on 7/2+ g.s.

(B) Band 2: based on 5/2+.

(C) Band 3: based on (15/2-).

(D) Band 4: based on (17/2-).

Adopted Levels, Gammas (continued)

(E) Band 5: based on
(19/2).

^{141}Xe β^- Decay 1988Fa06

Parent ^{141}Xe : $E=0.0$; $J\pi=5/2(-)$; $T_{1/2}=1.73$ s *I*; $Q(\text{g.s.})=6283$ *II*; % β^- decay=100.

Measured: γ , $\gamma\gamma$ (1988Fa06,1979Bo26,1977TaZZ,1976Ot03,1975Mo03), ce (1976Ot03), $\gamma(\text{t})$ (1975Mo03), β^- , $\beta\gamma$ (1973Ad04,1978Wo15).

Level scheme is that of 1988Fa06.

 ^{141}Cs Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	7/2+	24.84 s <i>16</i>	$T_{1/2}$: from Adopted Levels, Gammas dataset.
69.05 <i>3</i>	(3/2)+	23.3 ns <i>7</i>	
105.937 <i>5</i>	5/2+	8.7 ns <i>2</i>	
116.82 <i>7</i>			
187.76 <i>2</i>	+	<1.9 ns	
206.65		<2.1 ns	
369.5 <i>1</i>	11/2+		
389.0 <i>13</i>	9/2+		
468.0	+		
492.8			
557.1	+		
644.2	+		
668.7			
801.0			
843.1			
975.2			
979.8 <i>19</i>			
1097.12	7/2(-), 5/2(-)		
1121.0 <i>24</i>			
1134.3			
1195.5			
1338.7			
1556.6	5/2(-), 7/2(-)		

† Adopted values.

 β^- radiations

Measured av $E\beta=1960$ *II* (1980Al15,1982Al01).

$E\beta^-$	E(level)	$I\beta^{-\frac{1}{2}}\%$	Log <i>ft</i>	$E\beta^-$	E(level)	$I\beta^{-\frac{1}{2}}\%$	Log <i>ft</i>
(4726 <i>II</i>)	1556.6	12	5.4	(5639 <i>II</i>)	644.2	1.9	6.6
(4944 <i>II</i>)	1338.7	0.9	6.6	(5726 <i>II</i>)	557.1	0.1	7.9
(5088 <i>II</i>)	1195.5	1.3	6.5	(5790 <i>II</i>)	492.8	0.7	7.0
(5149 <i>II</i>)	1134.3	2.5	6.3	(5815 <i>II</i>)	468.0	2.4	6.5
(5162 <i>II</i>)	1121.0	2.5	6.3	(5894 <i>II</i>)	389.0	0.7	7.1
(5186 <i>II</i>)	1097.12	24	5.3	(5914 <i>II</i>)	369.5	1.6	6.7
(5303 <i>II</i>)	979.8	4.4	6.1	(6076 <i>II</i>)	206.65	2.8	6.5
(5308 <i>II</i>)	975.2	0.3	7.2	(6095 <i>II</i>)	187.76	5.9	6.2
(5440 <i>II</i>)	843.1	0.6	7.0	(6166 <i>II</i>)	116.82	0.3	7.5
(5482 <i>II</i>)	801.0	1.1	6.7	(6214 <i>II</i>)	69.05	8.2	6.1
(5614 <i>II</i>)	668.7	0.7	7.0	(6283 <i>II</i>)	0.0	<20 †	>5.7

† $I\beta(\text{g.s.})$ is based on estimates of 1976Ot03 corrected for more recent value of $I\beta(^{141}\text{Ba levels } \leq 55)=57\%$ in ^{141}Cs β decay (1982Ya04) and assumption that the 69 γ is E2 ($\alpha=7.6$).

‡ Based on imbalance of $I(\gamma+\text{ce})$ and assumption that $I\beta(\text{g.s.})=20\%$. Because of the uncertainty in $I\beta$ to levels >1560, the given values of $I\beta$ represent their upper limits and the log *ft*, represent their lower limits.

§ Absolute intensity per 100 decays.

^{141}Xe β^- Decay 1988Fa06 (continued) $\gamma(^{141}\text{Cs})$

$E\gamma$ and $I\gamma$ adopted in 1988Fa06 are from 1988Fa06, 1977TaZZ, except $E\gamma=118.705\ 4$, $105.937\ 5$, $100.721\ 2$, $81.826\ 2$ which are from 1976Ot03. See 1976Ot03 for many other γ 's not observed by 1977TaZZ and 1988Fa06.

$\alpha(\text{K})\text{exp}$ was determined by simultaneous measurement of $I\gamma$ and $\text{Ice}(\text{K})$ normalized to $\alpha(\text{K})\text{exp}$ for standard γ transitions (1976Ot03).

Unplaced γ 's are from 1977TaZZ.

$I\gamma$ normalization: based on the imbalance of $I(\gamma+\text{ce})$ and assumption that $I\beta(\text{g.s.})=20\%$ (reanalysis of 1976Ot03 data by 1988Fa06).

$E\gamma$	E(level)	$I\gamma^{\dagger}$	Mult.	α	Comments
37.1	105.937		[M1]		
47.78 5	116.82	0.7 2	[M1]	7.61	
69.05 3	69.05	20 1	(E2)	7.07	$E\gamma$: $E\gamma=68.994$ is reported by 1979Bo26; however, 1988Fa06, on the basis of cascade and crossover sums, conclude that this transition is misassigned. Mult.: from balance of $I(69\gamma)$ and $I(119\gamma)$ in $\gamma\gamma$ and fact that 119γ is $M1+(E2)$ (1988Fa06).
81.826 2	187.76	14 1	[M1]	1.599	
89.10 6	557.1	0.8 1			
89.80 4	206.65	2.0 2			
100.721 2	206.65	11.3 8			
105.942 6	105.937	41 3	M1+E2	1.1 4	Mult.: from Adopted Levels, Gammas dataset.
118.705 4	187.76	67 5			Mult.: $\alpha(\text{K})\text{exp}=0.20\ 8$ from which 1976Ot03 adopted M1,E2 while $E1(+M2)$ is a better match (not adopted because it would contradict parity conservation).
122.5 8	492.8	0.2 1			
137.63 4	206.65	3.4 2			
167.6 4	557.1	0.19 6			
187.69 4	187.76	11.8 8	E2, (M1)	0.18 3	Mult.: $\alpha(\text{K})\text{exp}=0.16\ 6$, may be M1+E2 or E2.
254.1 $\frac{1}{2}^{\pm}$ 6	1097.12	<0.47 $\frac{1}{2}^{\pm}$			
255.24 $\frac{1}{2}^{\pm}$ 5	644.2	3.4 $\frac{1}{2}^{\pm}$ 3			
261.3 5	468.0	0.15 7			
280.26 7	468.0	0.3 1			
283.05 4	389.0	2.2 2			
286.0 $\frac{1}{2}^{\pm}$ 1	492.8	$\leq 0.99\frac{1}{2}^{\pm}$			
	843.1	<0.99 $\frac{1}{2}^{\pm}$			
304.9 3	492.8	0.7 1			
320.2 $\frac{1}{2}^{\pm}$ 5	389.0	<0.25 $\frac{1}{2}^{\pm}$			
	1121.0	<0.25 $\frac{1}{2}^{\pm}$			
333.0 3	801.0	0.5 1			
335.4 7	979.8	0.2 1			
361.96 5	468.0	4.8 4	M1, E2	0.0258 17	Mult.: $\alpha(\text{K})\text{exp}=0.024\ 15$, may be M1+E2.
369.5 1	369.5	<0.4			Mult.: $\alpha(\text{K})\text{exp}\leq 0.023$, may be M1+E2 or E1.
	557.1	8.0 4			Mult.: $\alpha(\text{K})\text{exp}\leq 0.023$, may be M1+E2 or E1.
387.00 6	492.8	2.5 2			
389.11 4	389.0	6.7 7	M1, E2	0.0211 17	Mult.: $\alpha(\text{K})\text{exp}=0.02\ 1$.
398.9 2	468.0	1.4 1			
$\times 407.22\ 41$		0.295 86			
412.5 7	801.0	0.2 1			
422.4 $\frac{1}{2}^{\pm}$ 2	979.8	1.7 $\frac{1}{2}^{\pm}$ 5			
	1556.6	1.7 $\frac{1}{2}^{\pm}$ 5			
423.89 5	492.8	8.6 7			
435.6 3	1556.6	0.7 1			
437.7 4	644.2	0.4 1			
$\times 444.40\ 46$		0.27 12			
451.5 4	557.1	1.2 3			
453.2 2	1097.12	2.3 4			
456.8 3	644.2	2.0 2			
459.30 4	1556.6	23 2	M1, E2	0.0135 16	Mult.: $\alpha(\text{K})\text{exp}=0.013\ 6$.
462.10 4	668.7	1.6 2			
467.81 4	468.0	12 1	M1, E2	0.0128 15	Mult.: $\alpha(\text{K})\text{exp}=0.015\ 6$.
473.1 4	843.1	0.7 2			
476.6 5	1121.0	0.5 2			
480 1	668.7	0.5 4			
482.2 2	975.2	0.9 2			
492.85 6	492.8	2.8 3			

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^{141}Xe β^- Decay 1988Fa06 (continued) $\gamma(^{141}\text{Cs})$ (continued)

E_γ	E(level)	$I_\gamma^\dagger$	Mult.	Comments
$\times 498.43$ 78		0.19 12		
507.6 4	975.2	0.5 2		
511.9 4	979.8	2.1 4		
$\times 518.09$ 72		0.21 12		
538.4 1	644.2	5.3 4	M1, E2	Mult.: $\alpha(\text{K})\exp(538\gamma+540\gamma)=0.011$ 3.
540.12 4	1097.12	22 2	(E1)	Mult.: $\alpha(\text{K})\exp(540\gamma+538\gamma)=0.011$ 3.
$\times 544.87$ 53		0.36 15		
551.7 1	1195.5	2.0 2		
556.8 1	557.1	14 1	M1, E2	Mult.: $\alpha(\text{K})\exp=0.008$ 3.
$\times 560.81$ 38		0.52 13		
576.4 2	1556.6	1.6 2		
$\times 580.58$ 61		0.27 13		
594.2 1	801.0	2.1 2		
599.7 3	668.7	0.7 2		
604.3 2	1097.12	2.3 2		
613.06 4	801.0	5.0 1		
$\times 624.85$ 88		0.18 12		
628.8 3	1097.12	2.5 3		
$\times 630.83$ 37		1.90 31		
641.19 7	1134.3	6 1		
644.2 2	644.2	2.5 2		
669.3 4	668.7	0.5 2		
$\times 677.61$ 22		1.13 17		
$\times 681.63$ 82		0.26 15		
$\times 704.87$ 94		0.39 16		
708.6 7	1097.12	0.4 2		
$\times 713.58$ 31		0.56 17		
$\times 729.07$ 53		0.54 18		
731.92 8	801.0	2.3 3		
$\times 740.11$ 79		0.27 16		
744.9 3	1134.3	0.8 2		
755.32 6	1556.6	5.6 5		
772.9 5	979.8	9.4 6		
$\times 777.73$ 18		1.38 16		
$\times 783.14$ 57		0.31 13		
791.9 1	979.8	1.5 2		
801.0 3	801.0	0.8 2		
$\times 804.65$ 36		1.06 23		
807.0 4	1195.5	0.8 2		
$\times 819.36$ 93		0.19 11		
$\times 823.51$ 15		1.25 13		
$\times 828.38$ 49		0.44 14		
$\times 830.70$ 79		0.27 14		
842.7 2	843.1	1.5 2		
$\times 845.46$ 39		0.70 13		
$\times 848.13$ 25		1.03 13		
$\times 851.20$ 29		0.70 12		
$\times 854.45$ 20		1.23 19		
$\times 857.44$ 50		0.39 18		
$\times 867.26$ 90		0.27 16		
$\times 870.00$ 27		1.07 18		
873.8 4	979.8	0.4 1		
$\times 881.49$ 88		0.17 10		
$\times 894.65$ 15		3.26 35		
$\times 897.05$ 30		1.34 29		
$\times 903.4$ 19		0.91 40		
909.23 5	1097.12	100 7		
913.4 5	1121.0	2.4 9		
$\times 919.41$ 62		0.26 15		
$\times 925.74$ 39		0.43 12		
933 1	1121.0	0.4 4		
$\times 934.5$ 10		0.42 35		
$\times 942.95$ 42		0.57 14		

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^{141}Xe β^- Decay 1988Fa06 (continued) $\gamma(^{141}\text{Cs})$ (continued)

E_γ	E(level)	$I_\gamma^\dagger$	E_γ	E(level)	$I_\gamma^\dagger$
946.1 6	1134.3	0.5 1	$\times$ 1431.90 68		0.25 11
$\times$ 949.59 19		1.29 16	$\times$ 1440.24 84		0.34 16
$\times$ 974.02 32		0.51 12	$\times$ 1442.9 13		0.21 16
979.7 3	979.8	6.6 7	$\times$ 1448.84 47		0.310 92
$\times$ 985.93 23		1.28 17	$\times$ 1469.20 64		0.33 12
988.9 5	1195.5	0.8 2	$\times$ 1480.67 81		0.26 12
999.8 6	1556.6	0.6 2	$\times$ 1489.62 20		1.26 16
1007.6 1	1195.5	1.9 3	$\times$ 1498.52 63		0.50 13
1015.0 1	1121.0	1.3 1	$\times$ 1502.83 17		1.72 19
$\times$ 1025.96 76		0.42 21	$\times$ 1511.12 88		0.25 12
1028.25 7	1134.3	5.1 4	$\times$ 1537.9 14		0.17 13
$\times$ 1037.08 59		0.33 10	$\times$ 1545.97 91		0.20 17
1051.96 9	1121.0	4.6 4	$\times$ 1550.95 80		0.39 16
$\times$ 1056.76 72		0.28 12	1556.66 8	1556.6	12 1
1064.62 7	1556.6	3.3 3	$\times$ 1575.34 42		0.350 93
$\times$ 1075.18 46		0.310 93	$\times$ 1580.19 27		0.63 10
$\times$ 1082.20 27		0.56 12	$\times$ 1585.90 97		0.165 85
1089.6 5	1195.5	0.6 2	$\times$ 1601.62 29		0.74 12
$\times$ 1092.08 38		0.78 19	$\times$ 1621.36 94		0.22 11
1097.41 8	1097.12	0.36 6	$\times$ 1630.49 57		0.35 12
$\times$ 1099.06 23		2.37 47	$\times$ 1637.08 53		0.40 13
$\times$ 1104.31 76		0.200 98	$\times$ 1643.9 12		0.17 12
$\times$ 1111.88 70		0.32 15	$\times$ 1653.9 11		0.20 12
$\times$ 1116.22 93		0.24 13	$\times$ 1658.58 39		0.60 12
1121.1 1	1121.0	2.8 3	$\times$ 1687.88 35		0.87 15
1132.0 6	1338.7	0.5 2	$\times$ 1733.48 86		0.41 18
1134.8 4	1134.3	0.9 2	$\times$ 1736.4 12		0.29 18
$\times$ 1140.59 26		0.44 13	$\times$ 1749.31 40		0.52 12
1150.6 3	1338.7	0.9 2	$\times$ 1755.73 12		2.40 23
$\times$ 1159.05 51		0.35 13	$\times$ 1770.45 16		1.89 21
1168 1	1556.6	0.2 1	$\times$ 1784.02 91		0.27 14
$\times$ 1178.90 86		0.44 12	$\times$ 1789.8 12		0.17 14
$\times$ 1190.8 14		0.17 12	$\times$ 1800.05 18		1.48 18
$\times$ 1207.92 36		0.58 13	$\times$ 1829.53 42		0.52 11
$\times$ 1213.03 56		0.64 24	$\times$ 1855.71 49		0.39 10
$\times$ 1215.97 52		1.90 51	$\times$ 1860.30 25		0.88 12
$\times$ 1218.05 45		1.58 59	$\times$ 1870.95 53		0.34 10
$\times$ 1231.10 92		0.66 23	$\times$ 1882.43 35		0.67 12
1232.9 1	1338.7	2.3 3	$\times$ 1886.51 75		0.26 10
$\times$ 1238.40 56		0.44 12	$\times$ 1892.17 83		0.38 10
$\times$ 1241.7 12		0.21 12	$\times$ 1902.01 46		0.39 10
$\times$ 1246.48 16		1.29 15	$\times$ 1918.20 33		0.95 16
$\times$ 1252.37 39		0.43 11	$\times$ 1922.46 45		0.67 14
$\times$ 1260.94 29		0.55 12	$\times$ 1935.35 63		0.61 14
1270.4 5	1338.7	0.3 1	$\times$ 1951.3 12		0.19 12
$\times$ 1283.10 68		0.76 13	$\times$ 1964.7 12		0.19 11
$\times$ 1292.55 93		0.176 93	$\times$ 1993.4 13		0.17 11
$\times$ 1304.79 66		0.25 10	$\times$ 1998.82 63		0.37 12
$\times$ 1310.92 33		0.68 12	$\times$ 2009.3 13		0.16 11
$\times$ 1314.68 74		0.38 12	$\times$ 2019.92 20		1.30 16
$\times$ 1318.28 47		0.49 12	$\times$ 2039.3 13		0.33 14
$\times$ 1328.80 49		0.35 10	$\times$ 2042.60 53		0.75 15
$\times$ 1344.82 38		0.64 15	$\times$ 2047.0 14		0.21 12
$\times$ 1351.35 22		1.05 16	$\times$ 2057.16 76		0.49 12
$\times$ 1362.89 84		0.44 14	$\times$ 2101.2 13		0.16 11
1368.8 1	1556.6	5.3 6	$\times$ 2109.1 12		0.21 12
$\times$ 1372.54 50		0.55 17	$\times$ 2119.95 99		0.23 11
$\times$ 1383.83 40		0.76 16	$\times$ 2125.07 89		0.24 11
$\times$ 1392.98 53		0.54 16	$\times$ 2131.9 12		0.18 10
$\times$ 1396.4 16		0.17 15	$\times$ 2211.53 35		0.66 12
$\times$ 1404.47 20		1.13 16	$\times$ 2235.55 62		0.36 11
$\times$ 1420.52 56		0.268 88	$\times$ 2244.5 12		0.17 10
$\times$ 1428.33 49		0.39 11	$\times$ 2282.79 43		0.59 12

Continued on next page (footnotes at end of table)

^{141}Xe β^- Decay 1988Fa06 (continued) $\gamma(^{141}\text{Cs})$ (continued)

E_γ	$I_\gamma^\dagger$	E_γ	$I_\gamma^\dagger$	E_γ	$I_\gamma^\dagger$
$^{*}2303.41\ 20$	$1.87\ 20$	$^{*}2567.38\ 97$	$0.170\ 84$	$^{*}2817.9\ 10$	$0.177\ 68$
$^{*}2312.11\ 85$	$0.27\ 11$	$^{*}2578.06\ 52$	$0.353\ 88$	$^{*}2828.22\ 68$	$0.215\ 62$
$^{*}2334.26\ 70$	$0.280\ 91$	$^{*}2600.18\ 40$	$0.56\ 10$	$^{*}2840.59\ 33$	$0.459\ 76$
$^{*}2371.76\ 69$	$0.253\ 81$	$^{*}2630.06\ 41$	$0.514\ 95$	$^{*}2873.5\ 13$	$0.155\ 85$
$^{*}2386.82\ 76$	$0.186\ 88$	$^{*}2635.93\ 80$	$0.247\ 83$	$^{*}2878.03\ 83$	$0.260\ 79$
$^{*}2394.79\ 55$	$0.427\ 94$	$^{*}2655.66\ 98$	$0.181\ 82$	$^{*}2908.3\ 10$	$0.160\ 71$
$^{*}2412.03\ 48$	$0.378\ 87$	$^{*}2682.93\ 79$	$0.159\ 78$	$^{*}2948.25\ 55$	$0.411\ 74$
$^{*}2431.73\ 35$	$0.555\ 93$	$^{*}2703.35\ 91$	$0.183\ 71$	$^{*}3107.8\ 12$	$0.110\ 52$
$^{*}2447.58\ 43$	$0.423\ 89$	$^{*}2710.88\ 61$	$0.283\ 73$	$^{*}3230.9\ 12$	$0.098\ 47$
$^{*}2474.16\ 90$	$0.221\ 87$	$^{*}2726.94\ 61$	$0.333\ 82$	$^{*}3364.13\ 98$	$0.106\ 39$
$^{*}2497.0\ 13$	$0.149\ 86$	$^{*}2732.2\ 16$	$0.20\ 12$	$^{*}3383.8\ 10$	$0.097\ 40$
$^{*}2519.0\ 12$	$0.165\ 88$	$^{*}2735.92\ 37$	$0.86\ 14$	$^{*}3415.4\ 14$	$0.080\ 40$
$^{*}2537.98\ 60$	$0.303\ 85$	$^{*}2762.42\ 62$	$0.207\ 60$		
$^{*}2547.93\ 15$	$1.75\ 18$	$^{*}2790.75\ 61$	$0.263\ 68$		
$^{*}2561.67\ 84$	$0.191\ 91$	$^{*}2799.56\ 96$	$0.162\ 66$		

† For absolute intensity per 100 decays, multiply by =0.24.

‡ Multiply placed; undivided intensity given.

* γ ray not placed in level scheme.

Decay Scheme

$5/2(-)$ 0.0 1.73 s
 $^{141}_{54}\text{Xe}_{87}$
 $Q^- = 6283^{11}$
 $\% \beta^- = 100$

^{141}Xe β^- Decay 1988Fa06 (continued)

Decay Scheme (continued)

$5/2(-)$ 0.0 1.73 s
 $^{141}_{54}\text{Xe}_{87}$
 $Q^-=6283^{11}$
 $\% \beta^-=100$

& Multiply placed; undivided intensity given
 Intensities: I(γ +ce) per 100 parent decays

$^{248}\text{Cm}, ^{252}\text{Cf}$ SF Decay $^{2010}\text{Lu}02, ^{2004}\text{Ur}01$

Parent ^{248}Cm : $E=0.0$; $J\pi=0+$; $T_{1/2}=3.48\times 10^5$ y 6; %SF decay=8.39 16.

Parent ^{252}Cf : $E=0.0$; $J\pi=0+$; $T_{1/2}=2.645$ y 8; %SF decay=3.092 8.

Includes ^{254}Cf SF decay.

$^{2010}\text{Lu}02$, $^{2010}\text{Li}ZZ$: ^{252}Cf SF decay. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(\theta)$ using Gammasphere array with 101 Ge detectors.

Deduced parity doublets and evidence of octupole excitations. Identification of γ rays in ^{141}Cs through observation of coincidences with known γ rays in complementary fission fragments of Tc isotopes and by double gating of γ rays in ^{141}Cs .

$^{2004}\text{Ur}01$: ^{248}Cm SF decay. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(\theta)$ using EUROAM2 array.

$^{1998}\text{Hw}04$: ^{252}Cf SF decay. Measured γ , $\gamma\gamma$, Gammasphere, 72 Compton-suppressed Ge.

$^{1995}\text{Rz}01$: ^{248}Cm SF decay. Measured γ , $\gamma\gamma$, $X\gamma\gamma$ Eurogam, 45 Compton-suppressed Ge, 5 LEPS detectors.

$^{1981}\text{Se}ZW$: ^{254}Cf SF decay. Measured fission fragment- γ coin and fragment-fragment coin. Deduced $E\gamma$, $I\gamma$, $T_{1/2}$.

$^{1974}\text{Cl}ZX$: ^{252}Cf SF decay. Deduced transitions, $T_{1/2}$, fission yields.

Unless given otherwise, all data are from $^{2010}\text{Lu}02$.

 ^{141}Cs Levels

No half-lives longer than 10 ns were seen ($^{2004}\text{Ur}01$).

Electric dipole moment $D_0=0.08$ efm 2 from $B(E1)/B(E2)$ ratios ($^{2010}\text{Lu}02$).

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}$	Comments
0.0 §	7/2+		$J\pi$: from Adopted Levels, Gammas dataset.
105.9 # 3	5/2+	14 ns 1	$T_{1/2}$: from ^{252}Cf SF decay ($^{1974}\text{Cl}ZX$).
369.7 § 3	11/2+		
389.0 # 2	9/2+		
850.7 § 4	15/2+		
862.4 # 3	13/2+		
1482.9 § 4	19/2+		
1488.9 # 4	17/2+		
1549.9 @ 4	(15/2-)		
1577.2 5			Level observed by $^{2010}\text{Lu}02$ but not by $^{2004}\text{Ur}01$.
1632.3 & 4	(17/2-)		
1661.0 4	(17/2)		
1941.5 @ 4	(19/2-)		$B(E1)(452.6\gamma)/B(E2)(391.6\gamma)=1.20\times 10^{-6}$ fm ⁻² 22 ($^{2010}\text{Lu}02$).
2000.8 ^a 4	(19/2)		
2086.8 & 4	21/2(-)		$B(E1)(603.9\gamma)/B(E2)(454.4\gamma)=0.31\times 10^{-6}$ fm ⁻² 8 ($^{2010}\text{Lu}02$).
2113.5 # 4	21/2+		
2131.3 § 4	23/2+		
2285.4 5	(23/2+)		
2466.0 @ 4	(23/2-)		$B(E1)(352.5\gamma)/B(E2)(524.5\gamma)=0.47\times 10^{-6}$ fm ⁻² 9 ($^{2010}\text{Lu}02$).
2649.5 ^a 4	(23/2)		
2675.5 & 4	25/2(-)		$B(E1)(544.2\gamma)/B(E2)(588.7\gamma)=0.21\times 10^{-6}$ fm ⁻² 5 ($^{2010}\text{Lu}02$).
2784.6 # 5	(25/2+)		
2789.5 § 5	(27/2+)		
2994.9 @ 4	(27/2-)		$J\pi$: 21/2 in table 3 of $^{2010}\text{Lu}02$ is a misprint. $B(E1)(210.3\gamma)/B(E2)(528.9\gamma)=1.11\times 10^{-6}$ fm ⁻² 21 ($^{2010}\text{Lu}02$).
3056.6 5	(27/2+)		
3332.8 ^a 5	(27/2)		
3345.5 & 5	29/2(-)		$B(E1)(555.9\gamma)/B(E2)(670.0\gamma)=0.22\times 10^{-6}$ fm ⁻² 8 ($^{2010}\text{Lu}02$).
			$J\pi$: 27/2 in table 2 of $^{2010}\text{Lu}02$ is a misprint.
3501.8 § 6	(31/2+)		
3504.5 # 6	(29/2+)		
3603.2 @ 5	(31/2-)		
4273.0 @ 6	(35/2-)		
4345.7 § 7	(35/2+)		

[†] From least-squares fit to $E\gamma$'s (by evaluator), assuming $\Delta E\gamma=0.3$ keV for each γ ray.

[‡] From $^{2010}\text{Lu}02$ based on measured multiplicities (some assignments might differ from those in Adopted Levels, Gammas dataset).

§ (A): Band 1: based on 7/2+ g.s. Bands 1 and 4 form a parity doublet with $s=-i$.

(B): Band 2: based on 5/2+. Bands 2 and 3 form a parity doublet with $s=+i$.

@ (C): Band 3: based on (15/2-).

& (D): Band 4: based on (17/2-).

^a (E): Band 5: based on (19/2).

$^{248}\text{Cm}, ^{252}\text{Cf}$ SF Decay 2010Lu02,2004Ur01 (continued)

 $\gamma(^{141}\text{Cs})$

E γ	E(level)	I $\gamma^{\dagger}$	Mult. ‡	Comments
$\times 68.8$ § 1				$T_{1/2}=0.55$ ns 15 (1981SeZW).
$\times 75.6$ #&				$T_{1/2}=10$ ns 1 (1974ClZX).
$\times 76.5$ §&				$T_{1/2}=1.8$ ns 3 (1981SeZW).
$\times 89.9$ §&				$T_{1/2}=12$ ns 1 (1974ClZX).
				The discrepancy between $T_{1/2}$ for 89.9 γ in ^{141}Xe β^- decay (<2.1 ns) and in ^{252}Cf SF decay (12 ns) suggests that this γ may be a doublet with unknown placement of $T_{1/2}=12$ ns component.
$\times 96.1$ §&				$T_{1/2}=12$ ns 3 (1974ClZX).
105.9	105.9	15 2	M1+E2	$\alpha(\text{exp})=1.5$ 2. Mult.: $\alpha(\text{exp})$ from intensity balance consistent with mult=M1+E2 (2004Ur01); $\Delta J=2$ transition given in table I of 2004Ur01 seems a misprint since negative A_2 is expected for ΔJ transition; $A_2=-0.10$ 3, $A_4=+0.07$ 4 for (105 γ)(283 γ)(θ) (2004Ur01).
$\times 117.9$ #&				$T_{1/2}=4.0$ ns 5 (1981SeZW).
198.6&	2285.4			
210.3	2994.9	0.29 10		I γ : from I γ (528.9 γ) (2004Ur01) and branching ratio (2010Lu02).
270.4	3603.2			I γ : branching ratio <8.4% (2010Lu02).
283.1	389.0	14 1	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.12$ 2, $A_4=-0.08$ 6 for (283 γ)(473 γ)(θ) (2004Ur01).
288.9&	3345.5			
339.8	2000.8	0.9 3		The placement of this γ ray is considered uncertain by 2004Ur01.
345.4	2994.9	0.26 9		I γ : from I γ (528.9 γ) (2004Ur01) and branching ratio (2010Lu02).
352.5	2466.0	1.2 3		
369.7	369.7	100 5		
381.1	3056.6			I γ : branching ratio 96% (2010Lu02).
389.0	389.0	35 2	D	Mult.: $\Delta J=0,1$ transition from $A_2=-0.07$ 2, $A_4=+0.06$ 4 for (389 γ)(473 γ)(θ) (2004Ur01); $A_2=-0.090$ 11, $A_4=-0.014$ 17 (2010Lu02, same cascade).
390.1	2675.5	0.27 7		I γ : from I γ (588.7 γ) (2004Ur01) and branching ratio (2010Lu02).
391.6	1941.5	0.5 2		The placement of this γ ray is considered uncertain by 2004Ur01.
452.5	2113.5	0.93 11		I γ : from I γ (624.6 γ) (2004Ur01) and branching ratio (2010Lu02).
452.6	1941.5	4.2 3	D	$\Delta J=0,1$ transition from $A_2=-0.08$ 4, $A_4=+0.05$ 6 for (452.6 γ)(626.5 γ)(θ) (2010Lu02), and $A_2=-0.06$ 2, $A_4=+0.04$ 4 for (453 γ)(626 γ)(θ) (2004Ur01).
454.5	2086.8	1.9 5		
465.2	2466.0	0.8 2		
473.4	862.4	36 2		
481.0	850.7	64 4	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.101$ 9, $A_4=+0.013$ 14 for (481.0 γ)(369.7 γ)(θ) (2010Lu02), and from $A_2=+0.09$ 2, $A_4=-0.04$ 2 for (481 γ)(370 γ)(θ) (2004Ur01).
492.7	862.4	11.0 6	D	Mult.: $\Delta J=0,1$ transition from $A_2=-0.11$ 3, $A_4=+0.08$ 5 for (493 γ)(370 γ)(θ) (2004Ur01).
511.9	2000.8	4.5 3		
517.9	2000.8	4.0 4		
518.2	2649.5	0.27 6		I γ : from I γ (648.7 γ) (2004Ur01) and branching ratio (2010Lu02).
524.5	2466.0	3.8 4		
528.9	2994.9	0.9 3	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.13$ 5, $A_4=-0.06$ 8 for (528.9 γ)(524.5 γ)(θ) (2010Lu02).
544.2	2675.5	1.2 3		
555.9	3345.5			I γ : branching ratio 36.3% (2010Lu02).
588.7	2675.5	1.9 5		
603.9	2086.8	8.5 5	D	Mult.: $\Delta J=1$, D transition from $A_2=-0.11$ 3, $A_4=0.00$ 4 for (603.9 γ)(632.2 γ)(θ) (2010Lu02); other: $A_2=-0.07$ 2, $A_4=+0.01$ 3 for (604 γ)(summed γ)(θ) (2004Ur01).
608.3	3603.2	@		
624.6	2113.5	4.4 5	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.11$ 4, $A_4=+0.01$ 7 for (624.6 γ)(626.5 γ)(θ) (2010Lu02).
626.5	1488.9	18 1	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.105$ 21, $A_4=+0.03$ 3 for (626.5 γ)(473.4 γ)(θ) (2010Lu02), and $A_2=+0.08$ 2, $A_4=-0.04$ 4 for (626 γ)(summed γ)(θ) (2004Ur01).
630.6	2113.5	0.16 2		
632.2	1482.9	33 2	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.105$ 12, $A_4=+0.023$ 19 for (632.2 γ)(481.0 γ)(θ) (2010Lu02), and from $A_2=+0.10$ 2, $A_4=-0.07$ 4 for (632 γ)(summed γ)(θ) (2004Ur01).
638.2	1488.9	0.97 5		I γ : from I γ (626.5 γ) (2004Ur01) and branching ratio (2010Lu02).
648.4	2131.3	11.2 7	E2	Mult.: $\Delta J=2$ transition from $A_2=+0.095$ 14, $A_4=+0$

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$^{248}\text{Cm}, ^{252}\text{Cf}$ SF Decay 2010Lu02,2004Ur01 (continued) $\gamma(^{141}\text{Cs})$ (continued)

$E\gamma$	E(level)	$I\gamma^\dagger$	Mult. ‡	Comments
648.7	2649.5	1.8 4		
658.2	2789.5	4.2 4		
669.8	4273.0	@		
670.0	3345.5	@		
671.1	2784.6	1.0 2		
683.3	3332.8	@		
687.5	1549.9	1.5 3		
712.3	3501.8	@		
719.9	3504.5	@		
726.5	1577.2	@		
771.2	3056.6	@		
781.6	1632.3	3.6 4		
802.5	2285.4	@		
810.3	1661.0	2.8 5	D	Mult.: $\Delta J=0,1$ transition from $A_2=-0.14$ 3, $A_4=+0.06$ 3 for (810 γ)(summed γ)(θ) (2004Ur01).
843.9	4345.7	@		

† Relative intensities from 2004Ur01, except when noted otherwise.

‡ From angular correlations measured by 2004Ur01 and 2010Lu02. Mult=Q is E2 since $T_{1/2}(\text{level}) < 10$ ns for $\Delta J=2$; mult=D for $\Delta J=1$ or 0.

§ From ^{252}Cf SF decay (1974ClZX).

$^\#$ From ^{254}Cf SF decay (1981SeZW).

@ Only branching ratio of 100% is given for this transition (2010Lu02).

& Placement of transition in the level scheme is uncertain.

$^\times$ γ ray not placed in level scheme.

Adopted Levels, Gammas

$Q(\beta^-)=3202.7$; $S(n)=4534.9$; $S(p)=9971.10$; $Q(\alpha)=226.5$ 2012Wa38.
 $\langle r^2 \rangle^{1/2}=4.8823 \pm 0.0006$ fm (2004An14).

 ^{141}Ba Levels

Cross Reference (XREF) Flags

A ^{141}Cs β^- Decay
 B $^{248}\text{Cm}, ^{252}\text{Cf}$ SF Decay
 C $^{235}\text{U}(n, F\gamma)$

E(level)	$J\pi^\dagger$	XREF	$T_{1/2}$	Comments
0.0	3/2-	ABC	18.27 min 7	$\% \beta^- = 100$. $J\pi$: hfs (1988We07, 1983Mu12, 1981Ne06), comparison with μ from theory. $\mu = -0.337 \pm 0.005$ (2011StZZ, 1988We07); $Q = +0.454 \pm 0.010$ (2011StZZ, 1988We07). Other: $\mu = -0.346 \pm 0.016$ (1983Mu12, 1981Ne06). Other: $Q = +0.43 \pm 0.04$ (1983Mu12). All values of μ and Q are from hfs. $T_{1/2}$: from 1969Ca03. Others: 18.03 min 19 (1972Eh02), 18 min 1 (1959Sc36); see also 1962Fr04, 1958Ma57.
48.53# 2	(5/2)-	AB	2.3 ns 4	$J\pi$: γ to 3/2- is M1+E2, M1 from (7/2)-, syst. $T_{1/2}$: from 1984Is08 (^{141}Cs β decay). Others: <3.4 ns (1975Mo03) (^{141}Cs β decay), 20 ns 7 (1974ClZX) (^{252}Cf SF decay).
55.00\$ 4	(7/2)-	ABC	5.2 ns 5	$T_{1/2}$: from 1984Is08; 5.0 ns 1 (55+49 levels) (1982Ya04); see 1975Mo03. $J\pi$: γ to (5/2)- is M1, $\log ft = 6.1$ via 7/2+ parent, syst $I(\gamma+ce)(6.5\gamma) > I(\gamma+ce)(55\gamma)$. Configuration = $(v f_{7/2})^3$.
610.13 7	(9/2-)	AB		$J\pi$: 5/2, 7/2, 9/2 from $\log ft = 6.9$ from 7/2+ parent in ^{141}Cs β^- decay; γ from (13/2-), 1187 in $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay dataset; configuration = $((v h_{9/2}) (v f_{7/2})^2)$.
643.81\$ 7	(11/2-)	ABC		
709.44 8		A		
747.03# 6	(9/2-)	AB		
827.00 6		A		
1056.24 7		A		
1116.79 7		A		
1187.3#	(13/2-)	B		$J\pi$: stretched D to (11/2-), 644. Configuration = $(v f_{7/2})^3 \otimes 3-$.
1195.50 6		A		
1202.10 13		A		
1214.42 6		A		
1226.50 6		A		
1229.81 15		A		
1231.63 12		A		
1249.04 7		A		
1256.78 6	(11/2)	AB		$J\pi$: (11/2+) from $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay (2002Ur04, based on syst); however $\log ft = 7.8$ from 7/2+ parent rather suggests (11/2-).
1302.02\$ 4	(15/2-)	BC		
1341.5@ 1	(13/2+)	AB		$J\pi$: Level being fed from 7/2+ parent in β^- decay makes the 13/2+ assignment doubtful. However, unless there are two different levels, this is supported in $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay by $Q \gamma$ from (17/2+), 1836, and D γ to (11/2-), 644, where the (tentative) character of the two gammas result from band assignment configuration = $((v i_{13/2}) (v f_{7/2})^2)$.
1432.29 23		A		
1503.98 15		A		
1546.02 10		A		
1572.50 11		A		
1583.13 10		A		
1629.74 9		A		
1654.09 12		A		
1677.01 21		A		
1690.32 15		A		
1709.92 22		A		
1717.35 16		A		
1719.62# 5	(17/2-)	B		
1764.09 23		A		
1765.32 10		A		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
¹⁴¹Ba Levels (continued)

E(level)	Jπ [†]	XREF	E(level)	Jπ [†]	XREF
1836.23@ 7	(17/2+)	B	3120.36 11		A
1844.53 11		A	3127.78@ 10	(25/2+)	B
1853.87 22		A	3132.88 20		A
1874.01 9		A	3170.20 19		A
1942.49 13		A	3175.11# 11	(25/2-)	B
2010.18 20		A	3189.67 15		A
2062.43 20		A	3243.04 17		A
2107.24 12		A	3247.40 15		A
2114.94§ 6	(19/2-)	BC	3259.26 20		A
2142.82 13		A	3273.5 3		A
2172.16 ^a 7	(19/2-)	B	3315.53 21		A
2274.06 7		A	3334.89 18		A
2329.12# 9	(21/2-)	B	3431.73 24		A
2363.54 24		A	3441.7 3		A
2382.73 19		A	3456.54 24		A
2394.60 15		A	3472.13 ^a 21	(27/2-)	B
2433.25@ 8	(21/2+)	B	3493.23& 11	(27/2+)	B
2449.89 16		A	3820.2§ 5	(27/2-)	B
2781.47 ^a 11	(23/2-)	B	3834.20@ 13	(29/2+)	B
2874.68 15		A	3908.48# 15	(29/2-)	B
2943.77& 10	(23/2+)	B	4239.1 3	5/2+, 7/2+, 9/2+ [‡]	A
2950.38§ 14	(23/2-)	BC	4244.24& 15	(31/2+)	B
2972.66 19		A	4303.64 ^a 24	(31/2-)	B
3004.55 17		A	4364.40? 17	5/2+, 7/2+, 9/2+ [‡]	A
3031.95 23		A	4533.42 21	5/2+, 7/2+, 9/2+ [‡]	A
3043.04 21		A	4544.72? 22	5/2+, 7/2+, 9/2+ [‡]	A
3078.43 21		A	4591.20? 21	5/2+, 7/2+, 9/2+ [‡]	A
3087.6 3		A	4618.63@ 19	(33/2+)	B
3099.51 19		A	4671.0 3	5/2+, 7/2+, 9/2+ [‡]	A
3111.98 19		A	4931.67& 21	(35/2+)	B

[†] Unless given otherwise, Jπ values are from ²⁴⁸Cm, ²⁵²Cf SF decay based upon band assignment, and level systematics.

[‡] From log ft < 5.9 from 7/2+ parent.

§ (A): simplex s=+i, α=-1/2.

(B): simplex s=-i, α=+1/2.

@ (C): Band based on (13/2+); simplex s=+i, α=+1/2.

& (D): Band based on (23/2+); simplex s=-i, α=-1/2.

^a (E): Band based on (19/2-), α=-1/2.

γ(¹⁴¹Ba)

E(level)	Eγ [†]	Iγ [†]	Mult. [‡]	δ	α	Comments
48.53	48.53 2	100	M1+E2	0.36 11	10.2 14	Mult.: α(K)exp=7.4 7, α(L)exp=1.1 6 (1984Is08). B(M1)(W.u.)=0.0066 15; B(E2)(W.u.)=210 130.
55.00	6.469 50	100 9	M1		482	B(M1)(W.u.)=0.031 5.
	54.997 23	91 7	[E2]		17.13	B(E2)(W.u.)=9.0 14.
610.13	555.15 6	80 5	D, E2 §			B(E2)(W.u.)=9.4 13.
	561.63 6	100 7	D, E2 §			
643.81	588.79 7	100	D, E2			
709.44	654.42 8	93 6				
	660.88 11	100 10				
	709.42 15	20 2				
747.03	692.04 6	100 6	D, E2 §			
	698.52 11	15.8 13				
827.00	771.93 9	100 6				
	778.54 9	100 6				
	827.00 12	59 4				
1056.24	1007.76 12	92 5				
	1056.24 11	100 5				
1116.79	1061.83 7	100 6				
	1068.19 12	44 3				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

 $\gamma(^{141}\text{Ba})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]
1116.79	1116.77 15	13.7 11		1844.53	642.60 14	13.6 14	
1187.3	543.72 4	100	D		648.98 8	100 7	
	577.26 9	12			1097.59 11	53 3	
1195.50	448.42 12	4.6 3			1789.38 22	62 4	
	585.39 11	14.3 9		1853.87	1210.0 3	100 21	
	1140.50 7	53 4			1243.8 3	53 8	
	1147.00 11	100 10		1874.01	1126.96 14	16 1	
1202.10	591.75 14	17.7 13			1263.93 12	44 5	
	1147.2 3	100 18			1818.99 23	100 6	
	1153.64 7	93 6			1825.42 23	52 3	
1214.42	1165.87 12	42 3		1942.49	1195.63 18	100 25	
	1214.44 8	100 7			1232.96 13	79 5	
1226.50	1171.55 11	100 6		2010.18	808.12 14	65 5	
	1178.03 12	70 5			954.10 14	67 5	
	1226.43 11	95 6			1955.03 25	100 7	
1229.81	1181.16 14	70 5			1961.2 3	63 5	
	1229.95 12	100 6		2062.43	1315.27 20	100 7	
1231.63	1176.67 12	100 6			1452.6 3	35 4	
	1183.07 15	32 2		2107.24	1360.30 17	53 3	
1249.04	501.98 12	3.1 2			1497.13 17	51 3	
	605.28 6	26 2			2052.4 4	9.5 11	
	639.00 16	3.4 3			2058.50 23	100 7	
	1194.02 11	100 6		2114.94	278.79 17	12	[E1]
1256.78	509.7 3	17 4			395.17 22	5	
	612.97 8	23 2			812.94 5	100	Q
	646.66 7	100 10	D, E2 [§]	2142.82	2087.81 22	100 6	
1302.02	658.42 2	100	Q		2094.35 23	99 6	
1341.5	697.7 4	100			2142.83 23	93 6	
1432.29	1383.39 22	20 2		2172.16	335.96 16	42	
	1432.35 16	100 5			452.5 1	59	
1503.98	894.07 16	24 2			870.14 8	100	
	1449.02 16	100 6		2274.06	728.09 14	30 2	
	1455.28 22	28 2			1017.31 14	33 2	
	1503.7 3	11.9 15			1025.03 13	46 3	
1546.02	902.25 10	100			1071.94 13	100 6	
1572.50	1517.57 18	100 6			1630.11 18	68 4	
	1523.85 23	27 3		2329.12	214.3 3	6	
	1572.55 19	69 4			609.49 7	100	
1583.13	939.18 14	33 7		2363.54	1654.10 23	100	
	973.06 10	100 6		2382.73	1738.7 3	25 4	
1629.74	985.98 13	100 6			1772.74 25	100 7	
	1019.58 13	76 5			2327.8 6	21 5	
	1574.8 3	35 4		2394.60	1277.91 17	42 4	
1654.09	1043.96 14	59 4			2394.40 25	100 6	
	1598.90 24	50 5		2433.25	261.08 16	10	[E1]
	1605.72 21	100 7			318.34 6	35	[E1]
1677.01	1066.88 24	100			596.96 14	100	[E2]
1690.32	441.28 14	100		2449.89	1200.85 15	100	
1709.92	1661.51 16	100 6		2781.47	348.44 22		
	1709.5 3	31 2			452.2 [#] 3		
1717.35	1073.48 16	100			609.28 11		
1719.62	417.58 4	96	D	2874.68	1625.76 20	69 5	
	532.34 14	100			2819.56 21	100 11	
1764.09	1715.40 22	100 7		2943.77	614.66 5	100	
	1764.4 3	31 2		2950.38	517.1 [#]	32	[E1]
1765.32	550.92 17	44 6			835.44 13	100	[E2]
	569.79 15	65 4		2972.66	1343.01 23	37 4	
	938.34 16	100 11			1758.1 3	100 8	
1836.23	495.17 15	11	[E2]	3004.55	1809.2 3	70 5	
	534.22 8	100	D		2949.49 20	100 7	
1844.53	340.56 13	6.0 4		3031.95	1783.2 3	85 7	
	587.66 13	97 10			2387.9 4	60 7	
	613.3 4	11 6			2976.8 3	100 7	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Ba})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]
3043.04	1539.2 3	19 3		3273.5	2564.4 4	67 5	
	2399.14 25	100 6			3218.2 4	26 3	
3078.43	1401.4 3	29 4			3224.9 3	100 7	
	1851.93 25	100 7			3273.1 4	76 6	
3087.6	1885.9 3	80 5		3315.53	2066.7 3	100 8	
	3032.4 3	14 5			2671.7 3	70 5	
	3038.87 25	100 7			3260.2 4	61 8	
3099.51	1842.7 3	87 9		3334.89	1751.65 21	100 7	
	1868.1 4	84 12			2139.6 3	25 7	
	2489.3 3	100 13		3431.73	3376.9 3	100 9	
3111.98	1897.61 24	100 6			3382.9 4	50 6	
	3056.9 3	17 8		3441.7	2385.5 3	100	
3120.36	1687.89 21	24 2		3456.54	2709.8 3	80 9	
	1893.92 22	69 4			2846.21 25	100 7	
	1905.93 15	69 4		3472.13	690.66 17	100	
	1917.9 4	58 4		3493.23	318.14 9	100	[E1]
	2064.08 24	66 4			549.44 8	74	[E2]
	2410.9 3	26 2		3820.2	869.8 [#] 4	100	
	3071.93 22	100 6		3834.20	706.42 9	100	
	3120.5 3	26 2		3908.48	415.2 2		
3127.78	346.3 [#]				733.34 15		
	694.53 6			4239.1	1965.1 3	100 7	
3132.88	2489.3 3	30 4			3183.1 3	87 7	
	3077.72 25	100 6			3529.2 2	24 4	
3170.20	3115.32 23	100		4244.24	335.64 22	50	[E1]
3175.11	231.42 14	8	[E1]		751.04 11	100	[E2]
	845.97 9	100	[E2]	4303.64	831.50 12	100	
3189.67	1933.06 22	80 5		4364.40?	3132.5 4	100 13	
	1940.5 3	100 7			3169.1 3	49 4	
	1994.19 23	63 4		4533.42	3303.8 3	34 5	
	2545.6 6	13 5			3331.2 3	100 7	
	3134.4 4	38 5			3416.5 5	15 3	
3243.04	2047.58 25	100 7		4544.72?	3312.9 3	68 7	
	2533.5 3	25 3			3349.4 3	100 8	
	3188.6 7	11 3		4591.20?	3395.6 9	41 18	
	3194.4 4	57 15			3474.3 3	100 8	
3247.40	1998.34 19	52 3		4618.63	784.43 14	100	
	2637.5 3	28 2		4671.0	2728.6 4	74 8	
	3192.2 3	100 12			3098.6 3	100 9	
3259.26	2056.8 6	100 20			3238.2 4	45 6	
	2615.5 3	96 8		4931.67	687.43 14	100	
	3204.3 3	64 6					
3273.5	2044.1 3	94 8					

[†] From the respective dataset when the levels are populated one dataset; from the ^{141}Cs β^- decay when the levels are populated in both datasets ^{141}Cs β^- decay and $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay datasets.

[‡] From 1976Ot03 analysis of ce(K) for gammas from ^{141}Cs β^- decay dataset; and from 2002Ur04 angular distributions for gammas from $^{248}\text{Cm}, ^{252}\text{Cf}$ SF decay dataset, where the intraband transitions are stretched Q, probably E2, while the interband transitions are stretched D. For gammas measured in both datasets a note is given separately.

[§] From ^{141}Cs β^- decay alone.

[#] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)(A) simplex $s=+i$, $\alpha=-1/2$.(B) simplex $s=-i$, $\alpha=+1/2$.(C) Band based on $(13/2+)$;
simplex $s=+i$, $\alpha=+1/2$.

Adopted Levels, Gammas (continued)

(D) Band based on (23/2+);
simplex $s=-i$, $\alpha=-1/2$.

(E) Band based on (19/2-),
 $\alpha=-1/2$.

^{141}Cs β^- Decay 1982Ya04

Parent ^{141}Cs : $E=0.0$; $J\pi=7/2+$; $T_{1/2}=24.84$ s 17; $Q(\text{g.s.})=5256$ 10; % β^- decay=100.

Measured: γ , $\gamma\gamma$ (1984Is08,1982Ya04,1977TaZZ,1976Ot03), K x ray, L x ray (1982Ya04,1976Ot03), $\gamma(t)$

(1984Is08,1982Ya04), β^- (1973Ad04,1972AdZV), ce (1976Ot03), γ (1979Bo26).

1994He26,1997Gr09: Total Absorption γ -ray Spectra (TAGS) in ^{252}Cf SF decay. Deduced $I\beta$.

Decay scheme is from 1982Ya04.

 ^{141}Ba Levels

E(level)	$J\pi^{\S}$	$T_{1/2}$	E(level)	$J\pi^{\S}$
0.0	3/2-		2062.44	17
48.528 8	(5/2)-	2.3 ns [†] 4	2107.26	11
55.001 19	(7/2)-	5.2 ns [†] 5	2142.86	13
610.13 4	(9/2-)		2274.06	8
643.81 5	(11/2-)		2363.55	24
709.44 6			2382.74	19
747.03 5	(9/2-)		2394.62	15
827.00 6			2449.91	16
1056.21 7			2874.71	15
1116.79 6			2972.68	20
1195.51 5			3004.58	17
1202.09 5			3031.98	19
1214.43 6			3043.07	20
1226.51 7			3078.44	22
1229.80 9			3087.60	17
1231.65 9			3099.54	19
1249.05 6			3112.06	25
1256.79 6	(11/2)		3120.37	9
1341.5 4			3132.91?	20
1432.31 11			3170.36?	23
1504.00 8			3189.69	14
1546.03 10			3243.07	17
1572.50 11			3247.43	15
1583.14 9			3259.29	21
1629.75 9			3273.56	16
1654.10 11			3315.56	19
1677.02 21			3334.91	19
1690.33 15			3431.77?	24
1709.93 15			3441.7	3
1717.29 17			3456.57	20
1764.10 18			4239.14	20
1765.33 10			4364.48?	25
1844.54 6			4533.46	20
1853.87 22			4544.77?	22
1874.02 9			4591.1?	3
1942.49 11			4670.98	22
2010.19 10				

[†] $T_{1/2}=5.0$ ns 1 for level 48.5 and/or 55 (1982Ya04), <3.4 ns for 48 γ and <3.2 ns for 55 γ (1975Mo03).

[‡] From $\log ft < 5.9$.

[§] Adopted values.

 β^- radiations

$I\beta$ from TAGS are given in comments. Pseudo levels introduced in TAGS study, not otherwise seen are: 2525 ($I\beta=0.48\%$), 2600 ($I\beta=0.71\%$), 2750 ($I\beta=1.90\%$), 3600 ($I\beta=2.32\%$), 3750 ($I\beta=1.19\%$), 3900 ($I\beta=0.54\%$), 4050 ($I\beta=0.71\%$), 4800 ($I\beta=0.013\%$), 4950 ($I\beta=0.002\%$).

Measured β^- : 4980 80 (50% 3), 3320 40 (12% 1), 2170 30 (17% 1), 1440 20 (21% 1) (1973Ad04,1972AdZV); 4950 150 (1974Wu02).

$\Delta J=2$ unique β^- to $J=3/2-$ (g.s.) is expected to be much weaker than $\Delta J=1$ non-unique β to $J=5/2-$ 48.5 level. It suggests that $I\beta(\text{g.s.})$ is much less than 4% (see 1982Ya04).

av $E\beta=1680$ 70 (1980Al15,1982Al01).

$E\beta^-$	E(level)	$I\beta^{-\dagger\S}$	Log ft	Comments
(585 10)	4670.98	0.185 17	4.87 5	$I\beta=0.012$ (TAGS, 1994He26).
(665 10)	4591.1?	0.081 13	5.42 8	$I\beta=0.023$ (TAGS, 1994He26).

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^{141}Cs β^- Decay 1982Ya04 (continued) β^- radiations (continued)

$E\beta^-$	E(level)	$I\beta^- \uparrow \S$	Log ft	Comments
(711 10)	4544.77?	0.202 18	5.12 5	$I\beta=0.035$ (TAGS, 1994He26).
(723 10)	4533.46	0.259 24	5.04 5	$I\beta=0.07$ (TAGS, 1994He26).
(892 10)	4364.48?	0.27 3	5.35 6	$I\beta=0.14$ (TAGS, 1994He26).
(1017 10)	4239.14	0.226 19	5.63 4	$I\beta=0.42$ (TAGS, 1994He26).
(1799 10)	3456.57	0.232 21	6.57 4	$I\beta=2.20$ (TAGS, 1994He26).
(1814 10)	3441.7	0.162 17	6.74 5	$I\beta=0.77$ (TAGS, 1994He26).
(1824 10)	3431.77?	0.116 12	6.89 5	$I\beta=1.07$ (TAGS, 1994He26).
(1921 10)	3334.91	0.172 18	6.81 5	$I\beta=2.62$ (TAGS, 1994He26).
(1940 10)	3315.56	0.41 4	6.45 5	$I\beta=2.14$ (TAGS, 1994He26).
(1982 10)	3273.56	0.59 5	6.33 4	$I\beta=1.90$ (TAGS, 1994He26).
(1997 10)	3259.29	0.31 4	6.62 6	$I\beta=1.19$ (TAGS, 1994He26).
(2009 10)	3247.43	0.58 6	6.36 5	$I\beta=1.31$ (TAGS, 1994He26).
(2013 10)	3243.07	0.51 6	6.42 6	$I\beta=1.07$ (TAGS, 1994He26).
(2066 10)	3189.69	1.30 10	6.06 4	$I\beta=1.31$ (TAGS, 1994He26).
(2086 10)	3170.36?	0.32 3	6.68 5	$I\beta=0.71$ (TAGS, 1994He26).
(2123 10)	3132.91?	0.36 3	6.66 4	$I\beta=0.85$ (TAGS, 1994He26).
(2136 10)	3120.37	2.18 15	5.89 4	$I\beta=4.52$ (TAGS, 1994He26).
(2144 10)	3112.06	0.203 22	6.93 5	$I\beta=0.85$ (TAGS, 1994He26).
(2156 10)	3099.54	0.222 21	6.90 5	$I\beta=1.07$ (TAGS, 1994He26).
(2168 10)	3087.60	0.46 4	6.59 4	$I\beta=1.61$ (TAGS, 1994He26).
(2178 10)	3078.44	0.220 20	6.92 4	$I\beta=0.77$ (TAGS, 1994He26).
(2213 10)	3043.07	0.220 19	6.95 4	$I\beta=0.77$ (TAGS, 1994He26).
(2224 10)	3031.98	0.32 3	6.79 5	$I\beta=0.83$ (TAGS, 1994He26).
(2251 10)	3004.58	0.247 20	6.93 4	$I\beta=0.83$ (TAGS, 1994He26).
(2283 10)	2972.68	0.164 15	7.13 4	$I\beta=1.31$ (TAGS, 1994He26).
(2381 10)	2874.71	0.36 4	6.86 5	$I\beta=2.44$ (TAGS, 1994He26).
(2806 10)	2449.91	0.125 13	7.62 5	$I\beta=1.13$ (TAGS, 1994He26).
(2861 10)	2394.62	0.229 19	7.39 4	$I\beta=0.48$ (TAGS, 1994He26).
(2873 10)	2382.74	0.216 20	7.42 4	$I\beta=0.60$ (TAGS, 1994He26).
(2892 10)	2363.55	0.052 7	8.05 6	$I\beta=0.30$ (TAGS, 1994He26).
(2982 10)	2274.06	0.70 6	6.98 4	$I\beta=2.08$ (TAGS, 1994He26).
(3113 10)	2142.86	1.05 8	6.88 4	$I\beta=1.07$ (TAGS, 1994He26).
(3149 10)	2107.26	0.94 7	6.95 4	$I\beta=1.37$ (TAGS, 1994He26).
(3194 10)	2062.44	0.186 17	7.68 4	$I\beta=0.54$ (TAGS, 1994He26).
(3246 10)	2010.19	0.39 3	7.39 4	$I\beta=0.89$ (TAGS, 1994He26).
(3314 10)	1942.49	0.39 7	7.42 8	$I\beta=0.65$ (TAGS, 1994He26).
(3382 10)	1874.02	0.80 6	7.15 4	$I\beta=0.95$ (TAGS, 1994He26).
(3402 10)	1853.87	0.126 21	7.96 8	$I\beta=0.15$ (TAGS, 1994He26).
(3411 10)	1844.54	1.94 15	6.78 4	$I\beta=0.95$ (TAGS, 1994He26).
(3491 10)	1765.33	0.31 3	7.62 5	$I\beta=0.23$ (TAGS, 1994He26).
(3492 10)	1764.10	0.58 5	7.35 4	$I\beta=0.54$ (TAGS, 1994He26).
(3539 10)	1717.29	0.130 14	8.02 5	$I\beta=0.15$ (TAGS, 1994He26).
(3546 10)	1709.93	0.52 5	7.42 5	$I\beta=0.54$ (TAGS, 1994He26).
(3566 10)	1690.33	0.032 4	8.65 6	$I\beta=0.036$ (TAGS, 1994He26).
(3579 10)	1677.02	0.021 15	8.8 4	$I\beta=0.024$ (TAGS, 1994He26).
(3602 10)	1654.10	0.269 22	7.74 4	$I\beta=0.17$ (TAGS, 1994He26).
(3626 10)	1629.75	0.274 23	7.74 4	$I\beta=0.10$ (TAGS, 1994He26).
(3673 10)	1583.14	0.147 25	8.04 8	$I\beta=0.10$ (TAGS, 1994He26).
(3684 10)	1572.50	0.47 4	7.54 4	$I\beta=0.12$ (TAGS, 1994He26).
(3710 10)	1546.03	0.160 20	8.02 6	$I\beta=0.06$ (TAGS, 1994He26).
(3752 10)	1504.00	0.46 4	7.58 4	$I\beta=0.00$ (TAGS, 1994He26).
(3824 10)	1432.31	0.37 4	7.71 5	$I\beta=0.42$ (TAGS, 1994He26).
(3915 10)	1341.5	0.063 24	8.52 17	$I\beta=0.36$ (TAGS, 1994He26).
(3999 10)	1256.79	0.39 13	7.77 15	$I\beta=0.00$ (TAGS, 1994He26).
(4007 10)	1249.05	3.9 4	6.78 5	$I\beta=0.95$ (TAGS, 1994He26).
(4024 10)	1231.65	0.44 7	7.73 7	$I\beta=0.12$ (TAGS, 1994He26).
(4026 10)	1229.80	0.36 4	7.82 5	$I\beta=0.12$ (TAGS, 1994He26).
(4029 10)	1226.51	1.82 15	7.12 4	$I\beta=0.48$ (TAGS, 1994He26).
(4042 10)	1214.43	0.30 6	7.91 9	$I\beta=0.21$ (TAGS, 1994He26).
(4054 10)	1202.09	0.78 20	7.50 12	$I\beta=0.65$ (TAGS, 1994He26).
(4060 10)	1195.51	1.7 8	7.16 21	$I\beta=0.65$ (TAGS, 1994He26).
(4139 10)	1116.79	1.35 11	7.30 4	$I\beta=0.77$ (TAGS, 1994He26).
(4200 10)	1056.21	0.22 5	8.11 10	$I\beta=0.19$ (TAGS, 1994He26).

Continued on next page (footnotes at end of table)

^{141}Cs β^- Decay 1982Ya04 (continued) β^- radiations (continued)

$E\beta^-$	E(level)	$I\beta^- \dagger \S$	Log ft	Comments
(4429 10)	827.00	0.52 5	7.84 5	$I\beta=0.42$ (TAGS, 1994He26).
(4509 10)	747.03	2.01 24	7.28 6	$I\beta=0.65$ (TAGS, 1994He26).
(4547 10)	709.44	1.01 12	7.60 6	$I\beta=0.65$ (TAGS, 1994He26).
(4612 10)	643.81	0.9 3	7.68 15	$I\beta=0.36$ (TAGS, 1994He26).
(4646 10)	610.13	5.3 6	6.92 5	$I\beta=3.3$ (TAGS, 1994He26).
4980 80	55.001	57 8	6.10 7	$I\beta(0+48+55 \text{ levels})=35.6$ (TAGS, 1994He26).
(5207# 10)	48.528	$<4^{\ddagger}$	>7.3	

$\dagger$ β^- feeding was deduced from $I(\gamma+\text{ce})$ imbalance assuming no β^- to g.s.

$\ddagger$ From analysis of $I(6.5\gamma, 48.5\gamma)$ $I\beta<4\%$, log $ft>7.2$.

$\S$ Absolute intensity per 100 decays.

Existence of this branch is questionable.

 $\gamma(^{141}\text{Ba})$

$I\gamma$ normalization: $I(\gamma+\text{ce})(\text{g.s.})=100\%$; see comment on $I\beta(\text{g.s.})$ above.

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$	Mult.	δ	α	Comments
6.469 50	55.001	20.5 18	M1		482	Mult.: L1 conversion is much stronger than L2 or L3 conversion. Balance of $I(\gamma+\text{ce})$ to and from 48.5 level.
48.528 8	48.528	1000 30	M1+E2	0.36 11	10.2 14	δ : from analysis of L x ray data (1982Ya04). Mult.: $\alpha(\text{K})_{\text{exp}}=7.03$ 18 (1982Ya04). Others: 7.4 6 (1984Is08), 6.6 9 (1976Ot03) (normalized to $\alpha(\text{K})_{\text{exp}}$ for standard γ 's); $\alpha(\text{L})_{\text{exp}}=1.1$ 6 (1984Is08).
54.997 23	55.001	18.7 15	[E2]		17.13	
340.56 13	1844.54	4.3 3				
441.28 14	1690.33	4.0 3				
448.42 12	1195.51	11.1 7				
501.98 12	1249.05	15.4 9				
509.7 3	1256.79	22 5				
550.92 17	1765.33	8.3 12				
555.15 6	610.13	470 30	D, E2 ‡			
561.63 6	610.13	590 40	D, E2 ‡			
569.79 15	1765.33	12.4 7				
585.39 11	1195.51	34.2 22				
587.66 13	1844.54	70 7				
588.79 7	643.81	480 30	D, E2 ‡			
591.75 14	1202.09	21.4 16				
605.28 6	1249.05	129 8				
612.97 8	1256.79	31 3				
613.3 4	1844.54	8 4				
639.00 16	1249.05	16.8 16				
642.60 14	1844.54	9.8 10				
646.66 7	1256.79	133 13	D, E2 ‡			
648.98 8	1844.54	72 5				
654.42 8	709.44	88 6				
660.88 11	709.44	95 10				
692.04 6	747.03	380 22	D, E2 ‡			
697.7 4	1341.5	8 3				
698.52 11	747.03	60 5				
709.42 15	709.44	19.1 15				
728.09 14	2274.06	11.2 8				
771.93 9	827.00	32.7 19				
778.54 9	827.00	32.8 19				
808.12 14	2010.19	10.9 8				
827.00 12	827.00	19.3 13				
894.07 16	1504.00	9.9 8				
902.25 10	1546.03	31.4 19				
938.34 16	1765.33	19.0 20				
939.18 14	1583.14	9.0 20				
954.10 14	2010.19	11.3 8				

Continued on next page (footnotes at end of table)

^{141}Cs β^- Decay 1982Ya04 (continued) $\gamma(^{141}\text{Ba})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$	$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$
973.06 10	1583.14	27.1 16	1738.7 3	2382.74	4.6 7
985.98 13	1629.75	19.1 12	1751.65 21	3334.91	17.5 12
1007.76 12	1056.21	54 3	1758.1 3	2972.68	15.1 12
1017.31 14	2274.06	12.3 9	1764.4 3	1764.10	17.6 13
1019.58 13	1629.75	14.5 10	1772.74 25	2382.74	18.8 13
1025.03 13	2274.06	16.9 11	1783.2 3	3031.98	13.8 11
1043.96 14	1654.10	9.6 7	1789.38 22	1844.54	44.3 26
1056.24 11	1056.21	59 3	1809.2 3	3004.58	12.9 10
1061.83 7	1116.79	121 7	1818.99 23	1874.02	47.7 28
1066.88 24	1677.02	8.8 16	1825.42 23	1874.02	24.7 15
1068.19 12	1116.79	53 4	1842.7 3	3099.54	9.0 9
1071.94 13	2274.06	37.1 23	1851.93 25	3078.44	21.6 15
1073.48 16	1717.29	16.5 13	1868.1 4	3099.54	8.7 12
1097.59 11	1844.54	37.8 22	1885.9 3	3087.60	24.0 15
1116.77 15	1116.79	16.6 13	1893.92 22	3120.37	43.5 26
1126.96 14	1874.02	7.6 5	1897.61 24	3112.06	21.9 14
1140.50 7	1195.51	127 88	1905.93 15	3120.37	43.5 26
1147.00 11	1195.51	240 25	1917.9 4	3120.37	36.7 25
1147.2 3	1202.09	121 22	1933.06 22	3189.69	45 3
1153.64 7	1202.09	112 7	1940.5 3	3189.69	56 4
1165.87 12	1214.43	37.2 22	1955.03 25	2010.19	16.9 12
1171.55 11	1226.51	112 7	1961.2 3	2010.19	10.6 8
1176.67 12	1231.65	80 5	1965.1 3	4239.14	13.5 10
1178.03 12	1226.51	78 5	x 1989.2 3		18.3 14
1181.16 14	1229.80	29.8 19	1994.19 23	3189.69	35.2 21
1183.07 15	1231.65	25.4 17	1998.34 19	3247.43	21.1 14
1194.02 11	1249.05	500 30	2044.1 3	3273.56	19.3 16
1195.63 18	1942.49	32 8	2047.58 25	3243.07	33.4 24
1200.85 15	2449.91	15.8 12	2052.4 4	2107.26	5.3 6
1210.0 3	1853.87	10.4 22	2056.8 6	3259.29	15 3
1214.44 8	1214.43	89 6	2058.50 23	2107.26	56 4
1226.43 11	1226.51	106 7	2064.08 24	3120.37	41.7 23
1229.95 12	1229.80	42.5 25	2066.7 3	3315.56	22.4 17
1232.96 13	1942.49	25.3 16	2087.81 22	2142.86	45.5 27
1243.8 3	1853.87	5.5 8	2094.35 23	2142.86	45.1 27
1263.93 12	1874.02	20.9 25	2139.6 3	3334.91	4.3 13
1277.91 17	2394.62	8.5 8	2142.83 23	2142.86	42.5 26
x 1289.73 15		10.2 8	2327.8 6	2382.74	4.0 10
1315.27 20	2062.44	17.4 13	2385.5 3	3441.7	20.5 16
1343.01 23	2972.68	5.6 6	2387.9 4	3031.98	9.8 12
1360.30 17	2107.26	29.7 18	2394.40 25	2394.62	20.5 13
1383.39 22	1432.31	11.4 11	2399.14 25	3043.07	23.3 15
1401.4 3	3078.44	6.2 9	2410.9 3	3120.37	16.4 12
1432.35 16	1432.31	56 3	2489.3 3	3099.54	10.4 13
1449.02 16	1504.00	41.3 25		3132.91?	10.4 13
1452.6 3	2062.44	6.1 7	x 2503.8 4		5.7 8
1455.28 22	1504.00	11.4 9	2533.5 3	3243.07	8.4 9
1497.13 17	2107.26	28.5 17	2545.6 6	3189.69	7 3
1503.7 3	1504.00	4.9 6	2564.4 4	3273.56	13.7 11
1517.57 18	1572.50	35.6 22	2615.5 3	3259.29	14.4 12
1523.85 23	1572.50	9.7 9	2637.5 3	3247.43	11.4 10
1539.2 3	3043.07	4.5 7	2671.7 3	3315.56	15.6 11
1572.55 19	1572.50	24.5 15	2709.8 3	3456.57	13.1 15
1574.8 3	1629.75	6.7 7	2728.6 4	4670.98	7.9 8
1598.90 24	1654.10	8.2 8	2819.56 21	2874.71	27 3
1605.72 21	1654.10	16.3 12	2846.21 25	3456.57	16.3 11
1625.76 20	2874.71	18.5 13	2949.49 20	3004.58	18.4 12
1630.11 18	2274.06	25.2 16	2976.8 3	3031.98	16.3 12
1654.10 23	2363.55	6.6 7	3032.4 3	3087.60	4.3 16
1661.51 16	1709.93	50.4 29	3038.87 25	3087.60	29.9 21
1687.89 21	3120.37	15.2 12	3056.9 32	3112.06	3.8 17
1709.5 3	1709.93	15.5 11	3071.93 22	3120.37	63 4
1715.40 22	1764.10	56 4	3077.72 25	3132.91?	35.1 21

Continued on next page (footnotes at end of table)

^{141}Cs β^- Decay 1982Ya04 (continued) $\gamma(^{141}\text{Ba})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\S$	$E\gamma^\dagger$	E(level)	$I\gamma^\S$
3098.6 3	4670.98	10.7 10	3260.2 4	3315.56	13.7 17
3115.32 23	3170.36?	41.1 26	3273.1 4	3273.56	15.5 12
3120.5 3	3120.37	16.4 12	3303.8 3	4533.46	7.4 12
3132.5 4	4364.48?	23 3	3312.9 3	4544.77?	10.4 10
3134.4 4	3189.69	21 3	3331.2 3	4533.46	22.1 16
3169.1 3	4364.48?	11.2 10	3349.4 3	4544.77?	15.2 12
3183.1 3	4239.14	11.8 10	3376.9 3	3431.77?	9.8 9
3188.6 7	3243.07	3.5 10	3382.9 4	3431.77?	4.9 6
3192.2 3	3247.43	41 5	3395.6 9	4591.1?	3.0 13
3194.4 4	3243.07	19 5	3416.5 5	4533.46	3.3 6
3204.3 3	3259.29	9.6 9	3474.3 3	4591.1?	7.3 7
3218.2 4	3273.56	5.3 7	^x 3494.0 3		4.2 4
3224.9 3	3273.56	20.5 15	3529.2 4	4239.14	3.3 5
3238.2 4	4670.98	4.8 6			
^x 3252.24 25		21.1 14			

[†] 57 gammas reported by 1976Ot03 were not observed by 1982Ya04 nor by 1977TaZZ; 2221.7 γ , 2961.34 γ , 3936.2 γ reported by 1977TaZZ were not observed by 1982Ya04.

[‡] From analysis of ce(K) (1976Ot03).

[§] For absolute intensity per 100 decays, multiply by 0.0079 5.

^x γ ray not placed in level scheme.

^{141}Cs β^- Decay 1982Ya04 (continued)

Decay Scheme

 Intensities: I(γ +ce) per 100 parent decays

^{141}Cs β^- Decay 1982Ya04 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

^{141}Cs β^- Decay 1982Ya04 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

^{141}Cs β^- Decay 1982Ya04 (continued)

Decay Scheme (continued)

Intensities: I(γ +ce) per 100 parent decays

^{141}Cs β^- Decay 1982Ya04 (continued)

Decay Scheme (continued)

Intensities: I(γ +ce) per 100 parent decays

²⁴⁸Cm, ²⁵²Cf SF Decay 2002Lu08, 2002Ur04

Parent ²⁴⁸Cm: E=0.0; J π =0+; T_{1/2}=3.48×10⁵ y 6; %SF decay=8.39 16.

Parent ²⁵²Cf: E=0.0; J π =0+; T_{1/2}=2.645 y 8; %SF decay=3.092 8.

2003Ha49, 2002Lu08, 2002Ha46, 2002LuZW, 2001Ha14, 1999HaZV, and 1997Zh23: done by same group using ²⁵²Cf SF decay.

2002Lu08 (and 2003Ha49, conference paper): measured E γ , I γ , $\gamma\gamma$ using the GAMMASPHERE array consisting of 102

Compton-suppressed Ge detectors.

2001Ha14: measured E γ , I γ and $\gamma\gamma$ using GAMMASPHERE array comprised of 72 Compton-suppressed Ge detectors.

1997Zh23: measured γ , $\gamma\gamma$, $\gamma\gamma\gamma$ 20 and 36 Compton-suppressed Ge arrays.

2002Ur04: ²⁴⁸Cm SF decay and measured E γ , I γ and $\gamma\gamma$, $\gamma\gamma(\theta)$ using EUROGAM II array consisting of anti-Compton Spectrometers.

1974CIZX: measured: γ , $\gamma(t)$, yield.

Unless mentioned otherwise, all data are from 2002Lu08.

¹⁴¹Ba Levels

E(level) [†]	J π [‡]	Comments
0.0	3/2 ⁻ #	
48.53& 2	(5/2) ⁻ #	
55.00@ 2	(7/2) ⁻ #	
610.12& 6	(9/2) ⁻	
643.59@ 3	(11/2) ⁻	
746.9& 3	(9/2) ⁻	From 2002Ur04 only (not observed by 2002Lu08). J π : from 2004Ur04 based on band assignment.
1187.32& 5	(13/2) ⁻	
1256.6 3	(11/2) ⁺	From 2002Ur04 only (not observed by 2002Lu08). J π : from 2004Ur04 based on syst.
1302.02@ 4	(15/2) ⁻	
1341.08 ^a 14	(13/2) ⁺	
1719.62& 5	(17/2) ⁻	
1836.23 ^a 7	(17/2) ⁺	
2114.94@ 6	(19/2) ⁻	
2172.16 ^c 7	(19/2) ⁻	
2329.12& 9	(21/2) ⁻	
2433.25 ^a 8	(21/2) ⁺	
2781.47 ^c 11	(23/2) ⁻	
2943.77 ^b 10	(23/2) ⁺	
2950.38@ 14	(23/2) ⁻	
3127.78 ^a 10	(25/2) ⁺	
3175.11& 11	(25/2) ⁻	
3472.13 ^c 21	(27/2) ⁻	
3493.23 ^b 11	(27/2) ⁺	
3820.2@ 5	(27/2) ⁻	
3834.20 ^a 13	(29/2) ⁺	
3908.48& 15	(29/2) ⁻	
4244.24 ^b 15	(31/2) ⁺	
4303.64 ^c 24	(31/2) ⁻	
4618.63 ^a 19	(33/2) ⁺	
4931.67 ^b 21	(35/2) ⁺	

[†] From least-squares fit to E γ 's.

[‡] Tentative values established by 2002Lu08 based on the fact that fission product are formed with an average of six or more units of angular momentum and only yrast or near-yrast states are observed, and on the interlaced band structure of the level scheme.

From Adopted Levels, Gammas dataset.

@ (A): simplex s=+i, $\alpha=-1/2$.

& (B): simplex s=-i, $\alpha=+1/2$.

^a (C): Band based on (13/2⁺); simplex s=+i, $\alpha=+1/2$.

^b (D): Band based on (23/2⁺); simplex s=-i, $\alpha=-1/2$.

^c (E): Band based on (19/2⁻), $\alpha=-1/2$.

$\gamma(^{141}\text{Ba})$

E γ [†]	E(level)
6.47# 5	55.00
48.53# 2	48.53
54.997# 23	55.00

Continued on next page (footnotes at end of table)

$^{248}\text{Cm}, ^{252}\text{Cf}$ SF Decay 2002Lu08,2002Ur04 (continued) $\gamma(^{141}\text{Ba})$ (continued)

$E\gamma^\dagger$	E(level)	I_γ	Mult. [§]	Comments
214.3 3	2329.12	1.0		
231.42 14	3175.11	0.6	[E1]	B(E1)/B(E2)(231 γ)=2.18 $\times 10^{-6}$ 9 fm ⁻² (2002Lu08).
261.08 16	2433.25	1.2	[E1]	B(E1)/B(E2)(596 γ)=0.33 $\times 10^{-6}$ 4 fm ⁻² (2002Lu08).
278.79 17	2114.94	1.4	[E1]	B(E1)/B(E2)(813 γ)=1.54 $\times 10^{-6}$ 8 fm ⁻² (2002Lu08).
318.14 9	3493.23	3.4	[E1]	B(E1)/B(E2)(549 γ)=1.63 $\times 10^{-6}$ 8 fm ⁻² (2002Lu08).
318.34 6	2433.25	4.2	[E1]	B(E1)/B(E2)(596 γ)=0.63 $\times 10^{-6}$ 5 fm ⁻² (2002Lu08).
335.64 22	4244.24	0.8	[E1]	B(E1)/B(E2)(549 γ)=2.43 $\times 10^{-6}$ 9 fm ⁻² (2002Lu08).
335.96 16	2172.16	2.8		
346.3@	3127.78			E γ : from fig. 3 of 2002Lu08.
348.44 22	2781.47			
395.17 22	2114.94	0.6		
415.2 2	3908.48			
417.58 4	1719.62	22	D	Mult.: $\Delta J=1$, D transition from (418 γ)(658 γ)(θ): $A_2=-0.06$ 2, $A_4=+0.01$ 3 (2002Ur04).
452.2@ 3	2781.47			
452.5 1	2172.16	3.9		
495.17 15	1836.23	1.6	[E2]	
509.8 $\ddagger$	1256.6	1.5 5		
517.1@	2950.38	0.9	[E1]	E γ , I γ : from fig. 3 of 2002Lu08. B(E1)/B(E2)(835 γ)=0.73 $\times 10^{-6}$ 6 fm ⁻² (2002Lu08).
532.34 14	1719.62	23		
534.22 8	1836.23	15	D	Mult.: $\Delta J=1$, D transition from (534 γ)(589 γ +658 γ)(θ): $A_2=-0.05$ 2, $A_4=+0.01$ 2 (2002Ur04).
				B(E1)/B(E2)(495 γ)=1.41 $\times 10^{-6}$ 8 fm ⁻² (2002Lu08).
543.72 4	1187.32	26	D	Mult.: $\Delta J=1$, D transition from (544 γ)(589 γ)(θ): $A_2=-0.03$ 2, $A_4=+0.02$ 3 (2002Ur04).
549.44 8	3493.23	2.5	[E2]	
555.14 11	610.12	12		
561.63 9	610.12	18		
577.26 9	1187.32	3		
588.59 2	643.59	100	[Q]	
596.96 14	2433.25	12	[E2]	
609.28 11	2781.47	6.2		
609.49 7	2329.12	17		
613.0 $\ddagger$	1256.6	0.8 4		
614.66 5	2943.77	3.2		
646.7 $\ddagger$	1256.6	1.5 5		
658.42 2	1302.02	62.0	Q	Mult.: $\Delta J=2$, Q transition from (658 γ)(589 γ)(θ): $A_2=+0.12$ 3, $A_4=-0.01$ 2 (2002Ur04).
687.43 14	4931.67	0.9		
690.66 17	3472.13	3.5		
692.0 $\ddagger$	746.9	4 1		
694.53 6	3127.78	7		
697.54 24	1341.08	3		
698.5 $\ddagger$	746.9	1.0 5		
706.42 9	3834.20	5		
733.34 15	3908.48	1.4		
751.04 11	4244.24	1.6	[E2]	
784.43 14	4618.63	1.5		
812.94 5	2114.94	11.5	Q	Mult.: $\Delta J=2$, Q transition from (813 γ)(658 γ)(θ): $A_2=+0.09$ 4, $A_4=-0.03$ 4 (2002Ur04).
831.50 12	4303.64	1.1		
835.44 13	2950.38	2.8	[E2]	
845.97 9	3175.11	7.4	[E2]	
869.8@ 4	3820.2			
870.14 8	2172.16	6.6		

[†] From table I of 2002Lu08. The values given in figure 3 of 2002Lu08 are level-energy differences.[‡] From 2002Ur04 only (not observed by 2002Lu08).[§] All Q transitions deduced from angular correlations are E2 based on their prompt character (2002Ur04).

From Adopted Levels, Gammas dataset.

@ Placement of transition in the level scheme is uncertain.

$^{235}\text{U}(\text{n},\text{F}\gamma)$ 2012Mu08

2012Mu08: E=thermal neutrons from the Canada India Research Utility Services (CIRUS) reactor facility, Bhabha Atomic Research Center (BARC), Mumbai. Target=5.1 gm/cm³ UAl₃ (17% enriched ²³⁵U). Gamma rays were detected by two clover HPGe detectors equipped with anti-Compton shields, in coincidence mode. Measured E γ , I γ , $\gamma\gamma$ -coin. Deduced levels, J, π , isotopic yield, angular momentum distribution.

^{141}Ba Levels

E(level)	J $\pi^{\dagger}$	Comments
0.0	3/2-	
48	5/2-	
55 ‡	7/2-	
644 ‡	11/2-	
1189	13/2-	
1302 ‡	15/2-	
2116 ‡	19/2-	
2950 ‡	(23/2-) J π : from 2002Lu08.	

† From 2002Ur04, unless otherwise stated.

‡ (A): g.s. band.

$\gamma(^{141}\text{Ba})$

E γ	E(level)
545	1189
589	644
658	1302
814	2116
834	2950

Adopted Levels, GammasQ(β^-)=2501 4; S(n)=6688 4; S(p)=6953 9; Q(α)=1186 4 2012Wa38.

Activation cross sections: 1998Ko59, 1989Ba89.

 ^{141}La Levels

Cross Reference (XREF) Flags

A ^{141}Ba β^- Decay
B $^{142}\text{Ce}(\mu^-, n\gamma)$

E(level)	J π	XREF	T _{1/2}	Comments
0.0	(7/2+)	AB	3.92 h 3	% β^- =100. T _{1/2} : from 1981Ge04. Others: 4.03 h 4 (1972Eh02), 3.90 h 5 (1962Fr04), 3.87 h 4 (1960Al33). J π : log ft=7.6 to 9/2-; systematics for odd-A La nuclides. J π : log ft=7.6 via 3/2- parent; γ to 7/2+ is M1; $\gamma\gamma(\theta)$. T _{1/2} : from 1970Be43 ($\beta\gamma$ coin). J π : γ to 7/2+ is E2+M1, $\gamma\gamma(\theta)$, very strong γ from 3/2+. J π : $\gamma\gamma(\theta)$; γ to 5/2+ is M1, E2; log ft=7.0 via 3/2-. J π : no γ to 7/2+, consistent with (390 γ)(190 γ) (θ). J π : γ to 5/2+ is E2,M1; $\gamma\gamma(\theta)$; log ft=6.8 via 3/2- parent.
190.328 5	(5/2+)	AB	1.27 ns +6-10	
304.195 19	(5/2+)	AB		
467.277 14	(3/2+)	AB		
580.2	(1/2+)	A		
647.87 3	(3/2+)	AB		
685.4		A		
826.4		A		
831.8		A		
929.4	(5/2+)	A		J π : γ to 3/2+ is M1,E2; $\gamma\gamma(\theta)$; log ft=6.9 via 3/2- parent.
991.8		A		
1039.3		A		
1066.6		A		
1172.3		A		
1189.2		A		
1426.5		A		
1501.7		A		
1551.4		A		
1566.2		A		
1628.2		A		
1717.0		A		
1740.8		A		
1844.3		A		
1872.8		A		
1926.3		A		
2180.9		A		
2217.6		A		
2293.7		A		
2376.2		A		
2385.4		A		
2441.1		A		
2468.8		A		
2744.3		A		

 $\gamma(^{141}\text{La})$ All data are from β^- decay.

E(level)	E γ	I γ	Mult.	δ	α	Comments
190.328	190.328 5	100	M1		0.179	B(M1)(W.u.)=0.00213 +17-10.
304.195	113.9	0.42 2				
	304.19 2	100 2	E2+M1	>1.8	0.0456 10	
467.277	163.0	1.3 1				
	276.95 7	100 3	M1, E2		0.0629 25	
	467.5	24.4 8				
580.2	112.8	76 7				
	390.0	100 3				
647.87	67.8 [†]	<0.02				
	180.8	3.6 11				
	343.67 2	100 3	M1, E2		0.034 4	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{La})$ (continued)

E(level)	E_γ	I_γ	Mult.	α	E(level)	E_γ	I_γ
647.87	457.8	35 1	M1, E2	0.0155 24	1717.0	1136.8	80 20
	648.1	44 1			1740.8	909.3	13 2
685.4	381.4	65 10				1055.2	11 2
	685.4	100 25				1093.2	11 5
826.4	359.2	2.2 18				1273.4	56 4
	522.3	100 3				1436.6	100 6
	636.2	73 3				1550.2	45 3
	826.4	91 5			1844.3	805.3	7.0 15
831.8	364.5	36.5 17				1012.5	16 3
	527.6	28 4				1264.0	95 5
	641.5	24.8 11				1376.8	90 5
	831.7	100 5				1539.2	9 1
929.4	281.6	2.1 3				1653.6	100 5
	349.5	4.7 4			1872.8	321.5	1.6 8
	462.3	100 3	M1, E2	0.0151 23		700.7	7.6 8
	625.4	74 2				806.4	3.8 8
	739.2	99 3				833.8	10 2
	929.5	15.4 9				881.2	9 1
991.8	688.0	38 10				943.2	47 2
	801.7	100 14				1046.3	20 2
1039.3	572.3	100 9				1187.8	0.7 5
	1039.9	33 5				1224.9	26 4
1066.6	234.9	1.6 4				1405.1	19.2 14
	418.8	1.8 4				1568.3	16.5 16
	486.7	1.6 4				1682.3	100 5
	599.4	7.3 6			1926.3	753.8	6.0 24
	762.0	5.3 8				996.8	17 3
	876.3	100 3				1094.2	18 6
1172.3	242.7	13 2				1278.0	87 5
	524.3	63 3				1345.7	23.5 24
	704.8	36 4				1460.0	100 9
	867.8	15 3				1621.4	9.0 24
	981.7	100 13			2180.9	1600.6	100
	1173.1	24 2			2217.6	1178.3	100 20
1189.2	609.0	100				1391.0	80 20
1426.5	778.4	40 10				1569.8	70 30
	846.6	33 5			2293.7	1302.1	44 6
	1236.0	100 12				1712.7	85 15
1501.7	462.9	1.2 6				1990.0	100 19
	510.3	2.9 10			2376.2	1309.4	100 14
	670.3	3.9 4				1447.0	61 8
	675.4	6.4 6			2385.4	1455.9	100
	1034.3	3.9 9			2441.1	1609.3	100
	1197.3	100 3			2468.8	541.6	34 9
	1311.2	13.8 10				841.0	19 4
	1501.4	8.1 13				917.4	23 4
1551.4	1361.2	100				967.6	13 4
1566.2	880.8	100				1540.2	34 4
1628.2	561.7	17 2				1642.5	34 6
	588.8	11 2				1820.5	49 6
	698.8	36 2				2277.9	45 4
	981.2	17 4				2468.8	100 6
	1160.8	100 4			2744.3	1912.2	85 13
	1323.8	88 4				1918.3	33 5
	1437.8	18 3				2164.0	100 23
1717.0	885.2	100 20					

† Placement of transition in the level scheme is uncertain.

^{141}Ba β^- Decay 1986Fa08

Parent ^{141}Ba : $E=0.0$; $J\pi=3/2^-$; $T_{1/2}=18.27$ min 7; $Q(\text{g.s.})=3202$ 7; % β^- decay=100.

Measured: γ , $\gamma\gamma$ (1986Fa08,1979Pr01,1977TaZZ,1970Mc22,1970Be43,1968Al06), ce (1979Pr01,1970Be43), $\gamma\gamma(\theta)$ (1986Fa08),

I_γ (1997Gr09 by total absorption γ -ray spectrometer (TAGS)).

Level scheme is that of 1986Fa08.

 ^{141}La Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	(7/2+)		
190.328 5	(5/2+)	1.27 ns +6-10	$T_{1/2}$: from $\beta\gamma$ coin (1970Be43).
304.191 20	(5/2+)		
467.278 12	(3/2+)		
580.2 4	(1/2+)		
647.86 3	(3/2+)		
685.4 6			
826.4 4			
831.8 4			
929.4 3	(5/2+)		
991.8 5			
1039.3 4			
1066.6 4			
1172.3 4			
1189.2 11			
1426.5 6			
1501.7 4			
1551.4 6			
1566.2 12			
1628.2 4			
1717.0 8			
1740.8 5			
1844.3 5			

E(level)	$J\pi^\dagger$
1872.8 4	
1926.3 4	
2180.9 11	
2217.6 6	
2293.7 7	
2376.2 8	
2385.3 11	
2441.1 11	
2468.8 4	
2744.3 7	

† Adopted values.

 β^- radiations

$E\beta^-$	E(level)	$I\beta^-^\dagger$	Log ft	Comments
(458 7)	2744.3	0.39 5	5.85 6	$I\beta^-$: 0.184.
(733 7)	2468.8	0.85 5	6.21 3	$I\beta^-$: 0.28.
(908 7)	2293.7	0.57 6	6.72 5	$I\beta^-$: 0.55.
(1276 7)	1926.3	1.88 12	6.74 3	$I\beta^-$: 0.46.
(1329 7)	1872.8	4.39 20	6.443 22	$I\beta^-$: 4.61.
(1358 7)	1844.3	2.88 13	6.661 22	$I\beta^-$: 2.31.
(1461 7)	1740.8	2.03 11	6.935 25	$I\beta^-$: 2.21.
(1485 7)	1717.0	0.082 14	8.36 8	$I\beta^-$: 0.074.
(1574 7)	1628.2	3.08 14	6.878 22	$I\beta^-$: 3.32.
(1636 8)	1566.2	0.032 19	8.9 3	$I\beta^-$: 0.028.
(1700 7)	1501.7	6.6 3	6.678 21	$I\beta^-$: 6.18.
(2030 7)	1172.3	1.65 12	7.58 4	$I\beta^-$: 1.38.
(2135 7)	1066.6	3.79 18	7.312 22	$I\beta^-$: 3.9.
(2273 7)	929.4	12.5 5	6.903 19	$E\beta^-$: $E\beta^-=2370$ (1962Fr04), 2354 45 (1972AdZV). $I\beta^-$: 11.99.
(2370 7)	831.8	2.15 15	7.74 3	$I\beta^-$: 1.84.
(2376 7)	826.4	0.31 7	8.59 10	$I\beta^-$: 0.28.
(2517 7)	685.4	0.17 6	8.95 16	$I\beta^-$: 0.184.
(2554 7)	647.86	24.4 10	6.819 19	$I\beta^-$: 23.06. $E\beta^-$: $E\beta^-=2610$ (1962Fr04), 2588 41 (1972AdZV).
(2622 7)	580.2	1.1 4	8.21 16	$I\beta^-$: 0.65.
(2735 7)	467.278	18.1 11	7.07 3	$E\beta^-=2840$ (1962Fr04), 2734 39 (1972AdZV). $I\beta^-$: 19.37.
(3012 7)	190.328	8.3 19	7.58 10	$E\beta^-$: $E\beta^-=3100$ 100 (1962Fr04). $I\beta^-$: 10.15.
(3202 7)	0.0	4.4 22	9.41 ^{1u} 22	$I\beta^-$: 1.7 15.

Footnotes continued on next page

^{141}Ba β^- Decay 1986Fa08 (continued) **β^- radiations (continued)**

[†] From 1979Pr01, who determined I_γ relative to $I(1354\gamma)$ from ^{141}La decay using absolute intensity for 1354γ as determined by 1951Du19. $I\beta(\text{g.s.})$ is deduced to be 4.4% 22. Also in comments: intensities based on tags (1997Gr09).

 $\gamma(^{141}\text{La})$

$\alpha(\text{K})_{\text{exp}}$ were derived from simultaneous measurement of I_γ and $I_{\text{ce}}(\text{K})$ normalized to $\alpha(\text{K})_{\text{exp}}$ for standard γ transitions (1979Pr01).

I_γ normalization: $I(\gamma+\text{ce})(\text{g.s.})=95.6$ 22; see comment on $I\beta^-(\text{g.s.})$ above.

$E_\gamma^\dagger$	E(level)	$I_\gamma^{\dagger@}$	Mult. [‡]	δ	α	Comments
67.8&	647.86	<0.05				$\%I_\gamma=0.0011$ 12. I_γ : 0.8 1 in 1979Pr01.
112.8	580.2	22 2	[M1, E2]		1.0 3	$\%I_\gamma=1.00$ 10.
113.9	304.191	2.3 1	[M1, E2]		1.0 3	$\%I_\gamma=0.105$ 6.
163.0	467.278	6.4 7	[M1, E2]		0.32 5	$\%I_\gamma=0.29$ 4.
180.8	647.86	11.2 35	[M1, E2]		0.228 23	$\%I_\gamma=0.51$ 16.
190.328 5	190.328	1000 30	M1		0.179	$\%I_\gamma=45.5$ 13. Mult.: $\alpha(\text{K})_{\text{exp}}=0.172$ 25 (1979Pr01), 0.169 15 (1970Be43), $\text{K/L}=8.1$ 8 (1970Be43), $\delta<0.3$. E_γ : from 1979Bo26.
234.9	1066.6	1.3 3				$\%I_\gamma=0.059$ 14.
242.7	1172.3	2.0 3				$\%I_\gamma=0.091$ 14.
^x 255.1§ 6		0.2 1				$\%I_\gamma=0.009$ 5.
276.95 1	467.278	509 15	M1, E2		0.0629 25	$\%I_\gamma=23.1$ 10. E_γ : from 1979Bo26. Mult.: $\alpha(\text{K})_{\text{exp}}=0.053$ 8.
281.6	929.4	2.2 3				$\%I_\gamma=0.100$ 14.
304.19 2	304.191	553 17	E2 (+M1)	>1.8	0.0456 10	$\%I_\gamma=25.1$ 10. E_γ : from 1979Bo26. Mult.: $\alpha(\text{K})_{\text{exp}}=0.034$ 5.
321.5	1872.8	0.6 3				$\%I_\gamma=0.027$ 14.
343.67 2	647.86	314 9	E2		0.0307	$\%I_\gamma=14.3$ 6. E_γ : from 1979Bo26. Mult.: $\alpha(\text{K})_{\text{exp}}=0.022$ 3.
349.5	929.4	5.0 4				$\%I_\gamma=0.227$ 20.
359.2	826.4	0.21 17				$\%I_\gamma=0.010$ 8.
364.5	831.8	12.8 6				$\%I_\gamma=0.58$ 4.
381.4	685.4	2.6 4				$\%I_\gamma=0.118$ 19.
390.0	580.2	29 1				$\%I_\gamma=1.32$ 6.
418.8	1066.6	1.4 3				$\%I_\gamma=0.064$ 14.
^x 441.1§ 4		0.7 2				$\%I_\gamma=0.032$ 10.
457.8	647.86	109 3	M1, E2		0.0155 24	$\%I_\gamma=4.95$ 21. Mult.: $\alpha(\text{K})_{\text{exp}}=0.015$ 3.
462.3	929.4	106 3	M1, E2		0.0151 23	$\%I_\gamma=4.82$ 20. Mult.: $\alpha(\text{K})_{\text{exp}}=0.016$ 4.
462.9	1501.7	1.2 6				$\%I_\gamma=0.05$ 3.
467.5	467.278	124 4	E2		0.01243	$\%I_\gamma=5.64$ 24. Mult.: $\alpha(\text{K})_{\text{exp}}=0.008$ 2, may be E2, M1.
486.7	1066.6	1.3 3				$\%I_\gamma=0.059$ 14.
510.3	1501.7	3 1				$\%I_\gamma=0.14$ 5.
522.3	826.4	9.4 3				$\%I_\gamma=0.427$ 19.
524.3	1172.3	10.0 4				$\%I_\gamma=0.455$ 23.
527.6	831.8	9.9 15				$\%I_\gamma=0.45$ 7.
541.6	2468.8	1.8 5				$\%I_\gamma=0.082$ 23.
^x 551.0		2.1 3				$\%I_\gamma=0.095$ 14.
561.7	1628.2	4.1 5				$\%I_\gamma=0.186$ 24.
572.3	1039.3	5.7 5				$\%I_\gamma=0.259$ 24.
588.8	1628.2	2.7 4				$\%I_\gamma=0.123$ 19.
599.4	1066.6	5.8 5				$\%I_\gamma=0.264$ 24.
609.0	1189.2	8.0 9				$\%I_\gamma=0.36$ 5.
^x 611.3		0.4 1				$\%I_\gamma=0.018$ 5.
625.4	929.4	78 2				$\%I_\gamma=3.55$ 14.
636.2	826.4	6.9 3				$\%I_\gamma=0.314$ 17.
641.5	831.8	8.7 4				$\%I_\gamma=0.395$ 22.

Continued on next page (footnotes at end of table)

^{141}Ba β^- Decay 1986Fa08 (continued) $\gamma(^{141}\text{La})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger@$	Comments
648.1	647.86	137 4	%I γ =6.2 3.
x655.3		0.4 3	%I γ =0.018 14.
x658.9§ 5		0.7 3	%I γ =0.032 14.
670.3	1501.7	4.0 4	%I γ =0.182 19.
675.4	1501.7	6.6 6	%I γ =0.30 3.
685.4	685.4	4 1	%I γ =0.18 5.
688.0	991.8	1.1 3	%I γ =0.050 14.
698.8	1628.2	8.7 5	%I γ =0.40 3.
700.7	1872.8	2.8 3	%I γ =0.127 15.
704.8	1172.3	5.8 6	%I γ =0.26 3.
739.2	929.4	105 3	%I γ =4.77 20.
753.8	1926.3	1.0 4	%I γ =0.045 19.
762.0	1066.6	4.2 6	%I γ =0.19 3.
778.4	1426.5	1.7 4	%I γ =0.077 19.
x783.6§ 3		<1.3	%I γ =0.03 3.
801.7	991.8	2.9 4	%I γ =0.132 19.
805.3	1844.3	1.4 3	%I γ =0.064 14.
806.4	1872.8	1.4 3	%I γ =0.064 14.
826.4	826.4	8.6 5	%I γ =0.39 3.
831.7#	831.8	35.1 17	%I γ =1.60 9.
833.8	1872.8	3.6 8	%I γ =0.16 4.
841.0	2468.8	1.0 2	%I γ =0.045 10.
846.6	1426.5	1.4 2	%I γ =0.064 10.
867.8	1172.3	2.4 4	%I γ =0.109 19.
876.3	1066.6	80.0 27	%I γ =3.64 17.
880.8	1566.2	0.7 4	%I γ =0.032 19.
881.2	1872.8	3.2 5	%I γ =0.145 24.
885.2	1717.0	1.0 2	%I γ =0.045 10.
909.3	1740.8	2.5 4	%I γ =0.114 19.
917.4	2468.8	1.2 2	%I γ =0.055 10.
929.5	929.4	16.3 9	%I γ =0.74 5.
943.2	1872.8	17.5 9	%I γ =0.80 5.
x959.0		1.2 3	%I γ =0.055 14.
967.6	2468.8	0.7 2	%I γ =0.032 10.
x974.9§ 7		0.8 3	%I γ =0.036 14.
981.2	1628.2	4 1	%I γ =0.18 5.
981.7	1172.3	16 2	%I γ =0.73 10.
996.8	1926.3	2.8 5	%I γ =0.127 23.
x1008.4		1.4 3	%I γ =0.064 14.
1012.5	1844.3	3.2 5	%I γ =0.145 24.
1034.3	1501.7	4.1 9	%I γ =0.19 5.
1039.9	1039.3	1.9 3	%I γ =0.086 14.
1046.3	1872.8	7.4 9	%I γ =0.34 5.
1055.2	1740.8	2.0 4	%I γ =0.091 19.
x1066.6		2.2 4	%I γ =0.100 19.
1093.2	1740.8	2 1	%I γ =0.09 5.
1094.2	1926.3	3 1	%I γ =0.14 5.
1136.8	1717.0	0.8 2	%I γ =0.036 10.
x1147.0		0.6 2	%I γ =0.027 10.
1160.8	1628.2	24 1	%I γ =1.09 6.
1173.1	1172.3	3.8 3	%I γ =0.173 15.
1178.3	2217.6	1.5 3	%I γ =0.068 14.
1187.8	1872.8	0.24 19	%I γ =0.011 9.
1197.3	1501.7	104 3	%I γ =4.73 20.
1224.9	1872.8	9.5 13	%I γ =0.43 6.
x1233.2§ 7		0.4 2	%I γ =0.018 10.
1236.0	1426.5	4.2 5	%I γ =0.191 24.
1264.0	1844.3	19 1	%I γ =0.86 6.
1273.4	1740.8	10.9 7	%I γ =0.50 4.
1278.0	1926.3	14.4 8	%I γ =0.65 5.
1302.1	2293.7	2.4 3	%I γ =0.109 14.
1309.4	2376.2	5.1 7	%I γ =0.23 4.
1311.2	1501.7	14.3 10	%I γ =0.65 5.

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^{141}Ba β^- Decay 1986Fa08 (continued) $\gamma(^{141}\text{La})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger@$	Comments
1323.8	1628.2	21 1	% $I\gamma=0.95$ 6.
1345.7	1926.3	3.9 4	% $I\gamma=0.177$ 19.
^x 1354.6		1.6 2	% $I\gamma=0.073$ 10.
^x 1357.1		2.3 3	% $I\gamma=0.105$ 14.
1361.2	1551.4	0.70 25	% $I\gamma=0.032$ 12.
^x 1373.1 § 9		≈2	% $I\gamma=0.09$ 5.
1376.8	1844.3	18 1	% $I\gamma=0.82$ 6.
1391.0	2217.6	1.2 3	% $I\gamma=0.055$ 14.
1405.1	1872.8	7.1 5	% $I\gamma=0.323$ 25.
^x 1421.9 § 8		<0.5	% $I\gamma=0.011$ 12.
1436.6	1740.8	18.8 12	% $I\gamma=0.85$ 6.
1437.8	1628.2	4.2 8	% $I\gamma=0.19$ 4.
1447.0	2376.2	3.1 4	% $I\gamma=0.141$ 19.
1455.9	2385.3	2.8 7	% $I\gamma=0.13$ 4.
1460.0	1926.3	16.6 15	% $I\gamma=0.75$ 8.
1501.4	1501.7	8.5 13	% $I\gamma=0.39$ 6.
^x 1525.7 § 9		1.1 3	% $I\gamma=0.050$ 14.
1540.2	1844.3	1.8 2	% $I\gamma=0.082$ 10.
	2468.8	1.8 2	% $I\gamma=0.082$ 10.
^x 1547.1		0.7 2	% $I\gamma=0.032$ 10.
1550.2	1740.8	8.5 5	% $I\gamma=0.39$ 3.
^x 1559.9 § 7		1.4 7	% $I\gamma=0.06$ 4.
1568.3	1872.8	6.1 6	% $I\gamma=0.28$ 3.
1569.8	2217.6	1.0 5	% $I\gamma=0.045$ 23.
^x 1588.6 § 7		1.8 9	% $I\gamma=0.08$ 4.
1600.6	2180.9	1.4 3	% $I\gamma=0.064$ 14.
1609.3	2441.1	0.9 2	% $I\gamma=0.041$ 10.
1621.4	1926.3	1.5 4	% $I\gamma=0.068$ 19.
1642.5	2468.8	1.8 3	% $I\gamma=0.082$ 14.
1653.6	1844.3	20 1	% $I\gamma=0.91$ 6.
1682.3	1872.8	37 2	% $I\gamma=1.68$ 11.
1712.7	2293.7	4.6 8	% $I\gamma=0.21$ 4.
^x 1727.7		2.0 2	% $I\gamma=0.091$ 10.
^x 1735.4		4.6 8	% $I\gamma=0.21$ 4.
^x 1740.6		7.1 6	% $I\gamma=0.32$ 3.
^x 1795.4		12.5 9	% $I\gamma=0.57$ 5.
1820.5	2468.8	2.6 3	% $I\gamma=0.118$ 14.
^x 1841.7 § 8		0.9 5	% $I\gamma=0.041$ 23.
^x 1851.9 § 5		1.2 3	% $I\gamma=0.055$ 14.
^x 1859.9		2.0 3	% $I\gamma=0.091$ 14.
1912.2	2744.3	3.3 5	% $I\gamma=0.150$ 24.
1918.3	2744.3	1.3 2	% $I\gamma=0.059$ 10.
1990.0	2293.7	5.4 10	% $I\gamma=0.25$ 5.
^x 2026.2		9.8 15	% $I\gamma=0.45$ 7.
^x 2078.9 § 12		0.8 4	% $I\gamma=0.036$ 19.
^x 2136.6		0.7 2	% $I\gamma=0.032$ 10.
2164.0	2744.3	3.9 9	% $I\gamma=0.18$ 5.
^x 2195.0		2.1 3	% $I\gamma=0.095$ 14.
^x 2217.3 § 5		3.0 12	% $I\gamma=0.14$ 6.
^x 2269.0 § 4		<0.3	% $I\gamma=0.007$ 7.
2277.9	2468.8	2.4 2	% $I\gamma=0.109$ 10.
^x 2463.9 § 2		0.3 1	% $I\gamma=0.014$ 5.
2468.8	2468.8	5.3 3	% $I\gamma=0.241$ 16.
^x 2516.3 § 10		0.8 3	% $I\gamma=0.036$ 14.
^x 2810.3 § 6		<0.3	% $I\gamma=0.007$ 7.

† From 1986Fa08, except where noted otherwise.

‡ For A_2 , A_4 in $\gamma\gamma(\theta)$ see 1986Fa08.

§ Observed only by 1979Pr01.

832.537 39 in 1979Bo26.

@ For absolute intensity per 100 decays, multiply by 0.0455 14.

& Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

Decay Scheme

^{141}Ba β^- Decay 1986Fa08 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{141}\text{Ba } \beta^- \text{ Decay } 1986\text{Fa08 (continued)}$

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

 $^{142}\text{Ce}(\mu^-, n\gamma)$ 1973Lu01

 Measured γ following μ^- capture.

 ^{141}La Levels

E(level)	$J\pi^\dagger$
0 . 0	(7 / 2+)
190 . 5 5	(5 / 2+)
304 . 1 5	(5 / 2+)
467 . 4 7	(3 / 2+)
648 . 0 8	(3 / 2+)

 † Adopted values.

 $\gamma(^{141}\text{La})$

$E\gamma$	E(level)	$I\gamma$
190 . 5 5	190 . 5	37 . 8 76
276 . 9 5	467 . 4	6 . 6 13
304 . 1 5	304 . 1	9 . 3 19
343 . 8 5	648 . 0	2 . 3 5

Adopted Levels, Gammas

$Q(\beta^-)=580.4$ 11; $S(n)=5428.14$ 10; $S(p)=8406.5$ 18; $Q(\alpha)=-139.5$ 22 2012Wa38.

Theory, calculations: 1999Li26, 1997Li03, 1996Lo01, 1995Or04, 1992Ch09.

1999Di20: measured reaction cross section, excitation functions.

1999Ab40,1999Ab39: reaction cross section, yield.

1997KaZT, 1997FiZZ, 1997Ko44: activation cross section for 14 MeV n.

1996Ka03: stellar n-capture cross sections.

1992Gu15: possibility for isovector E2 giant resonance.

1991An07: measured cross section for $^{145}\text{Nd}(\gamma, \alpha)$.

 ^{141}Ce LevelsCross Reference (XREF) Flags

A ^{141}La β^- Decay

B $^{138}\text{Ba}(\alpha, n\gamma)$

C $^{139}\text{La}(^7\text{Li}, \alpha n\gamma)$

D $^{140}\text{Ce}(n, \gamma)$ E=thermal

E $^{140}\text{Ce}(\text{pol } p, p), (\text{pol } p, p')$ IAS

F $^{140}\text{Ce}(d, p), (d, p\gamma)$

G $^{140}\text{Ce}(\alpha, ^3\text{He})$

H $^{142}\text{Ce}(p, d)$

I $^{142}\text{Ce}(d, t)$

J $^{142}\text{Ce}(^3\text{He}, \alpha)$

E(level) [†]	J π	XREF	T _{1/2}	Comments
0.0	7/2 ⁻	ABCDEF HIJ	32.511 d 13	% β^- =100. J π : paramagnetic resonance (1976Fu06), L=3 in (d,p). $\mu=1.09$ 4 (2011StZZ,1983Va36). μ : from $\gamma(0, \text{H}, t)$; others: 1.31 20, 0.97 3, 0.9 1 (1978LeZA). T _{1/2} : by Limitation of Statistical Weights (LWM) Method (with 33.50 d 3 outlier excluded) of the following data: 32.50 d 20 (1950Fr58), 32.60 d 20 (1971Ba28), 32.51 d 6 (1971De11), 32.45 d 13 (1972Em01), 32.55 d 3 (1972La14), 32.51 d 6 (1973MeYE), 32.501 d 13 (1976Va30), 33.50 d 3 (1980RuZY), 32.51 d 10 (1983Wa26), 32.510 d 24 (1992Un01), 32.56 d 5 (2012To09). Others: 1967Ob01, 1965An07, 1957Ke26.
662.07 5	3/2 ⁻	A DEF HI		J π : L=1 in (d,p), CP(4767 γ) in (n, γ).
1137.05 19	1/2 ⁻	A DEF HI		J π : L=1 in (d,p), IAS of 1/2 ⁻ resonance (E(p)=10880) in (p,p).
1354.50 9	9/2 ⁻	A EFG		J π : L=5 in (d,p); IAS of 9/2 ⁻ resonance (E(p)=11130) in (p,p).
1368.71 18	13/2 ⁺	ABC FG IJ	5.3 ns 3	J π : L=6 in (d,p), T _{1/2} consistent with E3 γ to 7/2 ⁻ , not with M2. T _{1/2} : from ($\alpha, n\gamma$) (1978KoZR). Other: 4 ns 2 ($^7\text{Li}, \alpha n\gamma$) (1975Kl01). J π : L=(5) in (d,p), (d,t).
1377.0 18	(9/2 ⁻ , 11/2 ⁻)	F HI		J π : L=3 in (d,p); IAS of 5/2 ⁻ resonance (E(p)=11270) in (p,p).
1496.99 9	5/2 ⁻	A DEF I		J π : L=2 in (d,t), ($^3\text{He}, \alpha$); γ to 3/2 ⁻ , no γ to 7/2 ⁻ .
1626.2 5	(3/2 ⁺)	A HIJ		J π : L=5 in (d,p), γ to 13/2 ⁺ .
1693.31 10	11/2 ⁻	A FG		J π : L=3 in (d,p), (d,t); IAS of 7/2 ⁻ resonance (E(p)=11530) in (p,p).
1739.01 10	7/2 ⁻	A EF I		J π : L=0 in (d,t).
1785 3	1/2 ⁺	HIJ		J π : L=1 in (d,p), γ to 7/2 ⁻ , IAS of 3/2 ⁻ resonance (E(p)=11590) in (p,p).
1808.7 3	3/2 ⁻	DEF		J π : L=3 in (d,p), IAS of 5/2 ⁻ resonance (E(p)=11610) in (p,p).
1812.7 9	5/2 ⁻	EF		J π : L=5 in (d,t), ($^3\text{He}, \alpha$).
1915 3	11/2 ⁻ , 9/2 ⁻	IJ		J π : L=0 in (d,t).
1942 3	1/2 ⁺	I		XREF: H(1910).
1943.9 3		A		J π : γ to 13/2 ⁺ is $\Delta J=1$ D; excit. function; syst for N=83 nuclei.
1961.5 11	15/2(+)	BC H		J π : L=1 in (d,p), no γ to 7/2 ⁻ .
1994.3 4	(1/2 ⁻)	D F		J π : L=5 in ($^3\text{He}, \alpha$).
2030.22 20		A		
2044 10	11/2 ⁻ , 9/2 ⁻	J		
2049.3 3		A		
2114.5 15	(5/2 ⁻)	EF		J π : L=3 in (d,p); IAS of (5/2 ⁻) resonance (E(p)=11840) in (p,p).
2165 5	11/2 ⁻ , 9/2 ⁻	IJ		J π : L=5 in (d,t).
2165.6 14	3/2 ⁻	F		J π : L=1 in (d,p), γ to 7/2 ⁻ .
2171.1 3	9/2 ⁻	A		J π : L=5 in (d,t), ($^3\text{He}, \alpha$), β decay via (7/2 ⁺) parent.
2174.0 3	5/2 ⁻	A F		J π : IAS of 5/2 ⁻ resonance (E(p)=11900) in (p,p).
2189 2	(5/2 ⁻ , 7/2 ⁻)	F		J π : L=(3) in (d,p).
2189.6 3	3/2 ⁻	DEF		J π : L=(1) in (d,p), γ from 1/2 ⁺ in (n, γ), IAS of 3/2 ⁻ resonance (E(p)=11980) in (p,p).
2207.38 14	(7/2 ⁺)	A F I		J π : γ 's to (3/2 ⁺) and 9/2 ⁻ ; L=(4) in (d,t).
2207.5 15	17/2(+)	B		J π : γ to 15/2(+) is $\Delta J=1$ D; syst for N=83 nuclei.
2243 10	(7/2 ⁺ , 9/2 ⁺)	J		J π : L=(4) in ($^3\text{He}, \alpha$).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{141}Ce Levels (continued)

E(level) [†]	J π	XREF	T _{1/2}	Comments
2263 2	(7/2+, 9/2+)	EF		J π : L=(4) in (d,p).
2266.95 15	(5/2+)	A F		XREF: F(2263).
2272.5 18	(19/2)	B	2.2 ns 4	J π : L=(2) in (d,p), γ 's to 7/2- and 3/2-, β decay via 7/2+ parent. T _{1/2} : from (α ,n γ) (1978KoZR).
2292 2	(+)	F		J π : syst for N=83 nuclei, shell model.
2328.9 11	7/2-	A EF J		J π : L=(2+4) in (d,p).
2336.1 5	3/2-	DEF		J π : L=3 in (d,p), no γ to 3/2-, 1/2-, IAS of 7/2- resonance (E(p)=12110) in (p,p).
2403 5	3/2+, 5/2+	I		J π : L=1 in (d,p), strong γ to 5/2-; IAS of 3/2- resonance (E(p)=12140) in (p,p).
2405.9 9	(5/2-)	EF		J π : L=2 in (d,t).
2410.8 5	1/2-	D F		J π : L=3 in (d,p) (1971Br05); γ 's to 7/2- and 1/2-; contradicts L=2 in (d,t) (1979Li12); IAS of (5/2-) resonance (E(p)=12190) in (p,p).
2426.0 5	3/2-	DEF		J π : L=1 in (d,p), IAS of 1/2- resonance (E(p)=12180) in (p,p).
2450	(1/2-)	E		J π : L=1 in (d,p), IAS of 3/2- resonance (E(p)=12210) in (p,p).
$\approx$ 2450	(5/2-, 7/2-)	F		J π : IAS to (1/2-) resonance (E(p)=12230) in (p,p).
2458 5	3/2+, 5/2+	HIJ		J π : from L=(3) in (d,p),(d,p γ).
$\approx$ 2507	(3/2+, 5/2+)	F		XREF: H(2440).
2523.1 5	1/2-, 3/2-	D F		J π : L=2 in (d,t), (^3He , α).
2531 10	(9/2-, 11/2-)	J		J π : from L=(2) in (d,p),(d,p γ).
2543 5		I		J π : L=1 in (d,p).
2555 2		F		J π : L=(5) in (^3He , α).
2583 10		J		
2611 2	(1/2-, 3/2-)	F		J π : L=(1) in (d,p).
2634 2	5/2-, 7/2-	F		J π : L=3 in (d,p).
2649 5	3/2+, 5/2+	I		J π : L=2 in (d,t).
2671 10		J		
2800?		H		J π : L(p,d)=(5).
2841 5	1/2+	I		J π : L=0 in (d,t).
2886 5	3/2+, 5/2+	IJ		J π : L=2 in (d,t), (^3He , α), (d,p).
$\approx$ 2899	(3/2+, 5/2+)	F		J π : L=(2).
2899 2	13/2+, 11/2+	FG		J π : L=6 in (α , ^3He) in (d,p),(d,p γ).
2987 7	1/2+	IJ		J π : L=0 in (d,t), (^3He , α).
3012 3		F		
3055 7	3/2+, 5/2+	HIJ		XREF: H(3060).
3070 3	5/2-, 7/2-	F		J π : L=2 in (d,t), (^3He , α).
3070 3	1/2-, 3/2-	F		J π : L=3 in (d,p).
3071 7	3/2+, 5/2+	F I		J π : L=1 in (d,p).
3109 3		F		J π : L=2 in (d,t).
3114 7	11/2-, 9/2-	IJ		J π : L=5 in (d,t), (^3He , α).
3159 3	(1/2-, 3/2-)	F		J π : L=(1) in (d,p).
3175 3		F		
3203 3		F		
3210 7	3/2+, 5/2+	I		J π : L=2 in (d,t).
3235 3		F		
3265 3		F		
3297 3	(1/2-, 3/2-)	F		J π : L=(1) in (d,p),(d,p γ).
3319 3		F		
3333 10	5/2-, 7/2-	H J		J π : L=3 in (^3He , α).
3351 3	1/2+	F		J π : L=0 in (d,p).
3351 3	(3/2+, 5/2+)	F		J π : L=(2) in (d,p).
3408 3	(3/2+, 5/2+)	F		J π : L=(2) in (d,p).
3409 10	(11/2-, 9/2-)	J		J π : L=(5) in (^3He , d).
3413 9	1/2+	I		J π : L=0 in (d,t).
3449 3		F		
3486 3	(5/2-, 7/2-)	F		J π : from L=(3) in (d,p),(d,p γ).
3523 3	(7/2+, 9/2+)	F		J π : from L=(4) in (d,p),(d,p γ).
3578 3	(7/2+, 9/2+)	F		J π : from L=(4) in (d,p),(d,p γ).
3609 9	(9/2+, 7/2+)	IJ		J π : L=(4) in (^3He , α).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{141}Ce Levels (continued)

E(level) [†]	J π	XREF	Comments
3673 3	(3/2+, 5/2+)	F I	J π : L=(2) in (d,t),(d,p).
3684 3	(7/2+, 9/2+)	F I	J π : from L=(4).
3704 9		I	

[†] For levels populated and decayed by γ rays, from least-squares fit to E γ 's.

 $\gamma(^{141}\text{Ce})$

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\dagger}$	Mult.	Comments
662.07	662.06 6	100		
1137.05	475.0 2	100		
1354.50	1354.52 9	100		
1368.71	1368.7 2	100	[E3]	B(E3)(W.u.)=21.6 13.
1377.0	1378 $\frac{1}{2}$ 2	100		
1496.99	834.8 4	11 4		
	1497.0 1	100 6		
1626.2	964.0 8	100		
1693.31	324.6 4	1.8 7		
	1693.3 1	100 6		
1739.01	1739.0 1	100		
1808.7	672.0 8	48 14		
	1146.6 3	100 17		
	1808.4 7	59 17		
1812.7	1151 $\frac{1}{2}$ 1	6 2		
	1811 $\frac{1}{2}$ 2	100 14		
1943.9	589.9 6	30 15		
	1943.7 3	100 15		
1961.5	592.8 $\frac{5}{2}$	100	D	
1994.3	1332.2 4	100		
2030.22	2030.2 2	100		
2049.3	694.9 6	50 31		
	2049.2 3	100 16		
2114.5	1454 $\frac{1}{2}$ 2	12 1		
	2113 $\frac{1}{2}$ 2	100 8		
2165	791 $\frac{1}{2}$ #			
2165.6	791 $\frac{1}{2}$ # 3	23 23		791 γ from 3/2- to (9/2-,11/2-) is highly unlikely; it is possible that this γ originates from 2165, 11/2-,9/2- level in which case in (d,p),(d,p γ) dataset the 2165 doublet is rather observed.
	1502 $\frac{1}{2}$ 2	30 21		
	2166 $\frac{1}{2}$ 2	100 19		
2171.1	2171.1 3	100		
2174.0	435.0 8	4 3		
	547.1 5	6 3		
	676.8 5	8 3		
	1512.1 2	56 5		
	2173.9 3	100 12		
2189.6	692.5 4			
	1052.6 4	100 22		
	1527.6 6	78 17		
2207.38	581.1 5	15 6		
	710.4 2	40 8		
	853.0 3	40 8		
	2207.3 2	100 8		
2207.5	246 $\frac{5}{2}$	100	D	
2266.95	1604.8 2	21 2		
	2267.0 2	100 6		
2272.5	65 $\frac{5}{2}$	100	D	Mult.: based on RUL.
2328.9	2328.9 11	100		
2336.1	839.4 6			E γ : from (n, γ) (1970Ge03), not observed in (d,p γ) (1976Pi15). I γ : I(839 γ)/I(1674 γ)=1.2 (n, γ).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Ce})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$	Comments
2336.1	1197 2		$E\gamma$: from (d,p γ) (1976Pi15), not observed in (n, γ) (1970Ge03). $I\gamma$: I(1197 γ)/I(1674 γ)=4.1 (1976Pi15).
	1673.9 10		
2405.9	592 $\frac{3}{2}$ 2	<2.6	
	912 $\frac{3}{2}$ 2	19 3	
	1264 $\frac{3}{2}$ 2	2.3 15	
	1744 $\frac{3}{2}$ 1	100	
	2402 $\frac{3}{2}$ 2	12 3	
2410.8	602 2	9 9	
	1274.0 15	9 6	
	1748.7 5	100 15	
2426.0	617.1 6	16 3	
	1288.9 10	100 $\frac{3}{2}$ 10	
	1764.4 10	23 $\frac{3}{2}$ 6	
2523.1	1386.0 4	100	

† From ^{141}La β^- decay and (n, γ) data, unless given otherwise.

$\frac{3}{2}$ From $^{140}\text{Ce}(\text{d,p}),(\text{d,p}\gamma)$ dataset.

$\S$ From $^{139}\text{La}(^7\text{Li},\alpha n\gamma)$ dataset.

Placement of transition in the level scheme is uncertain.

 ^{141}La β^- Decay 1977TaZZ

Parent ^{141}La : $E=0.0$; $J\pi=(7/2+)$; $T_{1/2}=3.92$ h 3; $Q(\text{g.s.})=2501$ 4; % β^- decay=100.

Measured: γ , $\gamma\gamma$ (1977TaZZ), β (1959Sc36,1951Du19).

Decay scheme is from 1977TaZZ.

 ^{141}Ce Levels

E(level) †	$J\pi^\frac{3}{2}$	E(level) †	$J\pi^\frac{3}{2}$	E(level) †	$J\pi^\frac{3}{2}$
0.0	7/2-	1626.5 4	(3/2)+	2171.1 3	9/2-
662.06 6	3/2-	1693.31 10	11/2-	2174.02 16	5/2-
1137.0 9	1/2-	1739.01 10	7/2-	2207.40 14	(7/2+)
1354.50 9	9/2-	1943.9 3		2266.95 15	(5/2+)
1368.71 18	13/2+	2030.22 20		2328.9 11	7/2-
1497.01 9	5/2-	2049.3 3			

† From least-squares fit to $E\gamma$'s.

$\frac{3}{2}$ Adopted values.

 β^- radiations

Level feedings were derived from intensity imbalance for each level and I(1354 γ)=1.64% 7 (1981Ge04).

$E(\beta)=2430$ 30, $I\beta=95\%$ (1951Du19); 2500 100, $I\beta=98\%$ (1959Sc36).

$E\beta^-$	E(level)	$I\beta^{-\dagger}$	Log ft	$E\beta^-$	E(level)	$I\beta^{-\dagger}$	Log ft
(172 5)	2328.9	0.0005 4	8.5 4	(762 4)	1739.01	0.0149 15	9.16 5
(234 4)	2266.95	0.050 5	6.92 5	(808 4)	1693.31	0.075 7	8.54 5
(294 4)	2207.40	0.0153 16	7.75 5	(1004 4)	1497.01	0.0157 19	9.56 6
(327 4)	2174.02	0.029 3	7.62 5	(1132 4)	1368.71	0.0036 8	10.40 10
(330 4)	2171.1	0.0203 24	7.79 6	(1147 4)	1354.50	1.63 14	7.76 4
(452 4)	2049.3	0.0034 8	9.02 11	(1839 4)	662.06	0.0042 23	12.13 ^{lu} 24
(471 4)	2030.22	0.0051 6	8.90 6	2430 30	0.0	98.12 16	7.305 5
(557 4)	1943.9	0.0043 8	9.22 9				

† Absolute intensity per 100 decays.

¹⁴¹La β⁻ Decay 1977TaZZ (continued)

 $\gamma(^{141}\text{Ce})$

I γ normalization: I(1354 γ)=1.64% 7 (1981Ge04).

E γ	E(level)	I $\gamma^{\dagger}$	Mult.	α	Comments
324.6 4	1693.31	0.8 3	[E1]	0.01019	
435.0 8	2174.02	0.4 3			
474.9 9	1137.0	0.4 3			
547.1 5	2174.02	0.6 3	[E1]	0.00292	
^x 561.8 6		0.6 3			
581.1 5	2207.40	0.7 3	[E2]	0.00723	
589.9 6	1943.9	0.6 3			
662.06 6	662.06	15.8 9	[E2]	0.00520	
676.8 5	2174.02	0.8 3			
694.9 6	2049.3	0.7 4			
710.4 2	2207.40	1.9 4	[E1]	1.66 $\times 10^{-3}$	
834.8 4	1497.01	1.2 4			
853.0 3	2207.40	1.9 4	[E1]	1.15 $\times 10^{-3}$	
964.0 8	1626.5	0.9 5	[E1]	9.06 $\times 10^{-4}$	
1354.52 9	1354.50	1000 54			%I γ =1.64 7 (1981Ge04).
1368.7 2	1368.71	3.0 3	[E3]	0.00206	
1497.0 1	1497.01	11.1 7			
1512.1 2	2174.02	5.6 5			
1604.8 2	2266.95	5.2 5	[E1]	6.61 $\times 10^{-4}$	
1693.3 1	1693.31	45.0 25	[E2]	8.55 $\times 10^{-4}$	
1739.0 1	1739.01	9.5 6			
1943.7 3	1943.9	2.0 3			
2030.2 2	2030.22	3.1 3			
2049.2 3	2049.3	1.4 2			
2171.1 3	2171.1	12.4 12			
2173.9 3	2174.02	10.0 12			
2207.3 2	2207.40	4.8 4	[E1]	9.51 $\times 10^{-4}$	
2267.0 2	2266.95	25.2 15	[E1]	9.82 $\times 10^{-4}$	
2328.9 11	2328.9	0.3 2			

[†] For absolute intensity per 100 decays, multiply by 0.00164 11.

^x γ ray not placed in level scheme.

Decay Scheme

$^{138}\text{Ba}(\alpha, n\gamma)$ 1978KoZR

E=17-20 MeV.

Measured: γ , $\gamma\gamma$, $\gamma(t)$, $\gamma(\theta)$. ^{141}Ce Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	7/2-		
1369.7	13/2+	5.3 ns 3	
1962.5	15/2(+)		
2209	17/2(+)		
2274	(19/2)	2.2 ns 4	E(level): from sum of the $E\gamma$'s; 1978KoZR give a more precise value of 2272.8 on their figure.

 † Adopted values. $\gamma(^{141}\text{Ce})$

$E\gamma$	E(level)	Mult.	Comments
65	2274		
246	2209	D	Mult.: $A_2=-0.16$.
592.8	1962.5	D	Mult.: $A_2=-0.22$.
1369.7	1369.7		

 $^{139}\text{La}(^7\text{Li}, \alpha n\gamma)$ 1975K101

E=30 MeV.

Measured: γ , $\gamma(t)$. ^{141}Ce Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	† Adopted values.
0.0	7/2-		
1370.8	13/2+	4 ns 2	
1964?			

 $\gamma(^{141}\text{Ce})$

$E\gamma$	E(level)	† Placement of transition in the level scheme is uncertain.
593 †	1964?	
1370.8	1370.8	

 $^{140}\text{Ce}(n, \gamma)$ E=thermal 1970Ge03Measured: γ , $\gamma\gamma$.

Others: 1959Ba05, 1965Gr34, 1969Ch34, 1969IrZZ, 1970Or05, 2012To09.

 ^{141}Ce Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	7/2-	32.56 d 5	$T_{1/2}$: from time variation of 145-keV γ from ^{141}Ce decay (2012To09). Adopted value is 32.511 d 13. Measured capture $\sigma=0.51$ b 2 and resonance integral=0.55 b 2 (2012To09). $J\pi$: from CP(4767 γ) in $^{140}\text{Ce}(\text{pol } n, \gamma)$ (1971Dj03).
662.0 1	3/2-		
1137.0 3	1/2-		
1497.3 4	5/2-		

Continued on next page (footnotes at end of table)

$^{140}\text{Ce}(\text{n},\gamma)$ E=thermal 1970Ge03 (continued) ^{141}Ce Levels (continued)

E(level)	$J\pi^\dagger$	Comments
1808.7 4	3/2-	
1994.0 5	(1/2)-	
2189.6 5	3/2-	
2336.3 8	3/2-	
2410.8 6	1/2-	
2425.6 8	3/2-	
2522.9 6	1/2-, 3/2-	
(5428.6 6)	1/2+	E(level), $J\pi$: n-capture state 1/2+.

† Adopted values.

 $\gamma(^{141}\text{Ce})$

$I\gamma$ normalization: from $I(4291\gamma)=7.9$ and $I(4767\gamma)=16$ per 100 n-captures (1969Gr31).

$E\gamma$	E(level)	$I\gamma^\dagger$	Comments
475.0 2	1137.0	29 12	
602 1	2410.8	0.3 3	
617.1 6	2425.6	0.4 2	
662.0 1	662.0	100 6	
672.0 8	1808.7	1.4 4	
692.5 4	2189.6		
835.2 10	1497.3	0.4 3	
839.4 6	2336.3	0.6 3	
1052.6 4	2189.6	1.8 4	
1146.6 3	1808.7	2.9 5	
1274.0 15	2410.8	0.3 2	
1288.9 10	2425.6	2.4 6	
1332.2 4	1994.0	1.9 4	
1386.0 4	2522.9	1.9	
1497.3 4	1497.3	2.8 8	
1527.6 6	2189.6	1.4 3	
1673.9 10	2336.3	0.5 2	
1748.7 5	2410.8	3.4 5	
1764.4 10	2425.6	0.7 3	
$^x1774.1^\ddagger$ 10		0.7 4	E γ : isotope identification is not known.
1808.4 7	1808.7	1.7 5	
$^x1910.8$ 7		0.8 2	
$^x1957.8$ 8		1.0 5	
x2515 1		0.6 3	
2905.9 5	(5428.6)	3.0 7	
3003.3 6	(5428.6)	3.9 6	
3017.1 7	(5428.6)	4.7 6	
3092.5 5	(5428.6)	2.8 6	
3239.0 15	(5428.6)	2.7 6	
3435.0 6	(5428.6)	2.0 4	
3619.7 6	(5428.6)	4.0 9	
4291.4 6	(5428.6)	22.1 24	
4766.6 5	(5428.6)	48.0 48	

† For intensity per 100 neutron captures, multiply by 0.345 15.

‡ Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

$^{140}\text{Ce}(\text{pol p,p}),(\text{pol p,p}') \text{ IAS } 1977\text{C102}$

Others: 1968Ve07, 1971C108. See also 1978St13.

Measured: $\sigma(E,\theta)$ for pol protons, deduced: J,L,S for IAR. ^{141}Ce Levels

E(level) [†]	$J\pi^{\ddagger}$	L	E(level) [†]	$J\pi^{\ddagger}$	L	E(level) [†]	$J\pi^{\ddagger}$	L
0.0	7/2-	3	1820	3/2-	1	2330	7/2-	3
654	3/2-	1	1830	5/2-	3	2360	3/2-	1
1131	1/2-	1	2070?	(5/2-)	(3)	2400	1/2-	1
1384	9/2-	5	2130	5/2-	3	2410?	(5/2-)	(3)
1500	5/2-	3	2200	3/2-	1	2430	3/2-	1
1750	7/2-	3	2260?	(1/2-)	(1)	2450?	(1/2-)	(1)

[†] Energies of IAS in ^{141}Ce deduced from E(res)-9750 (E(res) of the lowest IAR).[‡] From $\sigma(\theta)$ for pol p. **$^{140}\text{Ce}(\text{d,p}),(\text{d,p}\gamma) 1977\text{Pa03},1976\text{Pi15},1975\text{Bo03}$**

E=17 MeV (1977Pa03), E=8 MeV (1976Pi15), E=19 MeV (1975Bo03). Others: 1971Br05, 1968He02, 1967Wi08, 1962Fu10, 1961Ho11; see also 1977St33.

Measured: $\sigma(E,\theta)$ (1977Pa03,1975Bo03), $p\gamma$ coin (1976Pi15); DWBA analysis. ^{141}Ce Levels

E(level)	$J\pi^{\S}$	$L^{\ddagger}$	$S^{\ddagger}$	Comments
0.0	7/2-	3	6.34	
662 1	3/2-	1	1.68	
1138 2	1/2-	1	0.73	
1355 2	9/2-	5	7.0	
1367 2	13/2+	6	9.0 1	
1378 2	(9/2-, 11/2-)	(5)		L: from 1967Wi08.
1497 2	5/2-	3	1.60	
1693 2	11/2-	5	2.91	
1736 2	7/2-	3	0.92	
1807 3	3/2-	1	0.23	
1812 2	5/2-	3	0.92	
1992 3	(1/2)-	1	0.07	
2113 [†] 2	(5/2)-	3	0.58	
2166 2	3/2-	1	0.09	
2172 2	5/2-			L=3 for 2177 (1975Bo03); other: L=(4) (1977Pa03).
2189 3	3/2-	(1)	0.09	
2189 2	(5/2-, 7/2-)	(3)	0.25	
2209 2	(7/2+)			S': weakly excited.
2263 2	(5/2+)	(2)	0.05	
2263 2	(7/2+, 9/2+)	(4)	0.12	
2292 [†] 2	(+)	(2+4)	0.01+0.06	
2323 5	7/2-	3	0.19	
2335	3/2-	1	0.27	
2402 2	(5/2-)	3		L: from 1971Br05.
2410	1/2-	1	0.45	
2424 3	3/2-	1	0.45	
2450 2		(3)	0.18	
2507 2		(2)	0.03	
2521	1/2-, 3/2-	1	0.14	
2555 2				
2611 2		(1)	0.07	
2634 2	5/2-, 7/2-	3	0.16	
2899 2		(2)	0.03	
2899 [†] 2	(13/2+, 11/2+)	(6)	2.1	
3012 3				
3070 3	1/2-, 3/2-	1	0.08	
3070 3	5/2-, 7/2-	3	0.14	

Continued on next page (footnotes at end of table)

$^{140}\text{Ce}(\text{d,p}),(\text{d,p}\gamma)$ 1977Pa03,1976Pi15,1975Bo03 (continued) **^{141}Ce Levels (continued)**

E(level)	$J\pi^{\S}$	$L^{\ddagger}$	$S^{\ddagger}$	Comments
3109 3				
3159 3	(1/2-, 3/2-)	(1)	0.05	
3175 3				
3203 3				
3235 3				
3265 [†] 3		(1+3)	0.11+0.17	
3297 3		(1)	0.08	
3319 [†] 3		(2+4)	0.05+0.10	
3351 3	1/2+	0	0.02	
3351 3	(3/2+, 5/2+)	(2)	0.14	
3408 3	(3/2+, 5/2+)	(2)	0.03	
3449 [†] 3				L: L=(0) (1977Pa03); L=1 (1975Bo03).
3486 3		(3)	0.07	
3523 3		(4)	0.34	
3578 3		(4)	0.29	
3673 3	(3/2+, 5/2+)	(2)	0.06	
3684 3		(4)	0.42	

[†] Possible doublet (1977Pa03).[‡] S', L are from 1977Pa03. For reduced normalization see 1977St33, 1978St13.[§] Adopted values. **$\gamma(^{141}\text{Ce})$**

From 1976Pi15.

$E\gamma$	E(level)	$I\gamma$	$E\gamma$	E(level)	$I\gamma$	$E\gamma$	E(level)	$I\gamma$
476 1	1138	130 18	1151 1	1812	6.9 21	1525 2	2189	24.4 40
592 [†] 2	2402	<3.5	1197 2	2335	57 7	1671 2	2335	14 5
602 [†] 2	2410	8.2 27	1264 ^{†‡} 2	2402	3.1 20	1736 2	1736	82.4 92
617 2	2424	16.8 33		2410		1744 ^{†‡} 1	2402	132 18
662 1	662	232 24	1286 2	2424	107 11	1744 ^{†‡} 2	2410	
671 3	1807	25 10	1330 2	1992	23.0 38	1768 2	2424	25 6
791 [†] 3	2166	4.3 50	1367 2	1367	20 3	1804 3	1807	17 4
835 1	1497	12.6 39	1378 2	1378	17 6	1811 2	1812	111 16
912 2	2402	25 4	1383 2	2521	46 6	2113 2	2113	65.1 50
1051 2	2189	34.4 40	1454 2	2113	7.5 7	2166 2	2166	18.7 35
1070 [†] 2	1736	3.6 17	1495 2	1497	91 9	2323 2	2323	39 6
1145 1	1807	18.0 26	1502 [†] 2	2166	5.7 40	2402 2	2402	16 4

[†] Placement of transition in the level scheme is uncertain.[‡] Multiply placed. **$^{140}\text{Ce}(\alpha,^3\text{He})$ 2008Ka01**

2008Ka01: E=51 MeV beam provided by Yale tandem accelerator. The reaction products were analyzed with an Enge magnetic split-pole spectrometer. The ^3He ions were isolated by a gas-filled ionization chamber and plastic scintillator at the focal plane of the Enge spectrometer and using E- ΔE technique. Angular distributions were measured at 6°, 11° and 20°. Resolution (FWHM)=70 keV. DWBA analysis.

Absolute cross sections have typical uncertainty of $\approx 7\%$ while relative values are accurate to 5%.

This work focuses on measurement of $i_{13/2}$ and $h_{9/2}$ single-neutron strengths for N=83 nuclides. From cross section data, matrix elements were also deduced for $f_{7/2}\otimes 2+$ (vib.) and $f_{7/2}\otimes 3-$ (vib.) configuration mixings.

$^{140}\text{Ce}(\alpha, ^3\text{He})$ 2008Ka01 (continued) **^{141}Ce Levels** $\Sigma[\text{C}^2\text{S}]$: 0.92 13 for $h_{9/2}$, 1.01 14 for $i_{13/2}$.Centroid energy (keV): 1447 10 for $h_{9/2}$, 1702 52 for $i_{13/2}$.

E(level) [†]	$J\pi^{\dagger}$	L	$\text{C}^2\text{S}^{\ddagger}$	Comments
1354.52 9	9/2-	5	0.67	$d\sigma/d\Omega$ (mb/sr)=0.54 at 20°, 0.21 at 30°.
1368.7 2	13/2+	6	0.79	$d\sigma/d\Omega$ (mb/sr)=1.01 at 20°, 0.57 at 30°.
1693.3 1	11/2-	5	0.25	$d\sigma/d\Omega$ (mb/sr)=0.15 at 11°, 0.13 at 20°, 0.08 at 30°.
2899 2	11/2+, 13/2+	6	0.22	$d\sigma/d\Omega$ (mb/sr)=0.44 at 6°, 0.31 at 11°, 0.15 at 30°.

[†] From Adopted Levels.[‡] Typical uncertainties are 10% based on relative cross sections and analysis using a variety of optical parameters listed by 2008Ka01. **$^{142}\text{Ce}(\text{p}, \text{d})$ 1972PiZU**

E=52 MeV.

Measured: $\sigma(\text{E}, \theta)$.

Many of the presented values of L contradict recent data from (d,t) (1979Li12).

 ^{141}Ce Levels

E(level)	L	Comments
0.0	(3)	
680	(1)	
1150	(1)	
1380	(5)	
1600	2	
1780	0	
1910	(2)	
2180	5	
2440	2	
2800	(5)	
3020		E(level): doublet.
3060	(4)	
3330		

 $^{142}\text{Ce}(\text{d}, \text{t})$ 1979Li12

E=17 MeV (1979Li12), 12.6 MeV (1972Le17).

Measured: $\sigma(\text{E}, \theta)$, DWBA analysis. **^{141}Ce Levels**

E(level)	$J\pi^{\dagger}$	L	S	E(level)	$J\pi^{\dagger}$	L	S
0.0	7/2-	3	0.91	2403 5	3/2+, 5/2+	2	0.050
661 3	3/2-	1	0.18	2458 5	3/2+, 5/2+	2	0.27
1139 3	1/2-	1	0.06	2543 5			
1361 3	13/2+	6	(0.2)	2649 5	3/2+, 5/2+	2	0.05
1380 3	(11/2-)	(5)	(0.38)	2841 5	1/2+	0	0.014
1498 3	5/2-	3	0.11	2886 5	3/2+, 5/2+	2	0.15
1626 3	3/2+	2	2.2	2987 7	1/2+	0	0.27
1738 3	7/2-	3	0.018	3055 7	3/2+, 5/2+	2	0.90
1785 3	1/2+	0	1.0	3071 7	3/2+, 5/2+	2	0.43
1915 3	11/2-	5	0.86	3114 7	11/2-	5	0.75
1942 3	1/2+	0	0.078	3210 7	3/2+, 5/2+	2	0.07
2165 5	11/2-	5	2.1	3413 9	1/2+	0	0.046
2203 5	(7/2+)	(4)	(0.42)	3609 9			

Continued on next page (footnotes at end of table)

$^{142}\text{Ce}(\text{d},\text{t})$ 1979Li12 (continued) **^{141}Ce Levels (continued)**

E(level)	$J\pi^\dagger$	L	S
3660 9	(3/2+, 5/2+)	(2)	(0.059)
3686 9			
3704 9			

† Values used in calculations of S.

 $^{142}\text{Ce}(^3\text{He},\alpha)$ 1979Li12

E=24 MeV.

Measured: $\sigma(\text{E},\theta)$; DWBA analysis.

 ^{141}Ce Levels

E(level)	$J\pi^\dagger$	L	S	E(level)	$J\pi^\dagger$	L	S
0.0	7/2-	3	0.83	2531 10	(11/2-)	(5)	(0.060)
1364 10	13/2+	6	≤ 0.44	2583 10			
1623 10	3/2+	2	2.3	2671 10			
1781 10	1/2+	0	0.45	2884 10	3/2+, 5/2+	2	
1910 10	11/2-	5	0.69	2986 10	1/2+	0	
2044 10	11/2-	5	0.46	3056 10	3/2+, 5/2+	2	1.4
2163 10	11/2-	5	1.7	3114 10	11/2-	5	0.82
2243 10	(7/2+)	(4)	(0.064)	3333 10	5/2-	3	0.30
2316 10	7/2-	(3)	(0.034)	3409 10	(11/2-)	(5)	(0.18)
2458 10	3/2+, 5/2+	2	0.28	3605 10	(7/2+)	(4)	

† Values used in calculations of S.

Adopted Levels, Gammas

Q(β⁻)=-1823.0 28; S(n)=9397 6; S(p)=5226.2 11; Q(α)=-1300.4 27 2012Wa38.
Theory, calculations: 1998Su03 (configuration for low-lying states), 1998St21.

¹⁴¹Pr Levels

Cross Reference (XREF) Flags

A ¹⁴¹Ce β⁻ Decay
B ¹⁴¹Nd ε Decay (2.49 h)
C ¹⁴¹Nd ε Decay (62.0 s)
D ¹⁴⁵Pm α Decay
E ¹³⁹La(³He,n)
F ¹³⁹La(α,2nγ)
G ¹⁴⁰Ce(p,p),(pol p,p) IAR

H ¹⁴⁰Ce(d,n)
I ¹⁴⁰Ce(³He,d)
J ¹⁴⁰Ce(⁷Li,⁶He)
K ¹⁴⁰Ce(¹⁶O,¹⁵N)
L ¹⁴¹Pr(γ,γ')
M ¹⁴¹Pr(γ,n),(γ,p),(e,e')
N ¹⁴¹Pr(n,n'γ)

O Others:
¹⁴¹Pr(d,d'),(α,α')
Coulomb Excitation
¹⁴²Ce(p,2nγ)
¹⁴²Nd(d,³He)
¹⁴⁴Nd(p,α)
¹⁴²Nd(e,e'p)

E(level) [†]	Jπ ^{‡§}	XREF	T _{1/2}	Comments
0.0	5/2+	ABCDEFGHIJKLMNO	stable	μ=+4.2754 (1982Ma31,2011StZZ). μ: by optical double resonance method. Q=-0.077 6 (1994Ii01,2011StZZ). Q: by collinear fast-beam laser spectroscopy; Others: -0.0589 42 (atomic beam) and -0.024 (1978LeZA). Jπ: L=2 in (³ He,d), atomic beam (1976Fu06). Radius(rms)=5.19 fm 22 in (e,e'p) (1993La16). μ=+2.95 9 (2011StZZ). μ: Others: 2.8 2 (1971Ka08), +3.1 2 (1973Gr15), +2.78 +12-6 (1971Be11). T _{1/2} : ¹⁴¹ Ce β ⁻ decay (1966Bl08). Others from ¹⁴¹ Ce β ⁻ decay: 1.82 ns 4 (1972Ga39), 1.91 ns 6 (1968Ra02), 1.83 ns 4 (1967Ba27); from (n,n'γ): >1.23 ps (2008Sc17). Jπ: L=4 in (³ He,d), γ to 5/2+ is M1+E2. Radius(rms)=5.21 fm 20 in (e,e'p) (1993La16). μ=+6.2 4 (1984Go12,2011StZZ). μ: from γ(θ,H,t) in (α,2nγ) (1984Go12); other: +7.2 4 (1974Ej01). T _{1/2} : from (α,2nγ) (1981Pr09). Others: 4.8 ns 3 (p,2nγ) (1981Ko16), 5.1 ns 3 (α,2nγ) (1975Fr18), 4.80 ns 25 (α,2nγ) (1973Ej02), 4.6 ns 1 (α,2nγ) (1984Go12), >0.76 ps (n,nγ) (2008Sc17). Jπ: L=5 in (³ He,d), γ to 5/2+ is E3, γ to 7/2+ is M2. Radius(rms)=5.64 fm 22 in (e,e'p) (1993La16). Jπ: γ to 5/2+ is ΔJ=1 M1+E2, log ft=6.4 via 3/2+ parent. Jπ: γ to 5/2+ is M1+E2, log ft=6.2 via 3/2+ parent, γγ(θ) for 1147γ in Coul. ex. (1980An22). Jπ: γ to 5/2+ is E2, L=0 in (³ He,d); contradicts with A ₂ =-0.10 5 in (p,2nγ) for γ to 5/2+. Radius(rms)=4.93 fm 24 in (e,e'p) (1993La16). Jπ: γ(θ) for γ from 5/2+ 7632 resonance in (γ,γ'), γ to 7/2+. Jπ: γ(θ) for γ from 5/2+ 7632 resonance in (γ,γ'), γ to 7/2+ is M1+E2 and is much stronger than γ to 5/2+. This eliminates the possibility of J=3/2 allowed by γ(θ) in (γ,γ'). Jπ: L=2 in (α,α'). Suggested (7/2+). Jπ: γ to 7/2+ is ΔJ=1, M1+E2. γ to 11/2-. γ from 13/2+. Jπ: γ to 7/2+ is ΔJ=2 E2, yield in (p,2nγ).
145.4434 14	7/2+	ABC EF HIJ L NO	1.85 ns 3	
1117.66 6	11/2-	C F HIJ L NO	4.8 ns 1	
1126.99 9	3/2+	B F L NO	>188 fs@	
1292.79 9	(5/2)+	B F L NO	0.33 ps@ +10-7	
1298.73 13	5/2+	B F HIJK NO	0.34 ps@ +22-10	
1436.18 12	3/2+	B F L NO	0.23 ps@ +8-5	
1452.39 9	(7/2)+	BC F L NO	0.31 ps@ +11-7	
1455.5 3	+	B F		
1457.43 10	9/2+	F L NO	0.26 ps@ +7-5	
1494.09 12	11/2+	EF NO	0.46 ps@ +36-15	
1510.3? 11		L		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{141}Pr Levels (continued)

E(level) [†]	$J\pi^{\ddagger\S}$	XREF		$T_{1/2}$	Comments
1520.91 10	9/2+	F	L NO	150 fs [@] +19-16	J π : γ to 5/2+ is $\Delta J=2$ E2, γ to 11/2-.
1559.0 10			L		$T_{1/2}$: other: 179 fs 22 (from B(E2) $\uparrow$ =0.057 7, 2007Sc18, (γ,γ')).
1580.09 10	5/2-	B F	L NO	0.22 ps [@] +6-4	J π : γ to 7/2+ is E1, ϵ from 3/2+; π contradicts direct excitation observed in Coul. ex. (1980An22).
1596.7? 12			L		
1608.34 18	(3/2)+	B F HIJKL	NO	11.8 fs [@] 7	J π : L=2 in ($^3\text{He},d$) and (M1+E2) γ to 5/2+ g.s.
1650.86 11	(9/2+)	F	L NO	132 fs [@] +21-17	J π : γ to 5/2+ is (E2) and γ to 7/2+ is (M1+E2). $T_{1/2}$: other: 159 fs 13 (from B(E2) $\uparrow$ =0.040 4, 2007Sc18, (γ,γ')).
1657.14 15	1/2+	B HI	L NO	>0.67 ps [@]	J π : L=0 in ($^3\text{He},d$),(d,n).
1666?			L		
1767.67 13	13/2+	F	NO	>0.37 ps [@]	J π : γ to 11/2- is $\Delta J=1$ E1, γ to 11/2+ is $\Delta J=1$ M1+E2; no γ to <11/2. 1994De56 suggest 11/2+.
1786.52 14	(5/2+)		L NO	0.19 ps [@] +5-4	J π : γ 's to 3/2+ and 7/2+ are (M1+E2).
1796.47 16	15/2+	F	NO	1.0 ns 1	μ =+8.0 17 (1984Go12,2011StZZ). μ : from $\gamma(\theta,H,t)$ in ($\alpha,2n\gamma$). J π : γ to 11/2+ is $\Delta J=2$ E2; no γ 's to J<11/2. $T_{1/2}$: from ($\alpha,2n\gamma$); other: >10.4 fs (n,n' γ). J π : γ to 5/2+ is (E2) and γ to 7/2+ is (M1+E2). J π : (M1+E2) γ 's to 5/2+, 7/2+, and 9/2+.
1812.39 14	(9/2+)		L NO	0.8 ps [@] +12-3	
1842.18 13	(7/2+)	F	L NO	0.70 ps [@] +59-22	
1849.0 10			L		
1853.77 12	(11/2+)	F	NO	0.8 ps [@] +16-3	J π : γ to 7/2+ is (E2) and γ to 9/2+ is (M1+E2).
1910.49? 20			N		
1913.1? 8		F			
1943.3 11			L		
1975.32 15	(3/2+)		L NO	0.39 ps [@] +19-10	XREF: L(1981). J π : γ to 5/2- is (E1) and γ to 7/2+ is (E2).
1986.24 16	(13/2+)	F	NO	>0.42 ps [@]	J π : γ to 9/2+ is (E2) and γ to 11/2- is (E1) with mult in (p,2n γ). J π : γ to 11/2- is (M1+E2).
2000.25 22	(13/2-)		N	0.13 ps [@] +11-5	
2000.49# 15	(9/2-)	C	NO	0.22 ps [@] +12-6	J π : γ to 7/2+ is (E1), γ to 9/2+ is (E1), and γ to 11/2-; π =- from L=3 in (α,α').
2004.17 22	(11/2+)		L NO	0.7 ps [@] +10-3	J π : γ to 7/2+ is (E2) and γ to 9/2+ is (M1+E2).
2018.16 14	(3/2+)		L N	0.40 ps [@] +26-12	J π : γ 's to 5/2+ and 1/2+ are (M1+E2).
2045.14 15	(9/2+)		N	0.68 ps [@] +86-25	J π : γ 's to 7/2+ are (M1+E2).
2069.13 15	17/2+	F	O		J π : γ to 15/2+ is $\Delta J=1$ M1+E2, no γ to <13/2+.
2075.54 12	(5/2+)		N	0.22 ps [@] +9-6	J π : γ 's to 3/2+ and 7/2+ are (M1+E2).
2100.99 25	(3/2+)		NO	0.17 ps [@] +7-4	J π : γ 's to 3/2+ and 5/2+ are (M1+E2).
2105.04# 18	(5/2-)		L NO	87 fs [@] +15-11	J π : L=3 in (α,α') and γ 's to 5/2+ and 7/2+ are (E1).
2105.5 3	(15/2-)		N	0.15 ps [@] +49-8	J π : γ to 11/2- is (E2).
2108.44 23	15/2(+)	F	NO	>28 fs [@]	J π : γ to 13/2+ is $\Delta J=1$ (M1), γ to 15/2+ is $\Delta J=0$ (M1).
2126.11 15	(11/2+)		NO	>114 fs [@]	J π : γ to 7/2+ is (E2) and γ to 9/2+ is (M1+E2).
2135.55 21	(7/2-)	L N		0.27 ps [@] +11-7	J π : γ 's to 5/2+, 7/2+, and 9/2+ are (E1).
2154.6 4	(1/2+, 3/2, 5/2+)		N		J π : γ 's to 1/2+ and (5/2)+ in (n,n' γ).
2171.87 25	(9/2-)		NO	101 fs [@] +18-15	J π : γ to 7/2+ is (E1).
2178 10	(5/2-)		O		J π : L=3 in (α,α'), γ 's to 7/2+ and 3/2+.
2188.18 20	(3/2+)		N	0.26 ps [@] +24-9	J π : γ to 7/2+ is (E2) and γ to 5/2+ is (M1+E2).
2190.43 20	(1/2-)		N	>215 fs [@]	J π : γ to 5/2+ is (M2) and γ to (7/2+) is (E3).
2205.96 21	11/2+		NO	171 fs [@] +40-28	J π : γ to 7/2+ is (E2) and γ to 11/2+ is (M1+E2).
2228.88 14	(7/2+)		N	0.7 ps [@] +61-4	J π : γ 's to 5/2+ and 7/2+ are (M1+E2).
2230.4 4			N		J π : suggested 13/2+,15/2+ in (n,n' γ) (1994De56).
2234 5	3/2		L		J π : from $\gamma(\theta)$ for γ from 5/2+ resonance 7632 in (γ,γ').
2243.26 16		F	NO		J π : suggested 13/2+ in (n,n' γ) (1994De56).
2247.8 4	(5/2-)	L N		147 fs [@] +35-25	J π : γ 's to 3/2+ and 5/2+ are (E1).

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Adopted Levels, Gammas (continued)
¹⁴¹Pr Levels (continued)

E(level) [†]	Jπ ^{‡§}	XREF	T _{1/2}	Comments
2254.0 18	+	NO		Jπ: L=2 in (α,α'). Suggested 1/2+,3/2+ in (n,n'γ) (1994De56).
2264.52 16	(3/2+)	N	0.18 ps [@] +10-7	Jπ: γ to 7/2+ is (E2) and γ to 1/2+ is (M1+E2).
2267.25 18	(1/2+)	E L N	>184 fs [@]	XREF: E(2280)L(2272).
2270.1 10		L		Jπ: γ to 5/2+ is (E2) and γ to 3/2+ is (M1+E2).
2296.0 10		L		
2302.7 4	(9/2+)	N	0.25 ps [@] +15-7	Jπ: γ to 7/2+ is (M1+E2).
2315.51 20	(5/2, 7/2)	L NO	130 fs [@] +35-24	XREF: L(2309).
2336.54 [#] 21	(15/2-)	N	>28 fs [@]	Jπ: L=3 in (α,α'); suggested 3/2-,5/2-,7/2- in (n,n'γ) (1994De56), but 5/2+,7/2+ in (n,n'γ) (2008Sc17) based on Δπ='no' γ's to π=+.
2345.86 15	(9/2+)	N	0.21 ps [@] +26-8	Jπ: γ to 11/2- is (E2) and γ to 9/2+ is (E3).
2353.7 19		L N		Jπ: γ to 11/2- is (E1) and γ to 5/2+ is (E2).
2362.97 18	(5/2-)	N	39 fs [@] +10-8	Jπ: suggested 1/2- in (n,n'γ) (1994De56).
2364.8? 8		N		Jπ: γ's to 3/2+ and 7/2+ are (E1).
2382.2 [#] 3	(9/2-)	C NO	0.24 ps [@] +28-9	Jπ: suggested as 7/2+ in (n,n'γ).
2399.28? 22		N		Jπ: γ to 9/2+ is (E1) and γ to 11/2- is (M1+E2).
2403.17 24	(9/2+)	N	0.49 ps [@] +85-20	Jπ: suggested 11/2+,13/2+ in (n,n'γ) (1994De56).
2419.9 3	(9/2+)	N	0.5 ps [@] +17-2	Jπ: γ to 5/2+ is (E2) and γ to 7/2+ is (M1+E2).
2453.3 3	(5/2-)	L N	18.7 fs [@] +35-28	Jπ: γ to 5/2+ is (E2) and γ to 11/2+ is (M1+E2).
2454.52 22	(15/2+)	N	>94 fs [@]	Jπ: γ's to 3/2+ and 5/2+ are (E1).
2461.85 21	(5/2+)	N	136 fs [@] +57-33	Jπ: γ to 11/2+ is (E2) and γ to 13/2+ is (M1+E2).
2473.2? 3	(1/2-)	N	>14 fs [@]	Jπ: γ's to 3/2+ and 7/2+ are (M1+E2).
2499.08? 22		N		Jπ: γ to 5/2- is (E2).
2499.77 25	(9/2+)	L N	102 fs [@] +28-19	Jπ: suggested 13/2+ in (n,n'γ) (1994De56).
2520.20 21	(3/2+)	L N	0.2 ps [@] +18-1	Jπ: γ to 7/2+ is (M1+E2).
2563.9 6	(7/2-)	L NO	55 fs [@] +10-8	Jπ: γ to 7/2+ is (E2) and γ to 5/2+ is (M1+E2).
2580.72 16	(11/2+)	N	>13 fs [@]	Jπ: γ to 7/2+ is (E1).
2583.0 6	(7/2-)	L NO	24 fs [@] +7-6	Jπ: γ to 7/2+ is (E2) and γ to 9/2+ is (M1+E2).
2586.1 10		L		Jπ: γ to 7/2+ is (E1).
2601.2 6	(5/2-, 7/2-)	L N	59 fs [@] +37-20	Jπ: γ's to 3/2+ and 7/2+ are (M1+E2).
2603.7 6	(5/2-, 7/2-)	N	28 fs [@] +12-9	Jπ: γ's to 7/2+ and 5/2+ are (E1).
2607.1 8	(1/2+)	N	0.12 ps [@] +11-5	E(level): Possible doublet with 2601.2 level.
2609 10	+	O		Jπ: γ's to 7/2+ and 5/2+ are (E1).
2611.7 5	(9/2+)	N	29 fs [@] +5-4	Jπ: γ to 5/2+ is (E2) and excitation function in (n,n'γ).
2623.3 4	(5/2+, 7/2+)	L N	72 fs [@] +19-14	Jπ: L=2 in (α,α').
2626.8? 4	(15/2-)	F O		Jπ: γ to 5/2+ is (E2) and excitation function in (n,n'γ).
2646.4 6	(9/2+)	L N	90 fs [@] +25-17	Jπ: γ's to 5/2+ and 7/2+ are (M1+E2).
2659.6 8	(11/2+)	N	>156 fs [@]	Jπ: from comparison with isotone ¹⁴³ Pm.
2669.07 [#] 22	(13/2-)	N	42 fs [@] +23-14	Jπ: γ to 5/2+ is (E2) and γ to 7/2+ is (M1+E2).
2683.06 24	(5/2, 7/2)+	N	0.22 ps [@] +22-8	Jπ: γ's to 7/2+ are (E2).
2692 10	-	L O		Jπ: γ to 7/2+ is (E3) and γ to 11/2+ is (E1).
2699? 5		L		Jπ: γ's to 3/2+ and 9/2+ are (M1+E2).
2707.9 [#] 4	15/2-	N	0.04 ps [@] +12-3	XREF: O(2984).
2710.1 3	(3/2+)	N	0.16 ps [@] +46-8	Jπ: L=3 in (α,α').
2718.5 [#] 4	(9/2, 11/2)	N	>159 fs [@]	Jπ: γ to 11/2- is (E2).
2722.4 4	(3/2+)	L N	44 fs [@] +16-11	Jπ: γ's to 3/2+ and 1/2+ are (M1+E2) and excitation function in (n,n'γ).
2731.4 3	(9/2+)	NO	55 fs [@] +23-15	Jπ: γ's to 9/2+ and 11/2-.
2739.7 4	(1/2-)	N	>87 fs [@]	Jπ: γ's to 1/2+ and 5/2+ are (M1+E2).
2749.62 17		O		Jπ: γ to 5/2+ is (E2) and γ to 11/2+ is (M1+E2).
2777.5 4	(9/2)	N	44 fs [@] +12-9	Jπ: γ to 5/2- is (E2).
				Jπ: γ to 7/2+ is D+Q and γ to 11/2+.

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Adopted Levels, Gammas (continued) ^{141}Pr Levels (continued)

E(level) [†]	$J\pi^{\ddagger\S}$	XREF	$T_{1/2}$	Comments
2782.4 6	(5/2+, 7/2+)	N	0.15 ps [@] +10-5	J π : γ 's to 5/2+ and 7/2+ are (M1+E2).
2782.7 3	(13/2+)	N	>51 fs [@]	J π : γ to 9/2+ is (E2) and γ to 11/2+ is (M1+E2).
2786		L		
2801.77 22	(9/2+)	N	0.12 ps [@] +16-5	J π : γ to 5/2+ is (E2) and γ to 7/2+ is (M1+E2).
2807.14 18	(3/2+, 5/2-)	L N	51 fs [@] +25-15	J π : γ 's to 5/2+ and 7/2+.
2810.71 22	(1/2+)	N	>76 fs [@]	J π : γ to 5/2+ is (E2) and γ to 3/2+ is (M1+E2).
2814.16 25	(1/2-)	N	24 fs [@] +26-14	J π : γ to 5/2- is (E2) and γ to 3/2+ is (E1).
2820 10		O		
2837.5 7	(5/2-, 7/2-)	L N	24 fs [@] +13-9	J π : γ 's to 5/2+ and 7/2+ are (E1).
2839.7 4	(9/2-)	N	56 fs [@] +48-23	J π : (5/2-, 7/2-, 9/2-) from (E1) γ to 7/2+; (3/2, 9/2, 11/2) from excitation function in (n,n' γ).
2844.7 4	(3/2-)	L NO	45 fs [@] +90-28	J π : γ to 5/2+ is (E1) and γ to 1/2+ is (E1). $T_{1/2}$: other: 0.01 eV (γ, γ').
2847.6 3	9/2+	N	>97 fs [@]	J π : γ to 5/2+ is (E2) and γ to 11/2+ is (M1+E2).
2863.5 6		N	0.06 ps [@] +150-4	
2876 10		O		
2881.6 4	(7/2+, 9/2+)	N	>55 fs [@]	J π : γ 's to 5/2+ and 11/2+ are (M1+E2).
2887.50 [#] 25	(9/2, 11/2+)	N	>24 fs [@]	J π : γ 's to 7/2+ and 11/2+.
2896.8 7	(11/2+)	N		J π : (5/2+, 7/2, 9/2, 11/2+) from γ 's to 7/2+ and 9/2+ and (11/2, 13/2) from excitation function in (n,n' γ).
2927.55 21	19/2-	F O		J π : γ to 17/2+ is $\Delta J=1$ E1, no γ to levels with $J<17/2$.
2929.3 5	(5/2+, 7/2+)	N	0.08 ps [@] +14-4	J π : γ 's to 5/2+ and 7/2+ are (M1+E2).
2941.4 6		NO		
2950.5 6	(1/2+)	L N		J π : (1/2+, 3/2, 5/2, 7/2+) from γ 's to 3/2+ and 5/2+ and (1/2) from excitation function in (n,n' γ).
2962.92 25	19/2+	F		J π : γ to 17/2+ is $\Delta J=1$ M1+E2, no γ to levels with $J<15/2$.
2983.5 4	(5/2-, 7/2-)	L N		J π : (3/2+, 5/2, 7/2, 9/2+) from γ 's to 5/2+ and 7/2+; (5/2-, 7/2-) more probable in (n,n' γ) (2008Sc17) based on excitation function and decay behavior.
2986 10	+	O		J π : L=2 in (α, α').
3000.76 23	(11/2+)	N		J π : (5/2+, 7/2, 9/2, 11/2+) from γ 's to 7/2+ and 9/2+; (11/2+) more probable in (n,n' γ) (2008Sc17) based on excitation function and decay behavior.
3016.3 5	(5/2-)	L N		J π : (3/2+, 5/2, 7/2+) from γ 's to 3/2+ and 7/2+; (5/2-) more probable in (n,n' γ) (2008Sc17) based on excitation function and decay behavior.
3017.2 3	21/2+	F		J π : γ to 17/2+ is $\Delta J=2$ E2, no γ to levels with $J<17/2$.
3019.25 23	(17/2)-	F	0.2 ns I	$T_{1/2}$: from ($\alpha, 2n\gamma$) (1981Pr09). J π : γ to 19/2- is $\Delta J=1$ M1, excitation function in ($\alpha, 2n\gamma$).
3034.4 6	(1/2+)	N		J π : (1/2+, 3/2, 5/2+) from γ 's to 1/2+ and 5/2+; (1/2+) more probable in (n,n' γ) (2008Sc17) based on excitation function and decay behavior.
3045.6 6	(11/2+, 9/2)	N		J π : (5/2+, 7/2, 9/2, 11/2+) from γ 's to 7/2+ and 9/2+; (11/2+, 9/2) more probable in (n,n' γ) (2008Sc17) based on excitation function and decay behavior.
3057.0 10		L		
3064.5 5	(9/2-)	N		J π : γ 's to 5/2- and 11/2+.

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Adopted Levels, Gammas (continued) ^{141}Pr Levels (continued)

E(level) [†]	$J\pi^{\ddagger\S}$	XREF	$T_{1/2}$	Comments
3075.5 9	(3/2+)	L N		$J\pi$: (3/2+,5/2,7/2,9/2+) from γ 's to 5/2+ and 7/2+; (3/2+) more probable in (n,n' γ) (2008Sc17) based on excitation function and decay behavior.
3080.2 5		N		
3083.4 14	(5/2)	L N	0.02 eV	$J\pi, T_{1/2}$: from (γ, γ').
3114.8 12		N		
3128.7 5		L NO		
3155.6 6		L N		
3203.3 7	(-)	E L O		$J\pi$: L($^3\text{He}, n$)=3.
3206.0 10		L		
3255.0 10		L		
3272.3 7		L		
3294.0 10		L		
3324.3 7		L		
3338.0 10		L		
3346.0 10		L		
3348.8 7	(7/2)	L O	0.05 eV	$J\pi, T_{1/2}$: from (γ, γ').
3370.0 10		L		
3376.0 10		L		
3397.0 3	21/2-	F		$J\pi$: γ to 19/2+ is $\Delta J=1$ E1, no γ to levels with $J<19/2$.
3417.3 7		L		
3427.3 7		L O		
3449.0 10		L		
3471.2 3	23/2-	F		$J\pi$: γ to 21/2+ is $\Delta J=1$ E1, no γ to levels with $J<21/2+$.
3494.8 7		L		
3508.0 10		L		
3526.8 3	(21/2-)	F		$J\pi$: γ to (17/2-) is $\Delta J=2$ E2, no γ to levels with $J<(17/2)$.
3581.0 10		L		
3585.8 4	23/2+	F	0.2 ns 1	$T_{1/2}$: from ($\alpha, 2n\gamma$) (1981Pr09). $J\pi$: γ to 21/2+ is $\Delta J=1$ M1, no γ to levels with $J<21/2$.
3590 20		O		
3643.1 10		L		
3643.5 5		F		
3659.1 10		L		
3706.1 10		L		
3761.1 10		L		
3773.1 10		L		
3791.1 10		L		
3812.1 10		L		
3829.1 10		L		
3879.3 7		L		
3913.1 10		L		
4370.7 4	-	F		
4740.9 4		F		
6116.9 4	7/2(+)	L	0.052 eV 10	$J\pi$: $\gamma(\theta)$ for γ 's to 5/2+ and 7/2+, γ to 3/2+ in (γ, γ'). $T_{1/2}$: Γ from 1979Mo19, 1972Wo21.
6878.6 4	7/2+	L	0.085 eV 10	$J\pi$: $\gamma(\theta)$ and polarization of 6877 γ M1 in (γ, γ') (1972Wo21). $T_{1/2}$: Γ from (1979Mo19).
7186.5 6	5/2	L		$J\pi$: $\gamma(\theta)$ in (γ, γ') (1971Pa01).
7255.8 5	5/2-	L	0.29 eV 3	$J\pi$: $\gamma(\theta)$ and polarization of 7256 γ E1 in (γ, γ') (1972Wo21).
7630.9 10	5/2+	L	0.090 eV +40-10	$T_{1/2}$: Γ from (1979Mo19, 1974Wo05). $T_{1/2}$: Γ from 1979Mo19. Other: 0.133 eV 23 (1969Mo11). $J\pi$: $\gamma(\theta)$ and polarization of 7632 γ M1 in (γ, γ') (1972Wo21).

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Adopted Levels, Gammas (continued) ^{141}Pr Levels (continued)

E(level) [†]	$J\pi^{\ddagger\S}$	XREF	$T_{1/2}$	Comments
7915.2 10	5/2+	L	0.007 eV 3	$J\pi$: $\gamma(\theta)$ and polarization of 7915 γ M1 in (γ,γ') (1972Wo21). $T_{1/2}$: Γ from (1974Wo05,1979Mo19).
8880.5 5	(5/2, 7/2)	L		$J\pi$: γ 's to 7/2+ and 3/2+.
9751	7/2-&	G	60 keV	$T_{1/2}$: resonance Γ from 1965Vo03.
10405	3/2-&	G	84 keV	$T_{1/2}$: resonance Γ from 1965Vo03.
10882	1/2-&	G	91 keV	$J\pi$: from polarization in (p,p) (1968Ve07), L=1 in (p,p'). $T_{1/2}$: resonance Γ from 1965Vo03.
11100?	(9/2-)&	G		
11251	(5/2-)&	G	77 keV	$T_{1/2}$: resonance Γ from 1965Vo03.
11493?	(5/2-)&	G	100 keV	$T_{1/2}$: resonance Γ from 1965Vo03.

[†] From least-squares fit to $E\gamma$ if connected by γ 's. χ^2 norm =1.95 greater than χ^2 critical=1.21.

[‡] Most $J\pi$ values were adopted from the (n,n' γ) dataset based on measured γ -ray multipolarities and $T_{1/2}$'s, and calculations.

[§] Monotonic increase of $J>9/2$ with increasing E for levels excited in ($\alpha,2n\gamma$) was supported by observation or non observation of crossover γ 's and excitation functions.

Possible member of $h_{11/2}\otimes 2+$ multiplet (n,n' γ).

@ From (n,n' γ) (2008Sc17, DSAM).

& L in (p,p), analogs to the lowest states in ^{141}Ce .

 $\gamma(^{141}\text{Pr})$

All γ data are from (n,n' γ), (p,2n γ), ($\alpha,2n\gamma$), and (γ,γ'), unless given otherwise.

E(level)	$E\gamma$	$I\gamma$	Mult.	α	Comments
145.4434	145.4433 14	100	M1+E2	0.449	δ : +0.069 7. $E\gamma, I\gamma, \text{Mult.}, \delta$: from β^- decay. B(M1)(W.u.)=0.00266 5; B(E2)(W.u.)=0.35 8.
1117.66	972.14 10	100.0 3	M2(+E3)		δ : +0.17 +9-8. B(M2)(W.u.)=0.242 18.
	1117.60 11	11.4 3	E3		δ : +0.17 +9-8 or >+6 (n,n' γ) (second value excluded by RUL). $I\gamma$: from (n,n' γ). Other: 10.5 12 ($\alpha,2n\gamma$) (1975Fr18). B(M2)(W.u.)=0.240 9; B(E3)(W.u.)=7 7.
1126.99	981.70 22	2.77 10	(E2)		$I\gamma$: from (n,n' γ). Other: 2.7 3 (ϵ decay (2.49 h)). B(E2)(W.u.)<2.0.
	1126.91 20	100.00 10	M1+E2		δ : +0.47 6. B(M1)(W.u.)<0.068; B(E2)(W.u.)<8.1. B(E2)(W.u.)=7.9 +21-18.
1292.79	1147.3 2	66.7 8	E2		
	1292.6 2	100.0 8	E2+M1		
1298.73	1298.44 22	100	E2		B(E2)(W.u.)=10 4.
1436.18	309.36 21	2.9 15	(E2+M1)	0.052 6	
	1290.67 24	100.0 15	(E2)		B(E2)(W.u.)=8.2 +23-21.
	1436.1 3	88.0 15	(E2+M1)		
1452.39	1306.63 21	100.0 5	M1+E2		δ : +0.90 +31-20 or -29 +7-6 (n,n' γ).
	1452.20 24	22.6 5	(M1+E2)		δ : -5 +2-6 or -0.48 +12-26 (n,n' γ).
1455.5	1455.5 3	100			
1457.43	339.15 24	1.23 14	(E1)		B(E1)(W.u.)=0.00022 5.
	1311.83 22	100.0 6	M1+E2		δ : -0.053 +22-26 or +8.9 +17-19 (n,n' γ).
	1457.42 23	35.0 6	(E2)		B(E2)(W.u.)=2.0 5.
1494.09	1348.7 2	100	E2		$E\gamma$: position of 1348 γ in adopted levels scheme contradicts Coul. ex. data. B(E2)(W.u.)=6 3. B(E1)(W.u.)=0.00046 5.
1520.91	402.87 23	2.05 11	(E1)		
	1375.56 25	11.7 3	(E2+M1)		
	1520.98 22	100.0 3	E2		B(E2)(W.u.)=9.3 +11-10.
1559.0	1559	100			
1580.09	287.06 22	3.06 14	(E1)	0.01455	B(E1)(W.u.)=0.00106 23.
	1434.54 25	100.0 7	E1		B(E1)(W.u.)=0.00028 6.
	1580.06 25	35.8 7	(E1)		B(E1)(W.u.)=7.4 $\times 10^{-5}$ 16.
1608.34	1608.20 23	100	(E2+M1)		
1650.86	532.6 2	12	[E1]		B(E1)(W.u.)=0.00125 18.

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_γ	I_γ	Mult.	α	Comments
1650.86	1506.1 3	8.58 22	(E2+M1)		δ : -0.23 6 or <-7.9 (n,n' γ).
	1651.39 23	100.00 22	(E2)		B(E2)(W.u.)=6.6 10.
1657.14	358.17 23	16.6 8			
	530.03 21	100.0 17	E2		B(E2)(W.u.)<230.
	1657.5 3	93.9 17	(E2)		B(E2)(W.u.)<0.72.
1767.67	273.6 2	26.4 12	M1+E2	0.0800	δ : +0.08 6.
					δ : -0.07 +8-7 (n,n' γ).
	310.0 5	4.4 12	(E2)	0.0456	B(M1)(W.u.)<0.57; B(E2)(W.u.)<71.
					E_γ : not seen in (n,n' γ).
	650.4 2	100 8	E1		B(E2)(W.u.)<480.
1786.52	494.6 3				B(E1)(W.u.)<0.0018.
	658.8 3	4.9 3	(E2+M1)		
	1640.9 3	46.7 11	(E2+M1)		
	1786.40 25	100.0 11	(E2+M1)		
1796.47	28.9 2	57 2	(M1)	7.30 19	B(M1)(W.u.)=0.090 11.
	302.6 4	100 3	E2	0.0492	B(E2)(W.u.)=0.89 10.
1812.39	359.74 22	15.3 7	(E2+M1)	0.034 5	δ : +0.11 13 or +3.5 +28-12 (n,n' γ).
	1667.13 24	100.0 13	(E2+M1)		δ : +0.25 4 or +2.3 +4-3 (n,n' γ).
	1812.7 3	52.8 12	(E2)		B(E2)(W.u.)=0.26 16.
1842.18	384.8 3	1.9 3	(E2+M1)	0.028 5	
	389.8 3	1.4 3	(E2+M1)	0.027 5	
	1696.6 3	54.6 11	(E2+M1)		δ : +0.52 +28-21 or -2.8 +1-4 (n,n' γ).
	1842.1 3	100.0 11	(E2+M1)		δ : -0.57 +16-23 or -4.6 +17-44 (n,n' γ).
1849.0	1849	100			
1853.77	332.66 22	1.1 11	(E2+M1)	0.042 6	
	396.51 25	6.3 4	(E2+M1)	0.026 5	δ : -0.31 +14-16 or -5 +2-11 (n,n' γ).
	1708.7 3	100.0 4	(E2)		B(E2)(W.u.)=0.8 7.
	1853.8 8	32 6			
1910.49?	1764.5 $\frac{7}{2}$ 2	72 $\frac{7}{2}$			
	1910.5 $\frac{7}{2}$ 2	100 $\frac{7}{2}$			
1913.1?	145.7				
	795.1				
1975.32	394.52 25	3.7 12	(E1)		B(E1)(W.u.)=0.00016 5.
	523.0 3	17 1	(E2)		B(E2)(W.u.)=59 20.
	848.6 3	65.9 17	(E2+M1)		
	1830.0 6	57.6 15	(E2)		B(E2)(W.u.)=0.38 13.
	1976.0 5	100 2	(E2+M1)		
1986.24	218.67 22	59 3	(E2+M1)	0.143 4	
	465.41 25	14.9 10	(E2)	0.01372	B(E2)(W.u.)<170.
	868.4 3	100.0 13	(E1)		B(E1)(W.u.)<0.00073.
2000.25	882.59 21	100	(E2+M1)		δ : +0.01 +62-4 or +10 +11-4 (n,n' γ).
2000.49	349.58 25	3.1 3	(E1)		B(E1)(W.u.)=0.00062 23.
	542.8 3	4.5 3	(E1)		B(E1)(W.u.)=0.00024 9.
	548.1 3	25.7 21	(E1)		B(E1)(W.u.)=0.0013 5.
	883.1 3				
	1855.2 6	100.0 3	(E1)		B(E1)(W.u.)=0.00013 5.
2004.17	545.7 3	3 3	(E2+M1)	0.0112 24	δ : -0.40 +19-21 or -4 +2-9 (n,n' γ).
	1858.2 7	100.0 3	(E2)		B(E2)(W.u.)=0.8 6.
2018.16	438.27 25	8.7 7	E1		B(E1)(W.u.)=0.00036 15.
	565.1 $\frac{7}{2}$ 2				
	719.5 3	15.9 11	(E2+M1)		
	725.2 3	5.1 9	(E2+M1)		
	1872.1 4	51.5 15	(E2)		B(E2)(W.u.)=0.40 17.
	2017.5 4	100.0 16	(E2+M1)		
2045.14	524.1 4				
	1900.01 22	100	E2+M1		δ : -0.49 +6-8 or -3.4 +6-8 (n,n' γ).
2069.13	272.7 1	100 2	M1+E2	0.075 7	δ : +0.10 8.
	301.4 1	2.8 2			
2075.54	425.19 22	7.1 10	(E2)	0.01770	B(E2)(W.u.)=120 40.
	495.27 22	11.8 10	(E1)		B(E1)(W.u.)=0.00042 +16-12.
	623.02 22	17.0 13	(E2+M1)		
	782.8 3	32.1 16	(E2+M1)		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_{γ}	I_{γ}	Mult.	α	Comments
2075.54	948.6 3	100.0 21	(E2+M1)		
	1929.7 4	56.4 18	(E2+M1)		
	2075.1 5	36.8 16	(E2+M1)		
2100.99	664.4 3	13.7 8	(E2+M1)		
	974.4 5	100.0 14	(E2+M1)		
	2102.0 6	13.5 13	(E2+M1)		
2105.04	525.3 3	8.2 10	(E2+M1)	0.012 3	
	652.7 3	24.9 10	(E1)		B(E1)(W.u.)=0.00128 19.
	1959.4 4	100.0 18	(E1)		B(E1)(W.u.)=0.00019 3.
	2104.9 5	67.5 18	(E1)		B(E1)(W.u.)=0.000104 15.
2105.5	987.8 3	100	(E2)		B(E2)(W.u.)=90 +100-70.
2108.44	122.3 3	18.4 20			
	311.9 4	100 4	(M1)	0.0567	B(M1)(W.u.)<15.
	340.9 5	42.9 20	(M1)	0.0449	B(M1)(W.u.)<5.1.
2126.11	272.28 22	68 9	(E2+M1)	0.075 7	
	604.9 3	41 5	(E2+M1)		
	631.8 3	43 4	(E2+M1)		
	669	92	(E2+M1)		I γ : this γ ray is not resolved by 2008Sc17 in (n,n' γ) due to a background line and the branching ratio relative to 632 γ was taken by the authors from 1994De56.
	1008.8 3	100 6	(E1)		B(E1)(W.u.)<0.00056.
	1981.4 5	32 4	(E2)		B(E2)(W.u.)<0.31.
2135.55	678.3 3	27.2 10	(E1)		B(E1)(W.u.)=0.00048 +17-14.
	682.9 4	5.0 10	(E1)		B(E1)(W.u.)=9. $\times 10^{-5}$ 3.
	1990.0 5	35.6 13	(E1)		B(E1)(W.u.)=2.5 $\times 10^{-5}$ 5.
	2135.5 5	100.0 17	(E1)		B(E1)(W.u.)=5.7 $\times 10^{-5}$ +20-16.
2154.6	855.2 $\frac{1}{2}$ 2				
	861.8 3				
2171.87	520.9 3	8.7 7	(E1)		B(E1)(W.u.)=0.00140 +24-21.
	2026.6 4	100.0 7	(E1)		B(E1)(W.u.)=0.00027 +5-4.
2188.18	736.0 3	61 3	(E2)		B(E2)(W.u.)=60 30.
	751.9 3	47.9 22	(E2+M1)		
	2042.5 5	100 3	(E2)		B(E2)(W.u.)=0.6 3.
	2188.0 6	33 3	(E2+M1)		
2190.43	897.6 2				
	2044.7 7	7 3	(E3)		
	2190.8 5	100 3	(M2)		
2205.96	352.7 3	3.5 7	(E2+M1)	0.036 6	
	752.7 5				
	2060.6 4	100.0 7	(E2)		B(E2)(W.u.)=2.0 4.
2228.88	386.95 25	8.9 18	(E2+M1)	0.028 5	
	649.0 3	100 36	(E1)		B(E1)(W.u.)=0.0006 +8-5.
	776.62 25	8.0 16	(E2+M1)		
	935.8 3	8.0 18	(E2+M1)		
	2082.8 5	52 3	(E2+M1)		δ : -0.37 +11-12 or -5 +2-5.
	2228.2 5	38.0 25	(E2+M1)		
2230.4	736.3 3	100			
2243.26	749.17 10	100	D+(Q)		
2247.8	1120.9 4	12.5 18	(E1)		B(E1)(W.u.)=0.00013 3.
	2247.6 5	100.0 18	(E1)		B(E1)(W.u.)=0.000133 3.
2254.0	2254.0 18	100			
2264.52	684.8 3	12.0 22	(E1)		B(E1)(W.u.)=0.00025 +16-9.
	812.4 4	10 3	(E2)		B(E2)(W.u.)=10 +6-4.
	828.1 3	18 4	(E2+M1)		
	965.9 4	17 3	(E2+M1)		
	2118.6 5	100 4	(E2)		B(E2)(W.u.)=0.8 +5-3.
	2264.0 5	49 3	(E2+M1)		
2267.25	291.65 25	6 5	(E2+M1)	0.061 7	
	975.0 3				
	2267.1 3	100 5	(E2)		B(E2)(W.u.)<1.1.
2270.1	2270	100			
2296.0	2296	100			
2302.7	1009.2 4				

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Adopted Levels, Gammas (continued)
 $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E γ	I γ	Mult.	α	Comments
2302.7	2158.3 5	100	(E2+M1)		δ : -0.16 +31-23 or <-7.9 (n,n' γ).
2315.51	1022.9 3	96 3	Q+D		Mult.: (E2+M1) (n,n' γ) (2008Sc17).
	2169.9 5	39.0 19	Q+D		Mult.: (E2+M1) (n,n' γ) (2008Sc17).
	2315.7 5	100 3			
2336.54	816.03 25	80 11	(E3)		
	1218.3 3	100 11	(E2)		B(E2)(W.u.)<96.
2345.86	559.0 3	51 4	[E2]		Mult.: (E2+M1) in (n,n' γ) 2008Sc17 but based on assigned spins it is rather $\Delta J=2$ γ .
					B(E2)(W.u.)=140 90.
	851.76 23	66 4	(E2+M1)		
	1052.6 3	90 5	(E2)		B(E2)(W.u.)=11 7.
	1229.8 3	37 7	(E1)		B(E1)(W.u.)=6. $\times 10^{-5}$ +4-3.
	2199.5 6	55 5	(E2+M1)		
	2345.1 6	100 6	(E2)		B(E2)(W.u.)=0.22 13.
2353.7	2353.7 19	100			
2362.97	754.64 24	16.4 14	(E1)		B(E1)(W.u.)=0.0013 3.
	1064.4 4	15 3	[E1]		B(E1)(W.u.)=0.00043 14.
	1235.7 3	100 3	(E1)		B(E1)(W.u.)=0.0019 5.
	2217.0 6	12.4 14	(E1)		B(E1)(W.u.)=4.0 $\times 10^{-5}$ 10.
	2362.5 6	39.6 19	(E1)		B(E1)(W.u.)=0.000105 +27-21.
2364.8?	1237.9 $\frac{1}{2}$				
	1246.7 $\frac{1}{2}$				
2382.2	861.3 3	100.0 17	(E1)		B(E1)(W.u.)=0.0012 7.
	1264.5 4	38.1 17	(E2+M1)		
2399.28?	1281.3 $\frac{1}{2}$ 2	100			
2403.17	945.8 3	43.2 19	(E2+M1)		
	2257.5 5	24.7 17	(E2+M1)		δ : -0.40 +22-41 or <-1.8 (n,n' γ).
	2403.2 5	100.0 24	(E2)		B(E2)(W.u.)=0.20 14.
2419.9	925.9 3	39 4	(E2+M1)		
	2274.2 6	100 8	(E2+M1)		δ : +0.4 +20-2 or +1.6 +8-13 (n,n' γ).
	2419.9 6	69 13	(E2)		B(E2)(W.u.)=0.10 8.
2453.3	1326.4 3	9 8	(E1)		B(E1)(W.u.)=0.0005 4.
	2452.7 6	100 8	(E1)		B(E1)(W.u.)=0.00083 14.
2454.52	449.91 22	64 5	(E2)	0.01508	
	687.32 23	100 5	(E2+M1)		δ : -0.26 +14-15.
					B(M1)(W.u.)<0.44; B(E2)(W.u.)<70.
2461.85	810.5 3	23.1 22	(E2)		B(E2)(W.u.)=37 12.
	1026.2 4	21.3 20	(E2+M1)		
	1335.0 4	24.7 20	(E2+M1)		
	2462.2 6	100 3	(E2+M1)		
2473.2?	368.16 21	100	(E2)	0.0270	
2499.08?	1381.1 $\frac{1}{2}$ 2	100			
2499.77	1046.5 4	19.6 14	(E2+M1)		δ : +0.22 +47-22 or +2.4 +29-13 (n,n' γ).
	2354.8 3	100.0 14	(E2+M1)		δ : +0.06 8 or +4.1 +16-11 (n,n' γ).
2520.20	501.5 3	62 9	(E2+M1)	0.014 3	
	1085.0 4	73 11	(E2+M1)		
	1227.3 4	77 10	(E2+M1)		
	2374.6 7	100 10	(E2)		B(E2)(W.u.)=0.22 +22-20.
	2520.7 9	76 10	(E2+M1)		
2563.9	2418.0 9	49 7	(E1)		B(E1)(W.u.)=0.000105 +18-16.
	2564.1 7	100 7	(E1)		B(E1)(W.u.)=0.00018 4.
2580.72	536.0 3	50 8	(E2+M1)	0.0118 25	
	726.7 3	33 8	(E2+M1)		
	1122.9 4	94 17	(E2+M1)		
	2435.30 25	100 19	(E2)		B(E2)(W.u.)<4.2.
2583.0	2437.2 8	50.4 6	(E1)		B(E1)(W.u.)=0.00024 +8-5.
	2583.3 7	100.0 6	(E1)		B(E1)(W.u.)=0.00040 +13-9.
2586.1	2586	100			
2601.2	2455.7 7	41 7	(E1)		B(E1)(W.u.)=8. $\times 10^{-5}$ 4.
	2601.3 8	100 7	(E1)		B(E1)(W.u.)=0.00017 +9-6.
2603.7	2458.7 7	25 3	(E1)		B(E1)(W.u.)=0.00012 +6-4.
	2603.1 8	100 3	(E1)		B(E1)(W.u.)=0.00040 +19-12.
2607.1	2607.1 8	100	(E2)		B(E2)(W.u.)=0.9 +6-4.

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_{γ}	I_{γ}	Mult.	Comments
2611.7	1318.6 5	14.3 17	(E2)	B(E2)(W.u.)=14 22.
	2612.4 7	100.0 17	(E2)	B(E2)(W.u.)=3.2 5.
2623.3	1330.3 5	39 6	(E2+M1)	
	2477.7 7	93 6	(E2+M1)	
	2623.8 8	100 7	(E2+M1)	
2626.8?	1509.1 4	100		
2646.4	2500.6 7	85 6	E2+M1	
	2646.9 8	100 6	E2	B(E2)(W.u.)=0.60 14.
2659.6	2514.1 8	100	(E2)	B(E2)(W.u.)<0.83.
2669.07	1175.2 3	20 3	(E1)	B(E1)(W.u.)=0.00048 +23-17.
	1216.4 4	34 5	(E3)	
	1551.3 4	100 5	(E2+M1)	δ : -0.18 8 or <-4.9 (n,n' γ).
2683.06	870.9 4	25 3	(E2+M1)	
	1246.1 5	13.7 24	(E2+M1)	
	1556.3 4	100 4	(E2+M1)	
	2537.5 11	10.0 22	(E2+M1)	
	2683.2 8	55 5	(E2+M1)	
2692	2692	100		
2707.9	1590.2 4	100	(E2)	B(E2)(W.u.)=32 +96-24.
2710.1	1411.3 3	82 16	(E2+M1)	
	1583.3 4	100 16	(E2+M1)	
2718.5	1197.5 4	100 5		
	1601.1 5	47 4		
2722.4	1271.6 5	30 20	(E2)	B(E2)(W.u.)=13 4.
	1422.4 6	20 20	(E2+M1)	
	2576.0 9	50 20	(E2)	B(E2)(W.u.)=0.7 4.
	2721.5 8	100 20	(E2+M1)	
2731.4	877.5 4	6 6	E2+M1	
	1278.7 5	44 20	E2+M1	
	2586.6 8	100 20	E2+M1	δ : -0.04 +16-14 or +7 +57-4 (n,n' γ).
	2732.1 8	50 20	E2	B(E2)(W.u.)=0.39 +15-11.
2739.7	1159.6 3	100	E2	B(E2)(W.u.)<71.
2749.62	963.1 1	100		
2777.5	923.8 4	20 3		
	2631.9 8	100 3	D+Q	δ : +0.06 +10-9 or +4.1 +29-12 (n,n' γ).
2782.4	2637.4 8	100 5	(E2+M1)	
	2781.8 9	52 5	(E2+M1)	
2782.7	576.93 25	49 22	(E2+M1)	
	1261.1 5	100 22	(E2)	B(E2)(W.u.)<54.
2786	2786	100		
2801.77	1151.2 5	100 8	(E2+M1)	
	2656.0 4	92 8	(E2+M1)	
	2801.8 3	78 8	(E2)	B(E2)(W.u.)=0.18 +13-10.
2807.14	491.4 3	17 17		
	2662.0 4	96 21		
	2807.13 22	100 21		
2810.71	1201.1 5	85 13	(E2+M1)	
	2810.95 23	100 13	(E2)	B(E2)(W.u.)<0.53.
2814.16	1233.1 4	85 13	(E2)	B(E2)(W.u.)=90 +120-50.
	1687.7 3	100 13	(E1)	B(E1)(W.u.)=0.0012 +16-6.
2837.5	2692.0 9	100 5	(E1)	B(E1)(W.u.)=0.00040 +24-14.
	2837.5 11	33 5	(E1)	B(E1)(W.u.)=0.00011 +7-4.
2839.7	2694.2 4	100	(E1)	B(E1)(W.u.)=0.00023 +16-10.
2844.7	1186.8 5	50 30	(E1)	B(E1)(W.u.)=0.0008 +13-5.
	1546.6 6	50 30	(E1)	B(E1)(W.u.)=0.0004 +6-3.
	2846.2 11	100 40	(E1)	B(E1)(W.u.)=0.00012 +20-8.
2847.6	1005.0 4	100 11	(E2+M1)	δ : +0.20 +43-23 or +2.5 +45-15 (n,n' γ).
	1354.0 5	50 8	(E2+M1)	
	1389.9 6	42 8	(E2+M1)	
	2702.8 12	33 6	(E2+M1)	
	2848.4 11	53 17	(E2)	B(E2)(W.u.)<0.14.
2863.5	1570.9 6	100 30		
	2716.8 15	49 30		

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_γ	I_γ	Mult.	α	Comments
2881.6	1028.0 5	92 42	(E2+M1)		
	1424.5 8	100 50	(E2+M1)		
	1428.5 6	81 19	(E2+M1)		
	2737.0 16	31 15	(E2+M1)		
	2882.3 11	81 15	(E2+M1)		
2887.50	1075.2 5	86 21			
	1367.0 4	100 21			
	1392.8 5	82 21			
	1769.6 6	61 36			
	2742.5 17	32 11			
2896.8	1439.0 8	41 14			
	2752.0 10	100 14			
2927.55	858.42 15	100	E1		
2929.3	1636.0 5	100 10	(E2+M1)		
	2785.2 11	85 10	(E2+M1)		
	2930.3 12	23 6	(E2+M1)		
2941.4	1484.2 10	66 41			
	1488.6 8	66 41			
	2796.4 14	81 25			
	2941.7 14	100 25			
2950.5	1514.4 6	100 22			
	2950.1 17	49 22			
2962.92	854.6 3	77 4	(E2)		
	893.7 3	100 4	M1+E2		
2983.5	2839.0 7	22 13			
	2983.0 5	100 13			
3000.76	956.0 4	60 22			
	1479.5 5	40 22			
	2855.2 3	100 18			
3016.3	941.0 5	97 24			
	1887.9 13	50 18			
	2871.0 19	38 15			
	3015.9 15	100 18			
3017.2	948.0 3	100	E2		
3019.25	91.7 1	100	M1	1.660	B(M1)(W.u.)=0.05 3.
3034.4	1734.9 7	100 33			
	1742.5 8	67 33			
3045.6	1524.6 7	100 19			
	2900.2 12	85 19			
3057.0	3057	100			
3064.5	960.5 6	84 55			
	1209.9 6	79 32			
	2918.4 12	100 21			
3075.5	1623.1 11	100 38			
	3075.4 15	92 38			
3080.2	1094.0 5	100 43			
	2934.1 17	89 43			
3083.4	2938	14			
	3083.4 14	100			
3114.8	2969.2 19	100 25			
	3114.8 15	49 25			
3128.7	764.6 5	53 33			
	1838.1 7	98 25			
	3128.7 16	100 25			
3155.6	1180.3 7	38 13			
	1497.7 14	18 13			
	1574.7 13	31 15			
	3011.2 12	43 9			
	3155 14	100 30			
3203.3	3058	16			
	3203	100 26			
3206.0	3206	100			
3255.0	3255	100			

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_γ	I_γ	Mult.	α	Comments
3272.3	3127	100			
	3272	43 7			
3294.0	3294	100			
3324.3	3179	100			
	3324	58 11			
3338.0	3338	100			
3346.0	3346	100			
3348.8	3203	100			
	3349	37 8			
3370.0	3370	100			
3376.0	3376	100			
3397.0	434.1 3	100	E1		
3417.3	3272	100			
	3417	35 7			
3427.3	3282	41			
	3427	100 23			
3449.0	3449	100			
3471.2	74.2 1	8.3 14			
	454.0 3	100.0 7	E1		
3494.8	3349	100			
	3495	85 22			
3508.0	3508	100			
3526.8	507.6 3	73 8	E2	0.01082	
	509.7 3	100 50			
3581.0	3581	100			
3585.8	568.6 3	100	M1	0.01224	B(M1)(W.u.)=0.0006 3.
3643.1	3643	100			
3643.5	116.7 3	100			
3659.1	3659	100			
3706.1	3706	100			
3761.1	3761	100			
3773.1	3773	100			
3791.1	3791	100			
3812.1	3812	100			
3829.1	3829	100			
3879.3	3734	82			
	3879	100 40			
3913.1	3913	100			
4370.7	843.9 3	27.3 18			
	899.6 3	100.0 36	E2		
4740.9	370.2 3	17.4 48			
	1269.6 3	100.0 96	(Q)		
6116.9	3490	4.5 6			
	3775	2.7 7			
	3806	2.5 5			
	4109	2.0 10			
	4511	2.4 8			
	4657	15.7 19			
	4822	2.4 8			
	5970	47.3 7			
	6115	100.0 9			
6878.6	5066				
	5094				
	5227				
	5299				
	5357				
	5422				
	6732				
	6877		M1		$\Gamma(\gamma_0)=0.017$ eV 9 (1972Wo21,1979Mo19).
7186.5	6066	4.3 22			
	7042	14.1 23			
	7188	100.0 32			
7255.8	5590 $\frac{1}{2}$	10.2 40			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_γ	I_γ	Mult.	Comments
7255.8	5659	6.6 40		
	5823	<8.7		
	6124	10.1 51		
	7111	64.9 57		
	7256	100.0 79	E1	$\Gamma(\gamma_0)=0.110$ eV 10 (1972Wo21).
7630.9	4841 4	3.1 4		
	4932 4			
	5043 4	1		
	5066 4	1		
	5108 4	3.1 4		
	5158 4			
	5284 4	3.1 4		
	5360 4	2		
	5397 4	16.7		
	5616 4	1		
	5785 4	5.2 6		
	5982 4			
	6050 4	3.1 4		
	6120 4			
	6181 4	18.8 2		
	6195 4	15.6 2		
	6339 4	1		
	6502 4	17.7 2		
	7487 4	15.6 2		
7915.2	7632 4	100 10	M1	$\Gamma(\gamma_0)=0.036$ eV 8 in (γ,γ') (1979Mo19,1972Wo21).
	7915	100	M1	$\Gamma(\gamma_0)=0.002$ eV 1 in (γ,γ') (1979Mo19,1972Wo21). B(M1)(W.u.)=0.0007 3.
8880.5	6937	24.2 63		
	7036	9.5 56		
	7228	18.0 57		
	7370	12.3 54		
	7588	4 3		
	8735	14.9 44		
	8883	100.0 75		

[†] $I_\gamma(1910\gamma)/I_\gamma(1765\gamma)=42/58$ (n,n' γ) (1994De56).[‡] Placement of transition in the level scheme is uncertain. **^{141}Ce β^- Decay 1979Ha09**Parent ^{141}Ce : E=0.0; $J\pi=7/2^-$; $T_{1/2}=32.511$ d 13; Q(g.s.)=580.4 11; % β^- decay=100.Measured: γ , K x ray, β^- , ce (1979Ha09,1975Le09,1972Sa34,1968Le03,1967Wh01,1967Is04,1967B103, 1965Wa13,1964Ha20).

2000Ke02: reanalyzed published Internal Bremsstrahlung data.

1994Mo48: Moss spectrum.

1994Fu16: ^{141}Ce as calibration source.The adopted half-life of ^{141}Ce , 32.508 d 13, is a weighted average of 32.50 d 20 (1950Fr58), 32.60 d 20 (1971Ba28), 32.51 d 6 (1971De11), 32.45 d 13 (1972Em01), 32.55 d 1 (1972La14), 32.51 d 6 (1973MeYE), 32.501 d 13 (1976Va30), 32.50 d 3 (1980RuZY), 32.51 d 10 (1983Wa26), and 32.510 d 24 (1992Un01). **^{141}Pr Levels**

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	5/2+		
145.440 3	7/2+	1.85 ns 3	$T_{1/2}$: from 1966B108. Others: 1.82 ns 4 (1972Ga39), 1.91 ns 6 (1968Ra02), 1.83 ns 4 (1967Ba27).

[†] Adopted values.

¹⁴¹Ce β⁻ Decay 1979Ha09 (continued)

β⁻ radiations

βγ(θ): 1970Wo07, 1965Ra08, 1961De27, 1960Ru03.
βγ(CP): 1972Sc02, 1971Va15, 1969Ra10, 1961De27.
β(long pol): (1972Po15).
Shape of β spectra: (1979Ha09,1971Bo19,1968Be06).
β matrix elements: 1992Ch09, 1977Na07, 1976Ba29, 1973Ci01.

Eβ ⁻	E(level)	Iβ ^{-†}	Log ft	Comments
436.7 46	145.440	69.7 4	6.970 5	Eβ ⁻ : from 1979Ha09. Others: 432 5 (1961De27), 440 9 (1958Jo22), 432 2 (1955Jo02), 444 2 (1952Ko27), 442 3 (1950Fr58). Iβ ⁻ : from Iγ(145γ)=69.7% 3 and α(145γ)=0.443 4. Other value: 70.2% 8 (1979Ha09).
582.2 26	0.0	30.3 4	7.755 7	Eβ ⁻ : from 1979Ha09. Others: 580 5 (1958Jo22), 574 3 (1955Jo02), 582 2 (1952Ko27), 581 3 (1950Fr58). Iβ ⁻ : 100% - Iβ(145 keV)=100% - 69.7% 4=30.3% 4 Other value: 28.8% 8 (1979Ha09).

† Absolute intensity per 100 decays.

γ(¹⁴¹Pr)

Double K-shell ionization with K internal conversion of 146γ (1985Na09).
Total K-shell ionization probability after β⁻ decay to 145 level=0.000179 11 (1986Na07), 0.000168 21 (1992BeZB).
For measured Iγ for 145γ and K x ray and L x ray see 1993BeZV, 1992Sc24, 1987Me17, 1985Me18.
The ratio I(K x ray)/Iγ(145γ)=0.346 5, deduced from gamma-ray and K-electron conversion data in this evaluation, agrees with 0.342 3, which is a weighted average of the following experimental values: 0.338 5 and 0.347 12 (1961Ne12); 0.342 9 (1972Ca07); 0.334 9 (1971Ca49); 0.349 5 (1979Ha09); 0.339 5 (1992Sc24). This agreement confirms the self consistency of the decay scheme.
Iγ normalization: weighted average of the following measured absolute emission probabilities of the 145-keV gamma ray: 48.44 41 (1975El09), 48.2 3 (1979Ha09), 48.5 4 (1980RuZY), and 48.0 5 (1992Sc24). Others: 48.9 4 (1980Sc07), 46.6 21 (1968Be06), 49.3 6 (1966El02), 45.4 23 (1964Cr03).

Eγ	E(level)	Iγ [‡]	Mult. [†]	δ	α	Comments
145.4433 14	145.440	100	M1+E2	+0.069 7	0.441 4	Eγ: from 2000He14. Others: 145.440 3 (1970Gr13), 145.444 20 (1979Bo26). Mult.: α(K)exp=0.376 8, α=0.438 10 (weighted average of 0.439 13, 0.436 17), K/L=7.29 24, K/L+=5.78 18 (1979Ha09), L1:L2:L3=1000:78.0 11:19.68 23 (1968Ge02); 1000:81 4:17.2 25 (1965Ge04). Others: α(K)exp=0.359 16 (1975Le09), 0.375 9 (1966Di02), 0.376 7 (1966Pa09); see also 1972Ca07, 1961Ne12, 1961Co04 α=0.452 8,0.435 7 (1992Sc24), 0.439 13, 0.436 17 (1979Ha09), 0.421 21 (1975Le09), 0.441 9 (1966Pa09), 0.440 11 (1966Di02). α: weighted average of 0.452 8, 0.435 7 (1992Sc24), 0.439 13, 0.436 17 (1979Ha09), 0.421 21 (1975Le09), 0.441 9 (1966Pa09), 0.440 11 (1966Di02). α(calculated)=0.449 7. δ: from 1979Ha21. Others: +0.068 8 (1962Sc11), +0.066 22 (1963Ha07). Penetration parameter=1.2 6 (1979Ha21). Other: 1973Ra41.

† α(K)exp from K x ray-co coin and K x ray/I(145γ) (1979Ha09).

‡ For absolute intensity per 100 decays, multiply by 0.484 3.

^{141}Ce β^- Decay 1979Ha09 (continued) **^{141}Nd ϵ Decay (2.49 h) 1973Bu21**

Parent ^{141}Nd : $E=0.0$; $J\pi=3/2+$; $T_{1/2}=2.49$ h 3; $Q(g.s.)=1823.0$ 28; $\% \epsilon + \% \beta^+$ decay=100.
 Measured: γ , $\gamma\gamma$, ce , β^+ (1973Bu21, 1974HeYW, 1969He10, 1968Da14, 1968Be28, 1963Al11).
 Except where noted otherwise, the presented data are from 1973Bu21.

 ^{141}Pr Levels

E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
0.0	5/2+	1298.60 21	1/2+	1580.2 2	5/2-
145.45 30	7/2+	1434.7 4	3/2+	1608.4 2	(3/2)+
1126.91 20	3/2+	1452?	(7/2)+	1657.0 4	1/2+
1292.6 2	(5/2)+	1456.1 2	+		

† Adopted values.

 β^+, ϵ Data

$I(K \text{ x ray})=11120$ 430, $I(\gamma^\pm)=628$ 24.
 $\epsilon(K)/\beta^+=31.5$ 32 was derived from $I(K \text{ x ray})/I(\gamma^\pm)$ (1973Bu21); Others: 30.4 23 (1972Ev01), 28 1 (1970Bi02), 22 8 (1968Be28), 32 3 (1966Gr05).
 $E(\beta^+)$ to g.s.=802 3 (1976GaZI). Others: 794 8 (1973Bu21), 790 20 (1963Bi19).

$E\epsilon$	E(level)	$I\beta^+^\dagger$	$I\epsilon^\dagger$	$\text{Log } ft$	$I(\epsilon+\beta^+)^\dagger$	Comments
(166 3)	1657.0		0.00095 25	7.98 12	0.00095 25	
(215 3)	1608.4		0.0184 25	6.97 6	0.0184 25	
(243 3)	1580.2		0.007 3	7.52 19	0.007 3	
(367 3)	1456.1		0.00120 25	8.69 9	0.00120 25	
(388 3)	1434.7		0.0154 17	7.64 5	0.0154 17	
(524 3)	1298.60		0.127 15	7.00 6	0.127 15	
(530 3)	1292.6		0.77 6	6.23 4	0.77 6	
(696 3)	1126.91		0.82 3	6.456 18	0.82 3	
1824 3	0.0	2.59 4	95.64 10	5.255 6	98.23 9	E ϵ : from 1976GaZI.

† Absolute intensity per 100 decays.

¹⁴¹Nd ε Decay (2.49 h) 1973Bu21 (continued)

 $\gamma(^{141}\text{Pr})$
 $\alpha(\text{K})_{\text{exp}}$ were normalized to $\alpha(\text{K})_{\text{exp}}(145\gamma)=0.376$ (¹⁴¹Ce β⁻ decay).

 $I\gamma$ normalization: $I(1127\gamma)=0.796\%$ 30 from $I(\text{K x ray})$, $I(\gamma^2)$ and $\epsilon/\beta^+(\text{g.s.})=38.3$ (theory).

$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$	Mult.	δ	α	Comments
145.45 30	145.45	30.0 30	M1+E2	+0.069 7	0.449	δ : from ¹⁴¹ Ce β ⁻ decay. Mult.: $\alpha(\text{K})_{\text{exp}}=0.376$ (¹⁴¹ Ce β ⁻ decay) used for normalization of $\alpha(\text{K})_{\text{exp}}$.
981.70 22	1126.91	2.73 29	(E2)		0.00221	
1126.91 20	1126.91	100	M1+E2	+0.47 6	0.00225 5	Mult.: $\alpha(\text{K})_{\text{exp}}=0.00167$ 33.
1147.30 20	1292.6	38.4 15	E2		1.60×10^{-3}	Mult.: $\alpha(\text{K})_{\text{exp}}=0.00114$ 24.
1289.58 30	1434.7	1.23 19				
1292.64 20	1292.6	57.5 52	E2+M1		0.00151 25	Mult.: $\alpha(\text{K})_{\text{exp}}=0.00086$ 19.
1298.60 21	1298.60	15.9 17	E2		1.26×10^{-3}	Mult.: $\alpha(\text{K})_{\text{exp}}=0.00081$ 24.
1306 [‡] 1	1452?	≤0.04				
1310.6 10	1456.1	≈0.05				
1434.6 5	1434.7	≈0.7	(E2+M1)		0.00125 18	
1435.1 22	1580.2	0.1 3	E1		6.31×10^{-4}	
1456.12 54	1456.1	0.10 3				
1580.17 22	1580.2	0.76 11	(E1)		6.69×10^{-4}	
1608.35 19	1608.4	2.3 3				
1657.04 40	1657.0	0.12 3				

[†] For absolute intensity per 100 decays, multiply by 0.0080 3.

[‡] Placement of transition in the level scheme is uncertain.

Decay Scheme

¹⁴¹Nd ε Decay (62.0 s) 1988Ch39,1970Ab05

Parent ¹⁴¹Nd: $E=756.51$ 5; $J\pi=11/2^-$; $T_{1/2}=62.0$ s 8; $Q(\text{g.s.})=1823.0$ 28; $\epsilon+\beta^+$ decay=0.025 25.

¹⁴¹Nd- $\epsilon+\beta^+$ decay: according to 1988Ch39 the sum of the three estimated branches from the ¹⁴¹Nd ε decay (62.0 s) is less than 0.05% (see β^+, ϵ Data table below).

Measured: γ (1988Ch39,1970Ab05).

1970Ab05: studied the branching of the 62.0 s, 11/2⁻, 757 keV isomer in ¹⁴¹Nd in between the ε and IT decays; observed both the 972γ following ¹⁴¹Nd ε decay (62.0 s) from the daughter level 11/2⁻, 1118 in ¹⁴¹Pr, and the 757γ from ¹⁴¹Nd IT decay (62.0 s) decay, and determined that $I(\gamma+\text{ce})(972\gamma)/I(\gamma+\text{ce})(757\gamma)=0.00032$ 8.

1988Ch39: Re-studied the isomer branching; did not observe the 972γ (which presumably was below their detection limit) but only determined the limit $I(\gamma+\text{ce})(972\gamma)/I(\gamma+\text{ce})(757\gamma)<0.00009$. Used the (α,2nγ) reaction to measure the branching of γ rays depopulated the 11/2⁻, 1118 level and used the γ-ray branchings from the (n,n'γ) reaction (1984Tr02) for the 9/2⁻, 2001 and 2383 levels to determine ε feeding limits for these three levels (the most likely to be populated by the ε decay of the isomer).

Continued on next page (footnotes at end of table)

^{141}Nd ϵ Decay (62.0 s) 1988Ch39,1970Ab05 (continued)

The level scheme is from 1988Ch39 and is incomplete showing only the levels and γ rays they included in the ϵ decay of the 62.0 s isomer. Because only very weak limits were established and the existence of this ϵ decay is questionable, no other known gammas in this part of the level scheme were added by evaluator (see the Adopted Levels, Gammas dataset for other possible transitions).

 ^{141}Pr Levels

E(level)	$J\pi^\dagger$	Comments
0.0	5/2+	
145.44	7/2+	
1117.60	11/2-	
1452.2	(7/2)+	
1521.0	9/2+	
2000.8	(9/2)-	
2382.8	(9/2)-	$J\pi$: 11/2- in 1988Ch39.

† Adopted values.

 β^+, ϵ Data

E_ϵ	E(level)	$I\beta^{+\ddagger}$	$I\epsilon^{\ddagger}$	Log $ft^\dagger$	
(197 § 3)	2382.8		<0.012	>4.9	† Estimated by 1988Ch39.
(579 § 3)	2000.8		<0.020	>5.7	‡ Absolute intensity per 100 decays.
(1462 § 3)	1117.60	<2.76 $\times 10^{-5}$	<0.01000	>6.9	§ Existence of this branch is questionable.

 $\gamma(^{141}\text{Pr})$

E(level)	$E_\gamma^\dagger$	$I_\gamma^{\ddagger\ddagger}$
145.44	145.44 §	
1117.60	972.14 $^\#$ 10	100 $^\#$ 5
	1117.60 $^\#$ 10	11 $^\#$ 1
2000.8	548.8 $^\@$	21 $^\@$
	883.1 $^\@$	51 $^\@$
	1855.4 $^\@$	100 $^\@$
2382.8	861.8 $^\@$	100 $^\@$
	1265.3 $^\@$	35 $^\@$

† Neither of the γ rays was observed in the ^{141}Nd ϵ decay (62.0 s); (the initial observance by 1970Ab05 of 972 γ was not confirmed by 1988Ch39).

‡ Relative photon branching from each level.

§ Observed by 1988Ch39 in the ^{141}Nd ϵ g.s. decay (2.49 h) and the $(\alpha, 2n\gamma)$ reaction.

$^\#$ Measured by 1988Ch39 in $(\alpha, 2n\gamma)$ reaction.

$^\@$ Quoted by 1988Ch39 from $(n, n'\gamma)$ reaction (1984Tr02).

Decay Scheme

^{145}Pm α Decay $^{1962}\text{Nu01}$

Parent ^{145}Pm : $E=0.0$; $J\pi=5/2+$; $T_{1/2}=17.7$ y 4; $Q(\text{g.s.})=2324.2$ 29; $\% \alpha$ decay= 2.8×10^{-5} .
 Measured: $E(\alpha)$, $I\alpha$.

 ^{141}Pr Levels

<u>E(level)</u>	<u>$J\pi^\dagger$</u>
0.0	5/2+

† Adopted values.

 α radiations

<u>$E\alpha$</u>	<u>E(level)</u>	<u>$I\alpha^\dagger$</u>
2240 40	0.0	100

† For α intensity per 100 decays, multiply by 2.8×10^{-7} .

 $^{139}\text{La}(^3\text{He},n)$ $^{1979}\text{A107}$

$E=25.4$ MeV.
 $J\pi(^{139}\text{La})=7/2+$.
 Measured: $\sigma(E,\theta)$, DWBA analysis.

 ^{141}Pr Levels

<u>E(level)</u>	<u>$J\pi^\dagger$</u>	<u>L</u>
150	7/2+	0
1490	11/2+	2
2280	(1/2+)	(2,3)
3200	(-)	3

† Adopted values.

 $^{139}\text{La}(\alpha,2n\gamma)$ $^{1981}\text{Pr09},^{1986}\text{En06}$

$E=27$ MeV (1981Pr09); 30 MeV (1988Ch39); 24 MeV (1977Na07).
 Measured: γ , $\gamma\gamma$, $\gamma(\theta)$, $\gamma(t)$, ce, linear polarization of γ (1981Pr09), γ , ce at $E(\alpha)=24$ MeV (1977Na07), γ (1988Ch39).
 $\alpha(K)\text{exp}$ were normalized to $\alpha(K)(M2)=6.85 \times 10^{-3}$ for 972 γ .
 All γ -ray data are from 1981Pr09, except where noted otherwise.

 ^{141}Pr Levels

<u>E(level)</u>	<u>$J\pi^\S$</u>	<u>$T_{1/2}^{\dagger\S}$</u>	<u>Comments</u>
0.0	5/2+	stable	
145.44 5	7/2+	1.85 ns $^\pm$ 3	
1117.7 3	11/2-	4.8 ns 1	$T_{1/2}$: measured by 1981Pr09. Others: 5.1 ns 3 (1975Fr18), 4.80 ns 25 (1973Ej02), 4.6 ns 1 (1984Go12).
1126.6 3	3/2+		
1291.6 3	(5/2)+		
1297.7 3	1/2+		
1434.6 3	3/2+		
1451.4	(7/2)+		
1455.5 3	+		
1457.7 4	9/2+		
1494.2 4	11/2+		
1520.7 3	9/2+		

Continued on next page (footnotes at end of table)

$^{139}\text{La}(\alpha, 2n\gamma)$ 1981Pr09, 1986En06 (continued) ^{141}Pr Levels (continued)

E(level)	J π [§]	T _{1/2} ^{†§}
1583.8	5/2-	
1609.8 3	(3/2)+	
1650.5 3	(9/2+)	
1767.9 5	13/2+	
1796.8 5	15/2+	1.0 ns 1
1851.4	(11/2+)	
1913.6?		
1986.5 5	(13/2+)	
2069.5 4	17/2+	
2108.8	15/2(+)	
2243.3		
2626.7? 5	(15/2-)	
2927.9 5	19/2-	
2963.3 6	19/2+	
3017.5 6	21/2+	
3019.6 6	(17/2-)	0.2 ns 1
3397.3 7	21/2-	
3471.5 7	23/2-	
3527.2 8	(21/2-)	
3586.0 8	23/2+	0.2 ns 1
3643.9 9		
4371.1 9	-	
4741.1 10		

[†] From 1981Pr09, except where noted otherwise.[‡] From adopted levels.[§] Adopted values. $\gamma(^{141}\text{Pr})$

E γ [†]	E(level)	I γ	Mult. [‡]	δ	α	Comments
28.9 2	1796.8	64 2	(M1)		7.50	Mult.: $\alpha(\text{L})\text{exp}=9$ 3.
74.2 1	3471.5	12 2				
91.7 1	3019.6	42 1	M1		1.689	Mult.: $A_2=-0.21$ 3, $A_4=-0.06$ 5, $\alpha(\text{K})\text{exp}=1.9$ 13. Coin with 454 γ .
^x 115.1 3		3 1				
116.7 3	3643.9	6 1				
122.3 3	2108.8	9 1				
145.44 5	145.44	1000	M1+E2	+0.06 3	0.456	Mult.: $A_2=-0.07$ 10, $A_4=-0.04$ 40. E γ : from 1988Ch39. Mult.: $A_2=-0.05$ 2, $A_4=+0.02$ 3, $p=-0.22$ 6, $\alpha(\text{K})\text{exp}=0.35$ 4, $\alpha(\text{L})\text{exp}=0.071$ 6.
145.7	1913.6?					
^x 170.7 3		3 1				Coin with 454 γ .
^x 178.4 3		12 1				Coin with 273 γ , $A_2=+0.06$ 16, $A_4=-0.22$ 26.
^x 207.0 3		2 1				Coin with 145 γ .
218.6 3	1986.5	22 1				Mult.: $A_2=+0.39$ 6, $A_4=+0.18$ 10, $\alpha(\text{K})\text{exp}=0.084$ 12.
^x 246.7 3		4 1				
^x 248.0		4 1				(246 γ +248 γ) coin with 175 γ , 273 γ .
272.7 1	2069.5	633 12	M1+E2	+0.10 8	0.0818 3	Mult.: $A_2=-0.05$ 6, $A_4=+0.23$ 10, for 272.7 γ +273.7 γ $\alpha(\text{K})\text{exp}=0.069$ 6, $\alpha(\text{L})\text{exp}=0.011$ 2.
273.7 3	1767.9	191 4	M1+E2	+0.08 6	0.081	Mult.: $A_2=-0.09$ 8, $A_4=-0.68$ 16, for 273.7 γ +272.7 γ $\alpha(\text{K})\text{exp}=0.069$ 6, $\alpha(\text{L})\text{exp}=0.011$ 2.
301.4 2	2069.5	18 1				
302.6 3	1796.8	111 3	E2		0.0494	Mult.: $A_2=+0.25$ 3, $A_4=-0.04$ 5, $p=+0.22$ 15, $\alpha(\text{K})\text{exp}=0.041$ 5, $\alpha(\text{L})\text{exp}=0.012$ 3.
310.3 3	1767.9	26 1	(E2)		0.0457	Mult.: $A_2=+0.52$ 23, $A_4=+0.39$ 30.
311.9	2108.8	49 2	(M1)		0.0575	Mult.: $A_2=+0.35$ 10, $A_4=+0.13$ 14, $p=+0.50$ 20.
^x 315.8 3		6 1				Coin with 273 γ , 454 γ , $A_2=-0.65$ 10, $A_4=-0.18$ 14.
340.9	2108.8	21 1	(M1)		0.0455	Mult.: $A_2=-0.10$ 6, $A_4=+0.06$ 7.
^x 364.4 3		6 1				Coin with 454 γ .
^x 368.8 3		8 1				Coin with 341 γ , $A_2=+0.30$ 20, $A_4=+0.21$ 38.
370.2 3	4741.1	4 1				
^x 418.3 3		15 1				Coin with 273 γ , 650 γ , 1349 γ .
434.1 3	3397.3	41 1	E1		0.00522	Mult.: $A_2=-0.15$ 4, $A_4=-0.08$ 6, $p=+0.37$ 25, $\alpha(\text{K})\text{exp}=0.0033$ 8.

Continued on next page (footnotes at end of table)

$^{139}\text{La}(\alpha, 2n\gamma)$ 1981Pr09, 1986En06 (continued) $\gamma(^{141}\text{Pr})$ (continued)

$E\gamma^{\dagger}$	E(level)	I_{γ}	Mult. ‡	δ	α	Comments
454.0 3	3471.5	145 1	E1		0.00470	Mult.: $A_2=-0.20$ 2, $A_4=-0.05$ 3, $p=+0.08$ 7, $\alpha(\text{K})\text{exp}=0.0028$ 5, $\alpha(\text{L})\text{exp}=9\times 10^{-4}$ 4.
507.6 3	3527.2	29 3	E2		0.01094	Mult.: $A_2=+0.18$ 20, $A_4=+0.03$ 40, $\alpha(\text{K})\text{exp}=0.0076$ 15, $\alpha(\text{L})\text{exp}=0.0013$ 6.
509.7 3	3527.2	40 20				
568.6 3	3586.0	52 1	M1		0.01251	Mult.: $A_2=-0.25$ 7, $A_4=-0.08$ 11, $p=-0.42$ 18, $\alpha(\text{K})\text{exp}=86\times 10^{-4}$ 12, $\alpha(\text{L})\text{exp}=19\times 10^{-4}$ 7.
x 617.9 3		16 1				Coin with 273 γ , 650 γ , $A_2=-0.23$ 8, $A_4=+0.20$ 15.
650.2 3	1767.9	766 15	E1		0.00212	Mult.: $A_2=-0.15$ 2, $A_4=-0.01$ 5, $p=+0.21$ 4, $\alpha(\text{K})\text{exp}=0.0016$ 2, $\alpha(\text{L})\text{exp}=2\times 10^{-4}$ 1.
x 669.3 3		31 1				Coin with 145 γ , 273 γ , 454 γ ; $A_2=-0.18$, $A_4=+0.04$ 14.
x 711.5 3		13 1				Coin with 569 γ .
749.1	2243.3	18 1				Mult.: $A_2=-0.26$ 12, $A_4=-0.007$ 27.
x 762.7 3		10 1				Coin with 273 γ .
795.1	1913.6?					
x 795.7 3		12 1				
843.9 3	4371.1	15 1				Mult.: $A_2=+0.24$ 12, $A_4=-0.23$ 18.
854.6 3	2963.3	43 2	(E2)		0.00303	Mult.: $A_2=+0.57$ 8, $A_4=-0.08$ 4, $\alpha(\text{K})\text{exp}=0.0023$ 4.
858.4 3	2927.9	209 4	E1		0.00120	Mult.: $A_2=-0.17$ 3, $A_4=-0.01$ 4, $p=+0.14$ 10, $\alpha(\text{K})\text{exp}=0.0010$ 5.
868.8 3	1986.5	37 2	(E1)			Mult.: $A_2=-0.25$ 9, $A_4=-0.09$ 16, $p=+0.51$ 50.
893.7 3	2963.3	56 2	M1+E2	-0.7 3	0.0037 3	Mult.: $A_2=-0.77$ 4, $A_4=+0.05$ 6, $\alpha(\text{K})\text{exp}=0.0041$ 7.
899.6 3	4371.1	55 2	E2		0.00270	Mult.: $A_2=+0.38$ 5, $A_4=-0.12$ 8, $\alpha(\text{K})\text{exp}=0.0022$ 8.
948.0 3	3017.5	305 6	E2		0.00241	Mult.: $A_2=+0.35$ 4, $A_4=-0.09$ 6, $p=+0.30$ 10, $\alpha(\text{K})\text{exp}=0.0020$ 2, $\alpha(\text{L})\text{exp}=3\times 10^{-4}$ 1.
972.14 10	1117.7	794 14	M2		0.00858	E γ : from 1988Ch39. Mult.: $A_2=+0.16$ 3, $A_4=0.00$ 5, $\alpha(\text{K})\text{exp}=6.85\times 10^{-3}$, $\alpha(\text{L})\text{exp}=0.0010$ 1, $p=-0.18$ 10.
x 1095.7 3		28 3				Coin with 145 γ , 273 γ , 650 γ ; $A_2=-0.12$ 8, $A_4=+0.37$ 13.
1117.60 10	1117.7	92 3	E3		0.00349	E γ : from 1988Ch39. Mult.: $A_2=+0.22$ 3, $A_4=-0.02$ 5, $\alpha(\text{K})\text{exp}=0.0032$ 8.
1126.6 3	1126.6	8 2				
1147.6 3	1291.6	5.4 6				E γ : observed only by 1977Na07.
1269.6 3	4741.1	23 2	(Q)			Mult.: $A_2=+0.60$ 24, $A_4=+0.03$ 33.
x 1277.7 3		9 1				Coin with 145 γ .
1288.7 3	1434.6	3 3				
1291.6 3	1291.6	15 4				
1297.7 3	1297.7	162 27				E γ : observed only in (d,n γ) at E(d)=13.5 MeV (1981Pr09).
1312.2 3	1457.7	59 2	M1+E2			Mult.: $A_2=-0.03$ 7, $A_4=+0.11$ 11.
1348.7 3	1494.2	433 8	E2		0.00116	Mult.: $A_2=+0.27$ 5, $A_4=-0.03$ 7, $p=+0.26$ 11, $\alpha(\text{K})\text{exp}=0.0008$ 2.
1434.6 3	1434.6	23 2				
x 1449.5 3						From 1977Na07.
1451.4	1451.4					E γ : observed only by 1977Na07.
1455.5 3	1455.5	<35				I γ : I(1455.5 γ +1457.7 γ)=33 2.
1457.7 3	1457.7	<35				I γ : I(1457.7 γ +1455.5 γ)=33 2.
1509.1 3	2626.7?	25 2				
1520.7 3	1520.7	45 2				Mult.: D+Q from $A_2=-0.13$ 10, $A_4=-0.24$ 15 contradicts Q from $A_2=+0.15$ 1, $A_4=-0.07$ 2 in (p,2n γ).
1583.8 3	1583.8	8 2				
1609.8 3	1609.8	18 2				
1650.5 3	1650.5	9 2				
1705.9	1851.4	5 1				

 † $\Delta E=0.1-0.3$ keV. ‡ From polarization and $\alpha(\text{K})\text{exp}$, $\alpha(\text{L})\text{exp}$. x γ ray not placed in level scheme.

$^{140}\text{Ce}(\text{p,p}),(\text{pol p,p})$ IAR 1971Ma55,1968Ve07

E=8.8–12.0 MeV (1971Ma55); 9.2–11.8 MeV (1968Ve07).

Analog resonances.

Measured: $\sigma(\theta)$.Resonances given below are analogs of ^{141}Ce levels at 0, 662, 1137, 1369, 1497, and 1739 keV with the same L and comparable S values as in $^{140}\text{Ce}(\text{d,p})$ from 1967Wi08. **^{141}Pr Levels**

E(level)	$J\pi^{\ddagger}$	$\Gamma^{\dagger}$	L	S
0.0	5/2+			
9751	7/2-	60 keV	3	0.86
10405	3/2-	84 keV	1	0.42
10882	1/2-	91 keV	1	0.28
11100?	(9/2-)		(5)	(0.6)
11251	(5/2)-	77 keV	3	0.27
11493?	(5/2-)	100 keV	(3)	(0.25)

 † Resonance Γ from 1965Vo03. ‡ Adopted values. **$^{140}\text{Ce}(\text{d,n})$ 1976AdZR,1975AdZQ**

E=12 MeV.

Measured: $\sigma(\text{E},\theta)$, DWBA analysis, tof. **^{141}Pr Levels**

E(level)	$J\pi^{\dagger}$	L	S	Comments
0.0	5/2+	2	0.47	
145 5	7/2+	4	0.28	
1110 9	11/2-	5	0.74	
1300 10	1/2+	0	0.35	
1600 15	(3/2)+	2	0.58	
1650 15	1/2+	0	0.14	

J π : adopted value is (9/2+).E(level),S: not resolved; the authors (1976AdZR) assumed that $\sigma(1600)/\sigma(1650)=4$. † Adopted values. **$^{140}\text{Ce}(^3\text{He,d})$ 1971Wi04**

E=40.3 MeV.

Others: 1971Jo16, 1970Is01.

Measured: $\sigma(\text{E},\theta)$, DWBA analysis. **^{141}Pr Levels**

E(level)	$J\pi^{\ddagger}$	L	$\text{C}^2\text{S}^{\dagger}$	Comments
0.0	5/2+	2	1.00	
145 5	7/2+	4	0.55	
1110 9	11/2-	5	1.31	
1300 10	1/2+	0	1.02	
1600 15	(3/2)+	2	1.92	
1650 15	1/2+	0	0.84	

J π : adopted value is (9/2+). † Relative. ‡ Adopted values.

$^{140}\text{Ce}(^7\text{Li}, ^6\text{He})$ 1980C108

E=52 MeV.

Measured: $\sigma(E, \theta)$, DWBA analysis. **^{141}Pr Levels**

E(level)	$J\pi^\dagger$	L	$C^2S^\ddagger$	Comments
0.0	5/2+	2	1.00 14	
145	7/2+	4	0.63 14	
1110	11/2-	5	1.36 21	
1300	1/2+	0	0.88 13	
≈ 1600				E(level): doublet with 1600, 3/2+ ($C^2S=0.82$ 13) and 1650, 1/2+ ($C^2S=1.24$ 19) components.

 † From J-dependence of $\sigma(\theta)$. ‡ Relative. **$^{140}\text{Ce}(^{16}\text{O}, ^{15}\text{N})$ 1973Na16, 1973BIZG**

E=62 MeV (1973Na16), 56,59 MeV (1973BIZG).

Measured: $\sigma(E)$. **^{141}Pr Levels**

E(level)	Comments
0.0	
1130	
≈ 1300	
≈ 1600	Composite line.

 $^{141}\text{Pr}(\gamma, \gamma')$ 2007Sc182007Sc18: E(end-point)=4.1 MeV Bremsstrahlung beam from the DYNAMITRON accelerator. Measured E_γ , I_γ using three HPGe detectors. One of the detectors was additionally surrounded by a BGO anti-Compton shield.E(γ)=6115 2 (1991BeZX).E(γ)=6111, 6115, 7188, 7256, 8883 (1971Pa01).E(γ)=7632 (1968Mo06, 1969Mo11).E(γ)=6877, 7256, 7632, 7915 (1972Wo21, 1974Wo05).E(γ)=2800-3600 (1993Vo05).Measured: γ' , $\gamma'(\theta)$ (1969Mo11, 1971Pa01, 1970Mo26, 1972Wo21) directional polarization (1972Wo21, 1970Mo26, 1969Mo11, 1968Mo06). **^{141}Pr Levels**Given in the comments are $g\Gamma_0$ values from 2007Sc18, where g is the statistical factor, and Γ_0 is the ground-state Γ (in eV).For $\Delta J=1$ the reduced transition strengths for both M1 and E1 are reported by 2007Sc18.

E(level)	$J\pi^\dagger$	$I_{s,0}$ (eV b) ‡	Comments
0.0	5/2+		
145.4	7/2+		
1118	11/2-		
1127	3/2+	4.0 6	B(M1) $\uparrow=0.083$ 13. $g\Gamma_0=1.37\times 10^{-3}$ 21.
1293	(5/2)+	2.1 4	B(M1) $\uparrow=0.060$ 7. $g\Gamma_0=1.49\times 10^{-3}$ 19.
1436	3/2+	1.4 5	B(M1) $\uparrow=0.051$ 7. $g\Gamma_0=1.76\times 10^{-3}$ 25.
1451	(7/2)+		$J\pi$: from $\gamma(\theta)$ for γ from 5/2+ resonance 7632.
1457.9 5	9/2+		
1513? 6			

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\gamma, \gamma')$ 2007Sc18 (continued) ^{141}Pr Levels (continued)

E(level)	$J\pi^\dagger$	$I_{s,0}$ (eV b) ‡	Comments
1521	9/2+	5.5 7	B(E2) $\uparrow$ =0.057 7. $g\Gamma_0$ =0.0037 4.
1559		1.0 3	B(E1) $\uparrow$ =0.16 $\times 10^{-5}$ 5; B(M1) $\uparrow$ =0.014 4. $g\Gamma_0$ =0.63 $\times 10^{-3}$ 20.
1579	5/2-	1.1 3	B(M1) $\uparrow$ =0.55 11. $g\Gamma_0$ =0.0023 5.
1597? 8			
1608	(3/2)+	32 4	B(M1) $\uparrow$ =0.44 5. $g\Gamma_0$ =21.3 $\times 10^{-3}$ 23.
1651	(9/2+)	4.6 6	B(E2) $\uparrow$ =0.040 4. $g\Gamma_0$ =0.0039 4.
1666?			
1786	(5/2+)	1.4 3	B(M1) $\uparrow$ =0.029 4; B(E1) $\uparrow$ =0.32 $\times 10^{-5}$ 4. $g\Gamma_0$ =1.88 $\times 10^{-3}$ 25.
1816		1.0 3	B(M1) $\uparrow$ =0.013 3; B(E1) $\uparrow$ =0.14 $\times 10^{-5}$ 4. $g\Gamma_0$ =0.89 $\times 10^{-3}$ 24.
1842	(7/2+)	0.9 3	B(M1) $\uparrow$ =0.018 4; B(E1) $\uparrow$ =0.20 $\times 10^{-5}$ 4. $g\Gamma_0$ =0.0013 3.
1849		1.3 3	B(M1) $\uparrow$ =0.015 4; B(E1) $\uparrow$ =0.17 $\times 10^{-5}$ 4. $g\Gamma_0$ =0.0011 3.
1946 6			
1981	(3/2+)	0.83 23	B(M1) $\uparrow$ =0.009 3; B(E1) $\uparrow$ =0.10 $\times 10^{-5}$ 3. $g\Gamma_0$ =0.84 $\times 10^{-3}$ 23.
2006 2			
2016			
2106	(5/2-)	1.0 3	B(E1) $\uparrow$ =0.38 $\times 10^{-5}$ 5. $g\Gamma_0$ =0.0037 5.
2135	(7/2-)	0.88 23	B(M1) $\uparrow$ =0.016 2; B(E1) $\uparrow$ =0.18 $\times 10^{-5}$ 3. $g\Gamma_0$ =0.0018 3.
2235	3/2		$J\pi$: $\gamma(\theta)$ for γ from 5/2+ resonance 7632.
2248	(5/2-)	1.7 3	B(M1) $\uparrow$ =0.017 3; B(E1) $\uparrow$ =0.19 $\times 10^{-5}$ 3. $g\Gamma_0$ =0.0023 4.
2270		1.3 3	B(M1) $\uparrow$ =0.013 3; B(E1) $\uparrow$ =0.14 $\times 10^{-5}$ 3. $g\Gamma_0$ =0.0017 4.
2296		0.67 19	B(M1) $\uparrow$ =0.007 2; B(E1) $\uparrow$ =0.07 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0009 3.
2309.3 6	(5/2, 7/2)		
2354 1	(9/2+)	0.83 20	B(M1) $\uparrow$ =0.008 2; B(E1) $\uparrow$ =0.09 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0012 3.
2453	(5/2-)	17.7 22	B(M1) $\uparrow$ =0.163 20; B(E1) $\uparrow$ =1.80 $\times 10^{-5}$ 22. $g\Gamma_0$ =0.028 3.
2480?			
2524	(3/2+)		
2564	(7/2-)	2.6 4	B(M1) $\uparrow$ =0.035 4; B(E1) $\uparrow$ =0.39 $\times 10^{-5}$ 4. $g\Gamma_0$ =0.0069 8.
2582		1.8 3	B(M1) $\uparrow$ =0.025 3; B(E1) $\uparrow$ =0.27 $\times 10^{-5}$ 4. $g\Gamma_0$ =0.0049 6.
2586	(7/2-)	0.84 21	B(M1) $\uparrow$ =0.007 2; B(E1) $\uparrow$ =0.08 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0015 4.
2602	(5/2-, 7/2-)	8.1 10	B(M1) $\uparrow$ =0.085 9; B(E1) $\uparrow$ =0.94 $\times 10^{-5}$ 10. $g\Gamma_0$ =17.3 $\times 10^{-3}$ 19.
2625 2	(5/2+, 7/2+)		
2646		0.68 16	B(M1) $\uparrow$ =0.013 2; B(E1) $\uparrow$ =0.14 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0027 5.
2692 §	-	1.27 22	B(E1) $\uparrow$ =0.12 $\times 10^{-5}$ 2; B(M1) $\uparrow$ =0.011 2. $g\Gamma_0$ =0.0024 4.
2700?			
2722	(3/2+)	0.68 17	B(M1) $\uparrow$ =0.006 1; B(E1) $\uparrow$ =0.06 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0013 eV 3.
2786		0.87 25	B(M1) $\uparrow$ =0.007 2; B(E1) $\uparrow$ =0.08 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0018 eV 5.
2805		0.85 19	B(M1) $\uparrow$ =0.007 2; B(E1) $\uparrow$ =0.08 $\times 10^{-5}$ 2. $g\Gamma_0$ =0.0017 4.

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$^{141}\text{Pr}(\gamma, \gamma)$ 2007Sc18 (continued) ^{141}Pr Levels (continued)

E(level)	$J\pi^\dagger$	Total Γ	$I_{s,0}$ (eV b) ‡	Comments
2837\$	(5/2-, 7/2-)		2.3 3	B(M1) $\uparrow$ =0.030 3; B(E1) $\uparrow$ =0.33 $\times 10^{-5}$ 4. g Γ_0 =0.0078 9.
2846#	(3/2-)@	0.01 eV	1.15 19	B(M1) $\uparrow$ =0.009 2; B(E1) $\uparrow$ =0.10 $\times 10^{-5}$ 2. g Γ_0 =0.0024 4.
2954			0.70 23	B(M1) $\uparrow$ =0.005 2; B(E1) $\uparrow$ =0.06 $\times 10^{-5}$ 2. g Γ_0 =0.0016 5.
2982\$	(5/2-, 7/2-)		7.9 23	B(E1) $\uparrow$ =0.87 $\times 10^{-5}$ 19; B(M1) $\uparrow$ =0.079 17. g Γ_0 =0.0024 eV 5.
3016	(5/2-)		0.93 18	B(M1) $\uparrow$ =0.007 1; B(E1) $\uparrow$ =0.08 $\times 10^{-5}$ 2. g Γ_0 =0.0022 4.
3057\$			1.13 26	B(E1) $\uparrow$ =0.09 $\times 10^{-5}$ 2; B(M1) $\uparrow$ =0.008 2. g Γ_0 =0.0028 6.
3073	(3/2+)		0.84 17	B(M1) $\uparrow$ =0.006 1; B(E1) $\uparrow$ =0.07 $\times 10^{-5}$ 1. g Γ_0 =0.0021 4.
3083#	(5/2)@	0.02 eV	4.5 6	B(M1) $\uparrow$ =0.037 4; B(E1) $\uparrow$ =0.41 $\times 10^{-5}$ 5. g Γ_0 =12.5 $\times 10^{-3}$ 15.
3127\$			8.8 11	B(M1) $\uparrow$ =0.129 20; B(E1) $\uparrow$ =1.42 $\times 10^{-5}$ 23. g Γ_0 =0.046 7.
3155		0.0069 eV 9	1.9 3	B(M1) $\uparrow$ =0.019 2; B(E1) $\uparrow$ =0.21 $\times 10^{-5}$ 3. g Γ_0 =0.0069 9.
3203\$	(-)		5.3 7	B(M1) $\uparrow$ =0.043 5; B(E1) $\uparrow$ =0.48 $\times 10^{-5}$ 6. g Γ_0 =16.4 $\times 10^{-3}$ 20.
3206			2.0 4	B(M1) $\uparrow$ =0.014 3; B(E1) $\uparrow$ =0.15 $\times 10^{-5}$ 3. g Γ_0 =5.3 $\times 10^{-3}$ 11.
3255			0.89 18	B(M1) $\uparrow$ =0.006 1; B(E1) $\uparrow$ =0.07 $\times 10^{-5}$ 1. g Γ_0 =0.0025 5.
3272\$			4.5 6	B(E1) $\uparrow$ =1.12 $\times 10^{-5}$ 10; B(E1) $\uparrow$ =0.101 9. g Γ_0 =0.041 4.
3294			1.8 3	B(M1) $\uparrow$ =0.012 2; B(E1) $\uparrow$ =0.13 $\times 10^{-5}$ 2. g Γ_0 =0.0050 8.
3324			4.1 5	B(M1) $\uparrow$ =0.075 7; B(E1) $\uparrow$ =0.83 $\times 10^{-5}$ 8. g Γ_0 =0.032 3.
3338			0.87 18	B(M1) $\uparrow$ =0.006 1; B(E1) $\uparrow$ =0.07 $\times 10^{-5}$ 1. g Γ_0 =0.0025 5.
3346			1.8 5	B(M1) $\uparrow$ =0.012 3; B(E1) $\uparrow$ =0.14 $\times 10^{-5}$ 3. g Γ_0 =5.4 $\times 10^{-3}$ 13.
3349\$#	(7/2)@	0.05 eV	2.4 4	B(E1) $\uparrow$ =0.64 $\times 10^{-5}$ 7; B(M1) $\uparrow$ =0.058 6. g Γ_0 =0.025 3.
3370			10.4 13	B(M1) $\uparrow$ =0.069 8; B(E1) $\uparrow$ =0.77 $\times 10^{-5}$ 9. g Γ_0 =0.031 4.
3376			14.7 18	B(M1) $\uparrow$ =0.098 12; B(E1) $\uparrow$ =1.08 $\times 10^{-5}$ 13. g Γ_0 =0.044 5.
3417\$			1.9 3	B(M1) $\uparrow$ =0.048 5; B(E1) $\uparrow$ =0.53 $\times 10^{-5}$ 5. g Γ_0 =22.0 $\times 10^{-3}$ 3. g Γ_0 =6.6 $\times 10^{-3}$ 17 for alternative assignment. $I_{s,0}$ (eV b): 2.2 6 for alternative assignment.
3427			3.3 5	B(M1) $\uparrow$ =0.030 3; B(E1) $\uparrow$ =0.33 $\times 10^{-5}$ 4. g Γ_0 =14.0 $\times 10^{-3}$ ev16.
3449			0.79 20	B(M1) $\uparrow$ =0.005 1; B(E1) $\uparrow$ =0.06 $\times 10^{-5}$ 1. g Γ_0 =0.0024 6.
3495\$			2.3 3	B(M1) $\uparrow$ =0.032 4; B(E1) $\uparrow$ =0.35 $\times 10^{-5}$ 5. g Γ_0 =15.8 $\times 10^{-3}$ 22. $I_{s,0}$ (eV b): 2.0 6 for alternative assignments. Total Γ : 0.0064 eV 18 for alternative assignment.
3508			1.33 24	B(M1) $\uparrow$ =0.009 2; B(E1) $\uparrow$ =0.09 $\times 10^{-5}$ 2. g Γ_0 =0.0043 8.
3581			1.8 3	B(M1) $\uparrow$ =0.011 2; B(E1) $\uparrow$ =0.12 $\times 10^{-5}$ 2. g Γ_0 =0.0059 10.
3643			2.3 3	B(M1) $\uparrow$ =0.014 2; B(E1) $\uparrow$ =0.15 $\times 10^{-5}$ 2. g Γ_0 =7.8 $\times 10^{-3}$ 12.
3659			0.84 22	B(M1) $\uparrow$ =0.005 1; B(E1) $\uparrow$ =0.06 $\times 10^{-5}$ 1. g Γ_0 =0.0029 8.

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$^{141}\text{Pr}(\gamma, \gamma')$ 2007Sc18 (continued) ^{141}Pr Levels (continued)

E(level)	$J\pi^\dagger$	Total Γ	$I_{s,0}$ (eV b) ‡	Comments
3706			1.9 3	$B(M1)\uparrow=0.012$ 2; $B(E1)\uparrow=0.13\times 10^{-5}$ 2. $g\Gamma_0=6.8\times 10^{-3}$ 12.
3761			0.73 25	$B(M1)\uparrow=0.004$ 1; $B(E1)\uparrow=0.05\times 10^{-5}$ 2. $g\Gamma_0=0.0027$ 9.
3773			1.0 3	$B(M1)\uparrow=0.006$ 2; $B(E1)\uparrow=0.07\times 10^{-5}$ 2. $g\Gamma_0=3.7\times 10^{-3}$ 10.
3791			1.5 3	$B(M1)\uparrow=0.009$ 2; $B(E1)\uparrow=0.10\times 10^{-5}$ 2. $g\Gamma_0=5.6\times 10^{-3}$ 13.
3812			2.1 4	$B(M1)\uparrow=0.012$ 2; $B(E1)\uparrow=0.14\times 10^{-5}$ 3. $g\Gamma_0=7.9\times 10^{-3}$ 15.
3829			1.7 4	$B(M1)\uparrow=0.010$ 2; $B(E1)\uparrow=0.11\times 10^{-5}$ 2. $g\Gamma_0=6.4\times 10^{-3}$ 14.
3879			1.8 4	$B(M1)\uparrow=0.019$ 4; $B(E1)\uparrow=0.21\times 10^{-5}$ 4. $g\Gamma_0=12.9\times 10^{-3}$ 25.
3913			1.7 5	$B(M1)\uparrow=0.010$ 3; $B(E1)\uparrow=0.11\times 10^{-5}$ 3. $g\Gamma_0=6.8\times 10^{-3}$ 21.
6115	7/2(+)	0.052 eV 10		$J\pi$: $\gamma(\theta)$ for γ 's to 5/2+ and 7/2+, γ to 3/2+. $\Gamma_{\gamma 0}/\Gamma_\gamma=0.47$ 10 (1991BeZX), $\Gamma_{\gamma 0}=0.030$ eV 10 (1991BeZX).
6877	7/2+@			$\Gamma(\gamma_0)=0.085$ eV 35 (1979Mo19).
7188	5/2			$J\pi$: $\gamma(\theta)$ for γ 's to 5/2+, 3/2+, 7/2+.
7256	5/2-@	0.29 eV 3		Γ from (1972Wo21, 1979Mo19).
7632	5/2+@	0.090 eV +40-10		$J\pi$: $\gamma(\theta)$ for γ 's to 5/2+ g.s. and 7/2+, γ to 5/2+ is E1. Total Γ : Γ from 1979Mo19. Other: 0.133 eV 23 (1969Mo11).
7915	5/2+@	0.007 eV 3		Γ from 1979Mo19.
8883	(5/2, 7/2)			

 † Adopted values. ‡ Integrated scattering cross section. § According to 2007Sc18 alternative assignment possible for γ transition(s) connected with the level. $^\#$ Weighted mean energy for the dipole excitation $E=3.277$ MeV, $\Gamma(0)=240$ meV +210-150. Configuration=(2+@3-@d5/2) (1993Vo05).@ From $\gamma(\theta)$ and directional polarization. $\gamma(^{141}\text{Pr})$

E(level)	E_γ	$I_\gamma^\dagger$
1127	982	3
	1127	97@ 15
1293	1148	40
	1293	60@ 7
1436	1291	56
	1436	44@ 6
1521	403	2@
	1376	10@
	1521	88@ 10
1559	1559	100
1579	1434	70
	1579	30 12
1608	1608	100
1651	533	10@
	1506	7@
	1651	83@ 9
1786	1641	37
	1786	63@ 8
1816	1816	100
1842	1697	39
	1842	61@ 12
1849	1849	100
1981	1981	100
2106	1961	68
	2106	32@ 10
2135	1990	42

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\gamma, \gamma)$ 2007Sc18 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	E_γ	$I_\gamma^\dagger$	Comments
2135	2135	58@ 9	
2248	2248	100	
2270	2270	100	
2296	2296	100	
2354	2354	100	
2453	2453	100	
2564	2419	36	
	2564	64 15	
2582	2437	36	
	2582	64 17	
2586	2586	100	
2602	2457	18	
	2602	82 18	
2646	2501	55	
	2646	45 16	
2692	2692&	100	
2722	2722	100	
2786	2786	100	
2805	2805	100	
2837	2692&	39	
	2837	61 13	I γ : other: 100 for alternate placements of γ rays.
2846	2846	100	
2954	2954	100	
2982	2837§	25	
	2982&	75 24	
3016	3016	100	
3057	3057&	100	
3073	3073	100	
3083	2938	12	
	3083	88 32	
3127	2982& 2	51	
	3127&	49 15	I γ : other 100 for alternate placements of γ -rays.
3155	3010	30	
	3155	70 21	
3203	3058&	14	
	3203§&	86 22	I γ : other: 100 for alternate placements of γ rays.
3206	3206	100	
3255	3255	100	
3272	3127&	70	
	3272§&	30 5	I γ : other: 100 for alternate placements of γ rays.
3294	3294	100	
3324	3179	63	
	3324	37 7	
3338	3338	100	
3346	3346	100	
3349	3203&	73	
	3349§&	27 6	I γ : 100 for alternate placements of γ rays.
3370	3370	100	
3376	3376	100	
3417	3272&	74	
	3417§	26 5	B(E1)=0.53 $\times 10^{-5}$ 5, B(M1)=0.048 5 or B(E1)=0.16 $\times 10^{-5}$ 4, B(M1)=0.014 4, depending on alternative placements of γ rays. I γ : other: 100 for alternate placements of γ -rays.
3427	3282	29	
	3427	71 16	
3449	3449	100	
3495	3349&	54	
	3495§	46 12	B(E1)=0.35 $\times 10^{-5}$ 5, B(M1)=0.032 4 or B(E1)=0.14 $\times 10^{-5}$ 4; B(M1)=0.013 4, depending on alternative placements of γ rays. I γ : other: 100 for alternate placements of γ -rays.
3508	3508	100	
3581	3581	100	
3643	3643	100	

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\gamma, \gamma') \quad 2007\text{Sc18 (continued)}$ $\gamma(^{141}\text{Pr}) \text{ (continued)}$

E(level)	E_γ	$I_\gamma^\dagger$	Mult. ‡	Comments
3659	3659	100		
3706	3706	100		
3761	3761	100		
3773	3773	100		
3791	3791	100		
3812	3812	100		
3829	3829	100		
3879	3734	45		
	3879	55 22		
3913	3913	100		
6115	3490	4.5 6		
	3775	2.7 7		
	3806	2.5 5		
	4109	2.0 10		
	4201 [#]	3 [#]		
	4447 [#]	8 [#]		
	4511	2.4 8		I_γ : 11 (1991BeZX).
	4537 [#]	2 [#]		
	4623 [#]	6 [#]		
	4657	15.7 19		
	4822	2.4 7		I_γ : 11 (1991BeZX).
	5970	47.3 7		
	6115	100.0 9		
6877	5066			
	5094			
	5227			
	5299			
	5357			
	5422			
	6732			
	6877		M1	$\Gamma(\gamma_0)=0.017 \text{ eV } 9 \text{ (1972Wo21,1979Mo19).}$
7188	6066	4.3 22		
	7042	14.1 23		
	7188	100.0 32		
7256	5590	10.2 40		
	5659	6.6 40		
	5823	<8.7		
	6124	10.1 51		
	7111	64.9 57		
	7256	100.0 79	E1	$\Gamma(\gamma_0)=0.11 \text{ eV } 1 \text{ (1972Wo21,1979Mo19).}$
7632	4841 4	1.5 2		
	4932 ^a 4			
	5043 4	0.5		
	5066 4	0.5		
	5108 4	1.5 2		
	5158 ^a 4			
	5284 4	1.5 2		
	5360 4	1		
	5397 4	8		
	5616 4	0.5		
	5785 4	2.5 3		
	5982 ^a 4			
	6050 4	1.5 2		
	6120 ^a 4			
	6181 4	9 1		
	6195 4	7.5 1		
	6339 4	0.5		
	6502 4	8.5 1		
	7487 4	7.5 1		
	7632 4	48 5	M1	$\Gamma(\gamma_0)=0.036 \text{ eV } 8 \text{ (1979Mo19).}$
7915	7915	100	M1	$\Gamma(\gamma_0)=0.002 \text{ eV } 1 \text{ (1979Mo19).}$
8883	6937	24.2 63		
	7036	9.5 56		

Continued on next page (footnotes at end of table)

¹⁴¹Pr(γ,γ') 2007Sc18 (continued)

$\gamma(^{141}\text{Pr})$ (continued)

E(level)	E γ	I $\gamma^\dagger$
8883	7228	18.0 57
	7370	12.3 54
	7588	4 3
	8735	14.9 44
	8883	100.0 75

† Relative photon branching from each level. The evaluator assumes transitions to mainly the ground state and the first excited state at 145.4 keV, when branching ratios are deduced from Γ_0/Γ values in 2007Sc18.

‡ From $\gamma(0)$ and directional polarization.

§ According to 2007Sc18 alternative assignment is possible.

$^\#$ From 1991BeZX.

$^\@$ 2007Sc18 state that Γ_0/Γ is from 2001Tu02, same data as in Adopted Levels, Gammas for ¹⁴¹Pr in ENSDF database, but the evaluator notes that some values and uncertainties are different.

$^\&$ Multiply placed.

$^\text{a}$ Placement of transition in the level scheme is uncertain.

¹⁴¹Pr(γ,n),(γ,p),(e,e')

Giant resonance region: 1991BeZT, 1980Ue01, 1978Ue01, 1977Sa15, 1973BuZE, 1972PiZW, 1972De35, 1972Dr01, 1971Pi09, 1971Be44, 1970Mc05, 1968Ca05, 1966Co10, 1966Br31, 1961Sh24.

¹⁴¹Pr($\text{n},\text{n}'\gamma$) 2008Sc17,1994De56,1984Tr02

$J\pi(^{141}\text{Pr target})=5/2+$.

2008Sc17: E=1.5–3.2 MeV beam used in excitation function measurement delivered by Van de Graff accelerator at the University of Kentucky. Angular distribution measurement also performed, with E=2.0, 3.0 MeV. Measured E γ , I γ , $\gamma\gamma$ -coin, angular distributions using an HPGe detector with BGO Compton suppression. Measured half-lives using Doppler Shift Attenuation Method. Maximum angular momentum transfer limited to ≤ 6 relative to 5/2 for the target. 1994De56: E=1.0–2.8 MeV. Measured γ , $\gamma\gamma$, $\gamma\gamma(t)$, excit, HPGe, FWHM=2 at E=1332; authors do not give E γ uncertainties. Preliminary results: 1992De16.

E=2.6 MeV (1984Tr02), E=Fast reactor neutrons (1978AhZX), E=2.22 MeV (1974Si20,1970Da02).

Measured: γ (1984Tr02,1978AhZX,1974Si20,1970Da02), $\gamma(0)$ (1972An13), $\gamma\gamma$ (1984Tr02,1968Da14), n' at E(n)=230–2580 keV tof (1969Ma05).

All data are from 2008Sc17, unless noted otherwise.

¹⁴¹Pr Levels

E(level) †	J $\pi^\S$	T $_{1/2}^\ddagger$	Comments
0.0	5/2+ $^\#$		
145.45 8	7/2+ $^\#$	>1.23 ps	
1117.48 11	11/2-	>0.76 ps	
1126.82 10	3/2+ $^\#$	>188 fs	
1292.72 10	5/2+ $^\#$	0.33 ps +10-7	
1298.68 13	1/2+	0.34 ps +22-10	
1436.17 12	3/2+ $^\#$	0.23 ps +8-5	
1452.36 10	7/2+ $^\#$	0.31 ps +11-7	
1457.32 11	9/2+	0.26 ps +7-5	
1493.96 14	11/2+	0.46 ps +36-15	
1520.80 11	9/2+	150 fs +19-16	
1580.06 10	5/2(-) $^\#$	0.22 ps +6-4	
1608.38 18	3/2+ $^\#$	11.8 fs 7	
1651.02 13	7/2+	132 fs +21-17	J π : 9/2+ is also stated in other places by 2008Sc17.
1657.05 16	1/2+	>0.67 ps	
1767.07 16	13/2+	>0.37 ps	
1786.50 14	(5/2, 7/2)+	0.19 ps +5-4	
1796.1 3	15/2+ $^\#$	>10.4 fs	
1812.36 15	9/2+	0.8 ps +12-3	

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) ^{141}Pr Levels (continued)

E(level) [†]	J π [§]	T _{1/2} [‡]	Comments
1842.11 14	7/2+	0.70 ps +59-22	
1853.70 13	11/2+	0.8 ps +16-3	
1910.28? a 15			J π : 1994De56 recommend 1/2-.
1975.27 15	3/2+	0.39 ps +19-10	
1985.93 18	13/2+	>0.42 ps	
2000.07 24	13/2-	0.13 ps +11-5	
2000.47& 16	9/2-	0.22 ps +12-6	
2003.71 23	11/2+	0.7 ps +10-3	
2018.13 15	3/2+	0.40 ps +26-12	
2045.11 17	9/2+	0.68 ps +86-25	
2075.54 12	5/2+, 7/2+	0.22 ps +9-6	J π : J π (exp)=5/2,7/2 in Table II of 2008Sc17.
2100.9 3	3/2+	0.17 ps +7-4	
2105.02& 19	5/2-	87 fs +15-11	J π : J π (exp)=5/2-,7/2- in Table II of 2008Sc17.
2105.3 4	15/2-	0.15 ps +49-8	
2107.73 25	15/2+	>28 fs	
2126.01 16	11/2+	>114 fs	
2135.49@ 21	7/2-	0.27 ps +11-7	
2154.5 a 4			J π : 1994De56 suggest 3/2-,5/2-.
2172.0 3	9/2-	101 fs +18-15	
2188.16 20	3/2+	0.26 ps +24-9	
2190.37@ 20	1/2-	>215 fs	
2205.91 22	11/2+	171 fs +40-28	
2228.84@ 15	7/2+	0.7 ps +61-4	J π : J π (exp)=5/2,7/2+ in Table II of 2008Sc17.
2230.3? a 4			J π : 1994De56 suggest 13/2+,15/2+.
2243.1? a 5			J π : 1994De56 suggest 13/2+.
2247.7 4	5/2-	147 fs +35-25	
2254.0? a			J π : 1994De56 suggest 1/2+,3/2+.
2264.50 17	3/2+	0.18 ps +10-7	
2267.21 18	1/2+	>184 fs	
2302.6 4	9/2+	0.25 ps +15-7	
2315.66 20	5/2+, 7/2+	130 fs +35-24	
2336.40& 22	(15/2-)	>28 fs	
2345.84@ 16	9/2+	0.21 ps +26-8	J π : J π (exp)=7/2- in Table II of 2008Sc17.
2353.7? a 19			J π : 1994De56 suggest 1/2-.
2362.93 18	5/2-	39 fs +10-8	
2364.84? a 17			J π : 1994De56 suggest 7/2+.
2382.1& 3	9/2-	0.24 ps +28-9	
2399.30? a 23			J π : 1994De56 suggest 13/2+,15/2+.
2403.11 24	9/2+	0.49 ps +85-20	
2419.8 3	9/2+	0.5 ps +17-2	
2453.1 3	5/2-	18.7 fs +35-28	
2453.99 23	15/2+	>94 fs	
2461.87 21	5/2+	136 fs +57-33	J π : J π (exp)=5/2,7/2 in Table II of 2008Sc17.
2473.2?@ 3	1/2-	>14 fs	
2499.10? a 23			J π : 1994De56 suggest 13/2+.
2499.76 25	9/2+	102 fs +28-19	
2520.16 21	3/2+	0.2 ps +18-1	
2563.9 6	7/2-	55 fs +10-8	J π : J π (exp)=7/2+ in Table II of 2008Sc17.
2580.69 17	11/2+	>13 fs	
2583.0@ 6	7/2-	24 fs +7-6	
2601.2 6	5/2-, 7/2-	59 fs +37-20	E(level): Possible doublet with 2603.7 level. J π : J π (exp)=5/2,7/2 in Table II of 2008Sc17.
2603.7 6	5/2-, 7/2-	28 fs +12-9	E(level): Possible doublet with 2601.2 level. J π : J π (exp)=5/2,7/2 in Table II of 2008Sc17.
2607.1 8	1/2+	0.12 ps +11-5	
2611.7 5	9/2+	29 fs +5-4	
2623.2 4	(5/2, 7/2)+	72 fs +19-14	J π : J π (exp)=7/2 in Table II of 2008Sc17.
2646.4 6	9/2+	90 fs +25-17	
2659.6 8	11/2+	>156 fs	
2668.96& 23	13/2-	42 fs +23-14	
2682.99 25	(5/2, 7/2)+	0.22 ps +22-8	
2707.7& 5	15/2-	0.04 ps +12-3	
2710.0 3	3/2+	0.16 ps +46-8	

Continued on next page (footnotes at end of table)

¹⁴¹Pr(n,n'γ) 2008Sc17,1994De56,1984Tr02 (continued)

¹⁴¹Pr Levels (continued)

E(level) [†]	Jπ [§]	T _{1/2} [‡]	Comments
2718.4& 4	(9/2, 11/2)	>159 fs	
2722.4 4	3/2+	44 fs +16-11	
2731.4 3	9/2+	55 fs +23-15	
2739.7 4	1/2-	>87 fs	
2777.5 4	9/2	44 fs +12-9	
2782.4 6	(5/2, 7/2)+	0.15 ps +10-5	Jπ: Jπ's of 2782.4 and 2782.7 levels seem reversed in table II of 2008Sc17.
2782.7 3	13/2+	>51 fs	Jπ: Jπ's of 2782.4 and 2782.7 levels seem reversed in table II of 2008Sc17.
2801.80 22	9/2+	0.12 ps +16-5	
2807.18 18	3/2+, 5/2-	51 fs +25-15	Jπ: Jπ(exp)=3/2+ in Table II of 2008Sc17.
2810.72 22	1/2+	>76 fs	
2814.0 3	1/2-	24 fs +26-14	
2837.5 7	(5/2, 7/2)-	24 fs +13-9	
2839.7 4	9/2-	56 fs +48-23	Jπ: Jπ(exp)=3/2, 9/2, 11/2 in Table II of 2008Sc17.
2844.6 4	3/2-	45 fs +90-28	
2847.5 3	9/2+	>97 fs	
2863.4@ 6		0.06 ps +150-4	
2881.6@ 4	7/2+, 9/2+	>55 fs	
2887.4& 3	(9/2, 11/2+)	>24 fs	Jπ: Jπ(exp)=9/2, 11/2 in Table II of 2008Sc17.
2896.8 7	11/2+		
2929.2 5	(5/2, 7/2)+	0.08 ps +14-4	Jπ: Jπ(exp)=5/2, 7/2 in Table II of 2008Sc17.
2941.4@ 6			
2950.5 6	1/2+		
2983.5 4	(5/2, 7/2)-		Jπ: Jπ(exp)=3/2 in Table II of 2008Sc17.
3000.74 23	11/2+		
3016.3 5	5/2-		
3034.3 6	1/2+		
3045.5 7	11/2+, 9/2		
3064.5 5	9/2-		Jπ: Jπ(exp)=9/2, 11/2+ in Table II of 2008Sc17.
3075.5 9	3/2+		
3079.9 5			
3083.4 14			
3114.8 12			
3128.7 5			
3155.5 6			

[†] From least-squares fit to Eγ's. Normalized $\chi^2=1.7$, as compared to critical $\chi^2=1.3$. Four gamma-ray energies differ from the fitted values by more than 3σ.

[‡] From DSAM (2008Sc17).

[§] From Jπ(initial) in table III of 2008Sc17 based on their γ(θ), excitation function measurements and decay modes, unless otherwise stated.

2008Sc17 quote from literature.

@ Level possibly deexcited by other transitions which have not been observed by 2008Sc17.

& Possible member of h_{11/2}⊗2+ multiplet.

^a Level reported by 1994De56 only.

γ(¹⁴¹Pr)

E(level)	Eγ ^{†‡}	Iγ	Comments
	x179.6# 2	5.5# 8	
	x261.46 18		Seen at E(n)=2.05 MeV.
	x268.3# 3	4.4# 8	
	x270.06 22		Seen at E(n)=2.52 MeV.
	x277.5# 3	2.9# 8	
	x461.95 18		Seen at E(n)=2.37 MeV.
	x546.4# 3	2.0# 4	
	x582.3 3		Seen at E(n)=2.90 MeV.
	x709.1 3		Seen at E(n)=2.60 MeV.
	x711.96 20		Seen at E(n)=2.52 MeV.
	x723.6# 2	3.1# 5	
	x787.8 3		Seen at E(n)=2.90 MeV.
	x893.0# 4	1.3# 4	

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$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E_{\gamma}^{\dagger\ddagger}$	I_{γ}	Mult. [§]	Comments
	^x 918.1 4			Seen at E(n)=2.90 MeV.
	^x 1019.3 3			Seen at E(n)=2.60 MeV.
	^x 1129.3 3			Seen at E(n)=2.52 MeV.
	^x 1153.2 4			Seen at E(n)=2.75 MeV.
	^x 1233.1 3			Seen at E(n)=2.90 MeV.
	^x 1384.5 4			Seen at E(n)=2.75 MeV.
	^x 1467.9 4			Seen at E(n)=2.75 MeV.
	^x 1481.3 4			Seen at E(n)=2.67 MeV.
	^x 1825.2 [#] 3	2.0 [#] 5		
	^x 2282.9 [#] 5	2.1 [#] 7		
	^x 2313.8 [#] 10	1.8 [#] 6		
	^x 2414.4 [#] 10	2.4 [#] 8		
	^x 2559.6 [#] 10	3.1 [#] 9		
	^x 2603.1 [#] 10	4 [#] 2		
145.45	145.44 20	100	E2+M1	
1117.48	971.75 21	89.8 3	[M2+E3]	δ : +0.17 +9-8 or >+6.
	1117.3 3	10.2 3	E3	
1126.82	981.1 3	2.7 1	E2	B(E2)(W.u.) $\leq$ 2.15.
	1126.50 21	97.3 1	E2+M1	δ [§] : +0.47 6.
				δ : quoted by 2008Sc17 from 1980An22 and 2001Tu02.
				B(M1)(μ^2_N) $\leq$ 0.0132.
				B(E2)(W.u.) $\leq$ 7.7.
1292.72	1146.90 22	40.0 5	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0039.
	1292.53 22	60.0 5	E2+M1	B(E2)(W.u.) $\leq$ 9.0.
				B(M1)(μ^2_N) $\leq$ 0.0042.
				B(E2)(W.u.) $\leq$ 8.2.
1298.68	1298.44 22	100	E2	B(E2)(W.u.)=10.6 +45-24.
1436.17	309.36 21	1.5 8	E2+M1	B(M1)(μ^2_N) $\leq$ 0.016.
				B(E2)(W.u.) $\leq$ 549.
	1290.67 24	52.4 8	E2	B(E2)(W.u.)=8.4 +24-16.
	1436.1 3	46.1 8	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0035.
				B(E2)(W.u.) $\leq$ 5.6.
1452.36	1306.63 21	81.6 4	E2+M1	δ : +0.90 +31-20 or -29 +7-6.
				B(M1)(μ^2_N)=0.0026 +14-12 or <0.0001.
				B(E2)(W.u.)=4.0 +28-16 or 9.0 +25-16.
	1452.20 24	18.4 4	E2+M1	δ : -5 +2-6 or -0.48 +12-26.
				B(M1)(μ^2_N)<0.0001 or 0.0006 +3-2.
				B(E2)(W.u.)=1.2 +4-3 or 0.22 +22-12.
1457.32	339.15 24	0.9 1	E1	B(E1)(W.u.)=0.00023 7.
	1311.83 22	73.4 4	E2+M1	δ : -0.053 +22-26 or +8.9 +17-19.
				B(M1)(μ^2_N)=0.0050 11 or 0.0001 1.
				B(E2)(W.u.)=0.03 +5-2 or 9.6 +22-16.
	1457.42 23	25.7 4	E2	B(E2)(W.u.)=2.0 +5-4.
1493.96	1348.51 22	100	E2	B(E2)(W.u.)=6.4 +29-15.
	1495.0@c 2			
1520.80	402.87 23	1.8 1	E1	B(E1)(W.u.)=0.00046 8.
	1375.56 25	10.3 3	E2+M1	δ : +0.26 +13-11 or +2.2 +7-5.
				B(M1)(μ^2_N)=0.001 2 or 0.0002 1.
				B(E2)(W.u.)=0.12 +16-8 or 1.5 +4-3.
	1520.98 22	87.9 3	E2	B(E2)(W.u.)=9.4 +11-9.
1580.06	287.06 22	2.2 1	E1	B(E1)(W.u.)=0.0011 3.
	1434.54 25	72.0 5	E1	B(E1)(W.u.)=0.00028 6.
	1580.06 25	25.8 5	E1	B(E1)(W.u.)=0.000074 8.
1608.38	1608.20 23	100	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0854.
				B(E2)(W.u.) $\leq$ 109.5.
1651.02	532.6@c 2			
	1506.1 3	7.9 2	E2+M1	δ : -0.23 6 or <-7.9.
				B(M1)(μ^2_N)=0.0007 1 or <0.0001.
				B(E2)(W.u.)=0.05 4 or 1.00 +18-15.
	1651.39 23	92.1 2	E2	B(E2)(W.u.)=7.4 +11-9.
1657.05	358.17 23	7.9 4		Mult.: E2 listed by 2008Sc17 is incorrect in view of 1/2+ to 1/2+ transition.
				Final $J\pi$ should be 1/2+, not 5/2+ as in table III of 2008Sc17.

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued)				
$\gamma(^{141}\text{Pr})$ (continued)				
E(level)	$E_{\gamma}^{\dagger\ddagger}$	I_{γ}	Mult. [§]	Comments
1657.05	530.03 21	47.5 8	[M1+E2]	B(M1)(μ^2_{N}) $\leq$ 0.0195. B(E2)(W.u.) $\leq$ 224.
	1513.2@c 2			
	1657.5 3	44.6 8	E2	B(E2)(W.u.) $\leq$ 0.70.
1767.07	273.38 21	18.8 7	E2+M1	$\delta^{\S}$: -0.07 +8-7. B(M1)(μ^2_{N}) $\leq$ 0.101. B(E2)(W.u.) $\leq$ 21.2.
	649.62 21	81.2 7	E1	B(E1)(W.u.) $\leq$ 0.0020.
1786.50	494.6& 3			
	658.8 3	3.2 2	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0031. B(E2)(W.u.) $\leq$ 23.
	1640.9 3	30.8 6	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0019. B(E2)(W.u.) $\leq$ 2.3.
	1786.40 25	66.0 7	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0031. B(E2)(W.u.) $\leq$ 3.1.
1796.1	301.9 3	100	E2	
1812.36	359.74 22	9.1 4	E2+M1	δ : +0.11 13 or +3.5 +28-12. B(M1)(μ^2_{N})=0.010 7 or 0.0007 +18-6. B(E2)(W.u.)=2.8 +19-3 or 225 +170-87.
	1667.13 24	59.5 8	E2+M1	δ : +0.25 4 or +2.3 +4-3. B(M1)(μ^2_{N})=0.0006 4 or 0.0001 1. B(E2)(W.u.)=0.04 +5-2 or 0.63 +44-20.
	1812.7 3	31.4 7	E2	B(E2)(W.u.)=0.26 +17-26.
1842.11	384.8 3	1.2 2	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0019. B(E2)(W.u.) $\leq$ 44.
	389.8 3	0.9 2	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0015. B(E2)(W.u.) $\leq$ 32.
	543.6& 4			
	1696.6 3	34.6 7	E2+M1	δ : +0.52 +28-21 or -2.8 +1-4. B(M1)(μ^2_{N})=0.0003 2 or <0.0001. B(E2)(W.u.)=0.10 +12-7 or 0.41 +26-15.
	1842.1 3	63.4 7	E2+M1	δ : -0.57 +16-23 or -4.6 +17-44. B(M1)(μ^2_{N})=0.0004 3 or <0.0001. B(E2)(W.u.)=0.14 +17-8 or 0.44 +36-6.
1853.70	332.66 22	1 1	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0039. B(E2)(W.u.) $\leq$ 115.
	396.51 25	5.9 4	E2+M1	δ : -0.31 +14-16 or -5 +2-11. B(M1)(μ^2_{N})=0.005 4 or 0.0002 +7-2. B(E2)(W.u.)=9 +24-8 or 100 +86-42.
	559.7& 6			
	1708.7 3	93.8 4	E2	B(E2)(W.u.)=1.1 +8-3.
	1853.8& 8			
1910.28?	1764.5@c 2	a		
	1910.5@c 2	a		
1975.27	394.52 25	1.5 5	E1	B(E1)(W.u.)=0.00016 +11-10.
	523.0 3	6.9 4	E2	B(E2)(W.u.)=60 +24-23.
	848.6 3	27.0 7	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0062. B(E2)(W.u.) $\leq$ 28.5.
	1830.0 6	23.6 6	E2	B(E2)(W.u.)=0.39 14.
	1976.0 5	41.0 8	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.0007. B(E2)(W.u.) $\leq$ 0.63.
1985.93	218.67 22	6.1 8	E2+M1	B(M1)(μ^2_{N}) $\leq$ 0.062. B(E2)(W.u.) $\leq$ 4321.
	465.41 25	12.2 8	E2	B(E2)(W.u.) $\leq$ 187.
	868.4 3	81.8 11	E1	B(E1)(W.u.) $\leq$ 0.00076.
2000.07	882.59 21	100	E2+M1	δ : +0.01 +62-4 or +10 +11-4. B(M1)(μ^2_{N})=0.043 +24-20 or 0.0004 +12-4. B(E2)(W.u.)<1.1 or 182 +104-85.
2000.47	349.58 25	2.3 2	E1	B(E1)(W.u.)=0.0006 6. Final $J\pi$ of 9/2+ as in table III of 2008Sc17 is inconsistent with 7/2+ listed as initial $J\pi$ for 1651.3 level.
	542.8 3	3.4 2	E1	B(E1)(W.u.)=0.24 18.
	548.1 3	19.3 16	E1	B(E1)(W.u.)=0.0013 6.

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E\gamma^{\dagger\ddagger}$	$I\gamma$	Mult.§	Comments
2000.47	883.1& 3			
	1855.2 6	75.0 2	E1	B(E1)(W.u.)=0.00013 6.
2003.71	545.7 3	3 3	E2+M1	δ : -0.40 +19-21 or -4 +2-9. B(M1)(μ^2_N)=0.0009 8 or 0.0001 +3-1. B(E2)(W.u.)=1.5 +45-15 or 10 8.
	1858.2 7	97.0 3	E2	B(E2)(W.u.)=0.8 5.
2018.13	438.27 25	4.8 4	E1	B(E1)(W.u.)=0.00036 18.
	565.1@c 2			
	719.5 3	8.8 6	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0034. B(E2)(W.u.) $\leq$ 22.2.
	725.2 3	2.8 5	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0011. B(E2)(W.u.) $\leq$ 7.3.
	1872.1 4	28.4 8	E2	B(E2)(W.u.)=0.40 18.
	2017.5 4	55.2 9	E2+M1	B(M1)(μ^2_N) $\leq$ 0.001. B(E2)(W.u.) $\leq$ 0.78.
2045.11	465.2& 4			
	524.1& 4			
	1900.01 22	100	E2+M1	δ : -0.49 +6-8 or -3.4 +6-8. B(M1)(μ^2_N)=0.0007 4 or 0.0001 1. B(E2)(W.u.)=0.15 +15-10 or 0.71 +45-41.
2075.54	425.19 ^b 22	2.7 4	E2+M1	Final $J\pi$ of 7/2,9/2+ as in table III of 2008Sc17 is inconsistent with 7/2+ listed as initial $J\pi$ for 1651.3 level. B(M1)(μ^2_N) $\leq$ 0.0096. B(E2)(W.u.) $\leq$ 176.
	495.27 22	4.5 4	E1	B(E1)(W.u.)=0.00043 18.
	623.02 22	6.5 5	E2+M1	B(M1)(μ^2_N) $\leq$ 0.007. B(E2)(W.u.) $\leq$ 59.
	782.8 3	12.3 6	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0065. B(E2)(W.u.) $\leq$ 35.2.
	948.6 3	38.3 8	E2+M1	B(M1)(μ^2_N) $\leq$ 0.011. B(E2)(W.u.) $\leq$ 42.
	1929.7 4	21.6 7	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0008. B(E2)(W.u.) $\leq$ 0.67.
	2075.1 5	14.1 6	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0004. B(E2)(W.u.) $\leq$ 0.30.
2100.9	664.4 3	10.8 6	E2+M1	B(M1)(μ^2_N) $\leq$ 0.012. B(E2)(W.u.) $\leq$ 90.
	974.4 5	78.6 11	E2+M1	B(M1)(μ^2_N) $\leq$ 0.027. B(E2)(W.u.) $\leq$ 94.
	2102.0 6	10.6 10	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0004. B(E2)(W.u.) $\leq$ 0.29.
2105.02	525.3 3	4.1 5	E2+M1	B(M1)(μ^2_N) $\leq$ 0.017. B(E2)(W.u.) $\leq$ 197.
	652.7 3	12.4 5	E1	B(E1)(W.u.)=0.00128 24.
	1959.4 4	49.8 9	E1	B(E1)(W.u.)=0.00019 3.
	2104.9 5	33.6 9	E1	B(E1)(W.u.)=0.000104 18.
2105.3	987.8 3	100	E2	B(E2)(W.u.)=92 +95-70.
2107.73	311.43 23	65.2 25	E2+M1	B(M1)(μ^2_N) $<$ 3.1. B(E2)(W.u.) $<$ 106200.
	340.85 25	34.8 25	E2+M1	B(M1)(μ^2_N) $<$ 1.3. B(E2)(W.u.) $<$ 37200.
2126.01	272.28 22	18.1 24	E2+M1	B(M1)(μ^2_N) $<$ 0.55. B(E2)(W.u.) $<$ 24600.
	604.9 3	11.0 12	E2+M1	B(M1)(μ^2_N) $<$ 0.031. B(E2)(W.u.) $<$ 273.
	631.8 3	11.4 11	E2+M1	B(M1)(μ^2_N) $<$ 0.027. B(E2)(W.u.) $<$ 226.
	669	24.5	E2+M1	$I\gamma$: this γ ray is not resolved by 2008Sc17 due to a background line, the branching ratio has been taken by the authors from 2001Tu02. B(M1)(μ^2_N) $<$ 0.049. B(E2)(W.u.) $<$ 365.
	1008.8 3	26.6 17	E1	B(E1)(W.u.) $<$ 0.00097.
	1981.4 5	8.4 11	E2	B(E2)(W.u.) $<$ 0.55.

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$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E\gamma^{\dagger\ddagger}$	$I\gamma$	Mult.§	Comments
2135.49	678.3 3	16.2 6	E1	B(E1)(W.u.)=0.00049 17.
	682.9 4	3.0 6	E1	B(E1)(W.u.)=0.00009 5.
	1990.0 5	21.2 8	E1	B(E1)(W.u.)=0.000025 9.
	2135.5 5	59.6 10	E1	B(E1)(W.u.)=0.000057 19.
2154.5	855.2@c 2			
	861.8& 3			
2172.0	520.9 3	8.0 6	E1	B(E1)(W.u.)=0.0014 3.
				Final $J\pi$ of 9/2+ as in table III of 2008Sc17 is inconsistent with 7/2+ listed as initial $J\pi$ for 1651.3 level.
	2026.6 4	92.0 6	E1	B(E1)(W.u.)=0.00027 5.
2188.16	736.0 3	25.3 11	E2	B(E2)(W.u.)=59 34.
	751.9 3	19.8 9	E2+M1	B(M1)(μ^2_N) $\leq$ 0.000011.
				B(E2)(W.u.) $\leq$ 66.
	2042.5 5	41.3 12	E2	B(E2)(W.u.)=0.6 3.
	2188.0 6	13.6 13	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0003.
				B(E2)(W.u.) $\leq$ 0.23.
2190.37	897.6& 2			
	2044.7 7	6.5 27	E3	
	2190.8 5	93.5 27	M2	
2205.91	352.7 3	3.4 7	E2+M1	
	752.7& 5			
	2060.6 4	96.6 7	E2	
2228.84	386.95 25	3.9 8	E2+M1	B(M1)(μ^2_N) $\leq$ 0.008.
				B(E2)(W.u.) $\leq$ 177.
	649.0 3	44 16	E1	B(E1)(W.u.)=0.00056 7.
	776.62 25	3.5 7	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0009.
				B(E2)(W.u.) $\leq$ 4.9.
	935.8 3	3.5 8	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0005.
				B(E2)(W.u.) $\leq$ 1.9.
	2082.8 5	22.9 12	E2+M1	δ : -0.37 +11-12 or -5 +2-5.
				B(M1)(μ^2_N)=0.0001 1 or <0.0001.
				B(E2)(W.u.)=0.01 +3-1 or 0.10 10.
	2228.2 5	16.7 11	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0002.
				B(E2)(W.u.) $\leq$ 0.12.
2230.3?	736.3& 3			
2243.1?	749.1& 4			
2247.7	1120.9 4	11.1 16	E1	B(E1)(W.u.)=0.00013 5.
	2247.6 5	88.9 16	E1	B(E1)(W.u.)=0.00013 3.
2254.0?	2254.0@c 18			
2264.50	684.8 3	5.9 11	E1	B(E1)(W.u.)=0.00026 15.
	812.4 4	4.8 14	E2	B(E2)(W.u.)=10 7.
	828.1 3	9 2	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0057.
				B(E2)(W.u.) $\leq$ 28.
	965.9 4	8.5 13	E2+M1	Final $J\pi$ of 5/2+ as in table III of 2008Sc17 is inconsistent with 1/2+ listed as initial $J\pi$ for 1298.4 level.
				B(M1)(μ^2_N) $\leq$ 0.0033.
				B(E2)(W.u.) $\leq$ 11.6.
	2118.6 5	49.1 18	E2	B(E2)(W.u.)=0.9 4.
	2264.0 5	24.2 17	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0007.
				B(E2)(W.u.) $\leq$ 0.44.
2267.21	291.65 25	6 5	E2+M1	B(M1)(μ^2_N)<0.097.
				B(E2)(W.u.)<3795.
	975.0& 3			
	2267.1 3	94 5	E2	B(E2)(W.u.)<1.17.
2302.6	1009.2& 4			
	2158.3 5	100	E2+M1	δ : -0.16 +31-23 or <-7.9.
				B(M1)(μ^2_N)=0.0015 7 or <0.0001.
				B(E2)(W.u.)=0.06 +8-4 or 1.1 4.
2315.66	1022.9 3	40.8 12	E2+M1	$I\gamma$: 40.(12) quoted by 2008Sc17 looks like a typographical error. The value given here was calculated by evaluator from 100-(summed branches for other transitions).
				B(M1)(μ^2_N) $\leq$ 0.0145.
				B(E2)(W.u.) $\leq$ 45.9.

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$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E\gamma^{\dagger\ddagger}$	I_{γ}	Mult. [§]	Comments
2315.66	2169.9 5	16.6 8	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0006. B(E2)(W.u.) $\leq$ 0.45. B(M1)(μ^2_N) $\leq$ 0.0013. B(E2)(W.u.) $\leq$ 0.81.
	2315.7 5	42.6 13		
2336.40	816.03 25	45 6	E3	
	1218.3 3	56 6	E2	B(E2)(W.u.) $<$ 105.
2345.84	559.0 3	12.8 10	E2+M1	B(M1)(μ^2_N) $\leq$ 0.024. B(E2)(W.u.) $\leq$ 248.
	851.76 23	16.6 11	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0085. B(E2)(W.u.) $\leq$ 39.
	1052.6 3	22.6 13	E2	B(E2)(W.u.) $=$ 11 7.
	1229.8 ^b 3	9.2 18	E1	B(E1)(W.u.) $=$ 0.00006 5.
	2199.5 6	13.8 12	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0004. B(E2)(W.u.) $\leq$ 0.29.
	2345.1 6	25.0 14	E2	B(E2)(W.u.) $=$ 0.22 15.
2353.7?	2353.7@c 19			
2362.93	754.64 24	9.4 8	E1	B(E1)(W.u.) $=$ 0.0014 5.
	1064.4 4	8.8 15	[M2]	Mult.: E1 listed by 2008Sc17 is inconsistent with 5/2- to 1/2+ transition. Final $J\pi$ of 5/2+ as in table III of 2008Sc17 is inconsistent with 1/2+ listed as initial $J\pi$ for 1298.4 level.
	1235.7 3	57.2 17	E1	B(E1)(W.u.) $=$ 0.0020 6.
	2217.0 6	7.1 8	E1	B(E1)(W.u.) $=$ 0.000042 16.
	2362.5 6	17.5 11	E1	B(E1)(W.u.) $=$ 0.00009 3.
2364.84?	1237.9@c 2			
	1246.7@c 2			
2382.1	861.3 3	72.4 12	E1	B(E1)(W.u.) $=$ 0.0012 7.
	1264.5 4	27.6 12	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0036. B(E2)(W.u.) $\leq$ 7.5.
2399.30?	1281.3@c 2			
2403.11	945.8 3	25.7 11	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0042. B(E2)(W.u.) $\leq$ 15.6.
	2257.5 5	14.7 10	E2+M1	δ : -0.40 +22-41 or <-1.8. B(M1)(μ^2_N) $=$ 0.0001 1 or <0.0001. B(E2)(W.u.) $=$ 0.01 +4-1 or 0.06 +7-5.
	2403.2 5	59.5 14	E2	B(E2)(W.u.) $=$ 0.06 +7-5.
2419.8	925.9 3	18.7 19	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0039. B(E2)(W.u.) $\leq$ 15.2.
	2274.2 6	48 4	E2+M1	δ : +0.4 +20-2 or +1.6 +8-13. B(M1)(μ^2_N) $=$ 0.0003 3 or 0.0001 +5-1. B(E2)(W.u.) $<$ 0.35 OR 0.16 +21-16.
	2419.9 6	33 6	E2	B(E2)(W.u.) $=$ 0.11 12.
2453.1	1326.4 3	8 7	E1	B(E1)(W.u.) $=$ 0.0005 5.
	2452.7 6	92 7	E1	B(E1)(W.u.) $=$ 0.00083 21.
2453.99	449.91 22	39 3	E2	B(E2)(W.u.) $<$ 3143.
	687.32 23	61 3	E2+M1	$\delta^{\S}$: -0.26 +14-15. B(M1)(μ^2_N) $<$ 0.082. B(E2)(W.u.) $<$ 83.
2461.87	810.5 3	13.7 13	E2+M1	B(M1)(μ^2_N) $\leq$ 0.012. B(E2)(W.u.) $\leq$ 54.
	1026.2 4	12.6 12	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0048. B(E2)(W.u.) $\leq$ 15.1.
	1335.0 4	14.6 12	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0025. B(E2)(W.u.) $\leq$ 4.7.
	2462.2 6	59.2 19	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0016. B(E2)(W.u.) $\leq$ 0.85.
2473.2?	368.16 21	100	E2	B(E2)(W.u.) $<$ 18957. Final level energy should be 2104.9, not 2105.0 as in table III of 2008Sc17.
2499.10?	1381.1@c 2			
2499.76	1046.5 4	16.4 12	E2+M1	δ : +0.22 +47-22 or +2.4 +29-13. B(M1)(μ^2_N) $=$ 0.005 +2-3 or 0.0008 +25-8. B(E2)(W.u.) $<$ 60 or 14 +7-8.

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$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E_{\gamma}^{\dagger\ddagger}$	I_{γ}	Mult. [§]	Comments
2499.76	2354.8 3	83.6 12	E2+M1	δ : +0.06 8 or +4.1 +16-11. B(M1)(μ^2_N)=0.0025 6 or 0.0001 +2-1. B(E2)(W.u.)=0.01 3-1 or 1.4 4.
2520.16	501.5 3	16.1 22	E2+M1	B(M1)(μ^2_N) $\leq$ 0.064. B(E2)(W.u.) $\leq$ 839.
	1085.0 4	18.8 29	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0074. B(E2)(W.u.) $\leq$ 20.8.
	1227.3 4	19.8 27	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0054. B(E2)(W.u.) $\leq$ 11.8.
	2374.6 7	25.8 27	E2	B(E2)(W.u.)=0.2 +3-2.
	2520.7 9	19.5 25	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0006. B(E2)(W.u.) $\leq$ 0.31.
2563.9	2418.0 9	33 5	E1	B(E1)(W.u.)=0.00011 3.
	2564.1 7	67 5	E1	B(E1)(W.u.)=0.00018 5.
2580.69	536.0 3	18 3	E2+M1	B(M1)(μ^2_N)<0.41. B(E2)(W.u.)<4690.
	726.7 3	12 3	E2+M1	B(M1)(μ^2_N)<0.12. B(E2)(W.u.)<734.
	1122.9 4	34 6	E2+M1	B(M1)(μ^2_N)<0.084. B(E2)(W.u.)<220.
	2435.30 25	36 7	E2	B(E2)(W.u.)<5.0.
2583.0	2437.2 8	33.5 4	E1	B(E1)(W.u.)=0.00024 +7-6.
	2583.3 7	66.5 4	E1	B(E1)(W.u.)=0.00040 +12-9.
2601.2	2455.7 7	29 5	E1	B(E1)(W.u.)=0.00008 +6-5.
	2601.3 8	71 5	E1	B(E1)(W.u.)=0.00017 +10-8.
2603.7	2458.7 7	20.0 24	E1	B(E1)(W.u.)=0.00012 +7-5.
	2603.1 8	80.0 24	E1	B(E1)(W.u.)=0.00041 +21-14.
2607.1	2607.1 8	100	E2	B(E2)(W.u.)=0.9 +5-4.
2611.7	1318.6 5	12.5 15	E2	B(E2)(W.u.)=14 4.
	2612.4 7	87.5 15	E2	B(E2)(W.u.)=3.2 6.
2623.2	1330.3 5	16.8 24	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0054. B(E2)(W.u.) $\leq$ 10.1.
	2477.7 7	40.0 24	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0018. B(E2)(W.u.) $\leq$ 1.01.
	2623.8 8	43 3	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0017. B(E2)(W.u.) $\leq$ 0.82.
2646.4	2500.6 7	46 3	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0017. B(E2)(W.u.) $\leq$ 0.88.
	2646.9 8	54 3	E2	B(E2)(W.u.)=0.61 17.
2659.6	2514.1 8	100	E2	B(E2)(W.u.)<0.83.
2668.96	1175.2 3	13.3 20	E1	B(E1)(W.u.)=0.0005 3.
	1216.4 4	22 3	E3	
	1551.3 4	65 3	E2+M1	δ : -0.18 8 or <-4.9. B(M1)(μ^2_N)=0.016 +9-7 or 0.0002 +8-2. B(E2)(W.u.)=0.7 +14-6 or 22 +12-9.
2682.99	870.9 4	12.5 14	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0057. B(E2)(W.u.) $\leq$ 24.9.
	1246.1 5	6.7 12	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0011. B(E2)(W.u.) $\leq$ 2.3.
	1556.3 4	49.1 19	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0037. B(E2)(W.u.) $\leq$ 5.1.
	2537.5 11	4.9 11	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0002. B(E2)(W.u.) $\leq$ 0.05.
	2683.2 8	26.8 21	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0004. B(E2)(W.u.) $\leq$ 0.18.
2707.7	1590.2 4	100	E2	B(E2)(W.u.)=31 +66-23.
2710.0	1411.3 3	45 9	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0085. B(E2)(W.u.) $\leq$ 14.0.
				Final $J\pi$ of 5/2+ as in table III of 2008Sc17 is inconsistent with 1/2+ listed as initial $J\pi$ for 1298.4 level.
	1583.3 4	55 9	E2+M1	B(M1)(μ^2_N) $\leq$ 0.0072. B(E2)(W.u.) $\leq$ 9.6.

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E\gamma^{\dagger\ddagger}$	$I\gamma$	Mult.§	Comments
2718.4	1197.5 4	68.0 25		B(M1)(μ^2_N)<0.0099. B(E2)(W.u.)<22.8. B(E1)(W.u.)<0.00063. B(E1)(W.u.)<0.00012. B(M1)(μ^2_N)<0.0019. B(E2)(W.u.)<2.5.
	1601.1 5	32.0 25		B(E2)(W.u.)=13 +13-12. B(M1)(μ^2_N)≤0.0072. B(E2)(W.u.)≤11.8.
2722.4	1271.6 ^b 5	15 10	E2	B(E2)(W.u.)=0.7 5.
	1422.4 6	10 10	E2+M1	B(M1)(μ^2_N)≤0.0034. B(E2)(W.u.)≤1.52.
	2576.0 9	25 10	E2	B(M1)(μ^2_N)≤0.0076.
	2721.5 8	50 10	E2+M1	B(E2)(W.u.)≤32.5. B(M1)(μ^2_N)≤0.014. B(E2)(W.u.)≤27.8.
2731.4	877.5 4	3 3	E2+M1	δ: -0.04 +16-14 or +7 +57-4. B(M1)(μ^2_N)=0.0021 12 or <0.0001. B(E2)(W.u.)<0.01 or 1.0 6.
	1278.7 5	22 10	E2+M1	B(E2)(W.u.)=0.4 3.
	2586.6 8	50 10	E2+M1	B(E2)(W.u.)<72.
2739.7	2732.1 8	25 10	E2	B(M1)(μ^2_N)≤0.027.
2777.5	1159.6 3	100	E2	B(E1)(W.u.)=0.0012 5. B(E2)(W.u.)≤103.
	923.8 4	17.0 23		δ: +0.06 +10-9 or +4.1 +29-12. B(M1)(μ^2_N)=0.0040 12 or 0.0002 +3-2. B(E1)(W.u.)=0.00026 7.
	2631.9 8	83.0 23	D+Q	B(E2)(W.u.)=0.01 +5-1 or 1.8 6.
2782.4	2637.4 8	66 3	E2+M1	B(M1)(μ^2_N)≤0.0014. B(E2)(W.u.)≤0.66.
	2781.8 9	34 3	E2+M1	Eγ: 781.84 in tables II and III of 2008Sc17 seems a misprint. B(M1)(μ^2_N)≤0.0006. B(E2)(W.u.)≤0.27.
2782.7	576.93 25	33 15	E2+M1	B(M1)(μ^2_N)<0.20. B(E2)(W.u.)<1951.
	1261.1 5	67 15	E2	B(E2)(W.u.)<66.
2801.80	1151.2 5	37 3	E2+M1	B(M1)(μ^2_N)≤0.015. B(E2)(W.u.)≤38.
	2656.0 4	34 3	E2+M1	Final $J\pi$ of 9/2+ as in table III of 2008Sc17 is inconsistent with 7/2+ listed as initial $J\pi$ for 1651.3 level. B(M1)(μ^2_N)≤0.0011. B(E2)(W.u.)≤0.52.
	2801.8 3	29 3	E2	B(E2)(W.u.)=0.19 16.
2807.18	491.4 3	8 8		B(M1)(μ^2_N)≤0.12. B(E1)(W.u.)=0.003 3. B(E2)(W.u.)≤1616.
	2662.0 4	45 10		Final $J\pi$ of 5/2+ as in table III of 2008Sc17 is inconsistent with 5/2+,7/2+ listed as initial $J\pi$ for 2315.5 level. B(E2)(W.u.)=0.9 6.
	2807.13 22	47 10		B(E1)(W.u.)=0.00012 +8-6. B(M1)(μ^2_N)≤0.0026. B(E1)(W.u.)=0.00010 +7-6. B(E2)(W.u.)≤1.13.
2810.72	1201.1 5	46 7	E2+M1	B(M1)(μ^2_N)<0.016. B(E2)(W.u.)<36.
	2810.95 23	54 7	E2	B(E2)(W.u.)<0.59.
2814.0	1233.1 4	46 7	E2	B(E2)(W.u.)=90 +103-60.
	1687.7 3	54 7	E1	B(E1)(W.u.)=0.0012 +17-7.
2837.5	2692.0 9	75 4	E1	B(E1)(W.u.)=0.0004 3.
	2837.5 11	25 4	E1	B(E1)(W.u.)=0.00012 +9-6.
2839.7	2694.2 4	100	E1	B(E1)(W.u.)=0.00023 +16-11.
2844.6	1186.8 5	25 15	E1	B(E1)(W.u.)=0.0008 +17-10.

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E\gamma^{\dagger\ddagger}$	$I\gamma$	Mult. [§]	Comments
2844.6	1546.6 6	25 15	E1	Final $J\pi$ of 5/2+ as in table III of 2008Sc17 is inconsistent with 1/2+ listed as initial $J\pi$ for 1298.4 level. B(E1)(W.u.)=0.0004 +8-5. B(E1)(W.u.)=0.00012 +22-13.
2847.5	2846.2 11 1005.0 4	50 20 36 4	E1 E2+M1	δ : +0.20 +43-23 or +2.5 +45-15. B(M1)(μ^2_N)<0.016 or <0.0005. B(E2)(W.u.)<3.1 or <51. B(M1)(μ^2_N)<0.0034. B(E2)(W.u.)<6.1.
	1354.0 5	18 3	E2+M1	B(M1)(μ^2_N)<0.0027. B(E2)(W.u.)<4.6.
	1389.9 6	15 3	E2+M1	B(M1)(μ^2_N)<0.0003. B(E2)(W.u.)<0.13.
	2702.8 12	11.8 23	E2+M1	B(E2)(W.u.)<0.19. B(E1)(W.u.)<0.003.
2863.4	2848.4 11 1570.9 6	19 6 67 20	E2	B(M1)(μ^2_N)≤0.053. B(E2)(W.u.)≤70. B(E1)(W.u.)<0.00034. B(M1)(μ^2_N)≤0.0055. B(E2)(W.u.)≤2.4.
	2716.8 15	33 20		B(M1)(μ^2_N)<0.023. B(E2)(W.u.)<71.
2881.6	1028.0 5	24 11	E2+M1	B(M1)(μ^2_N)<0.0096. B(E2)(W.u.)<15.8.
	1424.5 8	26 13	E2+M1	B(M1)(μ^2_N)<0.0066. B(E2)(W.u.)<10.7.
	1428.5 6	21 5	E2+M1	B(M1)(μ^2_N)<0.0004. B(E2)(W.u.)<0.19.
	2737.0 16	8 4	E2+M1	B(M1)(μ^2_N)<0.0001. B(E2)(W.u.)<0.31.
	2882.3 11	21 4	E2+M1	B(E1)(W.u.)=0.0021 5. B(M1)(μ^2_N)<0.041. B(E2)(W.u.)<116.
2887.4	1075.2 5	24 6		B(E1)(W.u.)=0.00120 24. B(M1)(μ^2_N)<0.023. B(E2)(W.u.)<41.
	1367.0 4	28 6		B(E1)(W.u.)=0.00091 23. B(M1)(μ^2_N)<0.018. B(E2)(W.u.)<31.
	1392.8 5	23 6		B(M1)(μ^2_N)<0.0084. B(E2)(W.u.)<8.9.
	1769.6 6	17 10		B(E1)(W.u.)=0.00033 20. B(E1)(W.u.)=0.000048 18. B(M1)(μ^2_N)<0.0011. B(E2)(W.u.)<0.46.
	2742.5 17	9 3		
2896.8	1439.0 8 2752.0 10	29 10 71 10		
2929.2	1636.0 5	48 5	E2+M1	B(M1)(μ^2_N)≤0.012. B(E2)(W.u.)≤14.4.
	2785.2 11	41 5	E2+M1	B(M1)(μ^2_N)≤0.002. B(E2)(W.u.)≤0.87.
	2930.3 12	11 3	E2+M1	B(M1)(μ^2_N)≤0.0005. B(E2)(W.u.)≤0.18.
2941.4	1484.2 10 1488.6 8 2796.4 14 2941.7 14	21 13 21 13 26 8 32 8		
2950.5	1514.4 6 2950.1 17	67 15 33 15		
2983.5	2839.0 7 2983.0 5	18 11 82 11		
3000.74	956.0 4 1479.5 5	30 11 20 11		

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$^{141}\text{Pr}(\text{n},\text{n}'\gamma)$ 2008Sc17,1994De56,1984Tr02 (continued) $\gamma(^{141}\text{Pr})$ (continued)

E(level)	$E\gamma^{\dagger\ddagger}$	$I\gamma$	Comments
3000.74	2855.2 3	50 9	
3016.3	941.0 5	33 8	
	1887.9 13	17 6	
	2871.0 19	13 5	
	3015.9 15	34 6	
3034.3	1734.9 7	60 20	Final $J\pi$ of 5/2+ as in table III of 2008Sc17 is inconsistent with 1/2+ listed as initial $J\pi$ for 1298.4 level.
	1742.5 8	40 20	Final $J\pi$ of 1/2+ as in table III of 2008Sc17 is inconsistent with 5/2+ listed as initial $J\pi$ for 1292.4 level.
3045.5	1524.6 7	54 10	
	2900.2 12	46 10	
3064.5	960.5 6	32 21	
	1209.9 6	30 12	
	2918.4 12	38 8	
3075.5	1623.1 11	52 20	
	3075.4 15	48 20	
3079.9	1094.0 5	53 23	
	2934.1 17	47 23	
3083.4	3083.4 14	100	
3114.8	2969.2 19	67 17	
	3114.8 15	33 17	
3128.7	764.6 5	21 13	
	1838.1 ^b 7	39 10	Final $J\pi$ of 1/2+ as in table III of 2008Sc17 is inconsistent with 5/2+ listed as initial $J\pi$ for 1292.4 level.
	3128.7 16	40 10	
3155.5	1180.3 7	29 10	
	1497.7 14	14 10	
	1574.7 13	24 12	
	3011.2 12	33 7	

[†] From 2008Sc17, unless noted otherwise. Uncertainty include statistical and systematic components.

[‡] Unplaced gammas are from 2008Sc17, unless noted otherwise.

[§] From 2008Sc17 from angular distribution measurements. Sign given by 2008Sc17 has been reversed here to conform to Krane-Steffen convention used in ENSDF database. 2008Sc17 state use of Rose-Brink convention.

Observed only by 1978AhZX; the intensities are relative to I(1127 γ)=100%.

@ Observed only by 1994De56 ($\Delta E\gamma$ assumed by evaluator).

& Observed by 1984Tr02 and 1994De56 but not by 2008Sc17.

^a $I\gamma(1910\gamma)/I\gamma(1765\gamma)=42/58$ (1994De56).

^b Differs from the fitted value by 3 σ or more.

^c Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

 $^{141}\text{Pr}(\text{d},\text{d}'),(\alpha,\alpha')$ 1971Ba15

(d,d'): E=45 MeV (1971Ba15), 12 MeV (1969El09); others: 1962Jo05, 1961Co07.

(α,α'): E=45 MeV (1971Ba15). Measured: $\sigma(E,\theta)$, DWBA analysis.

For giant quadrupole resonances at E=115 MeV see 1976Yo02.

 ^{141}Pr Levels

E(level) [§]	$J\pi^{\ddagger}$	$L^{\dagger}$	β_L in (α,α')	Comments
0.0	5/2+			
145 10	7/2+		≤ 0.014	
1125 10		2+3		E(level), β_L in (α,α'): unresolved levels 1118 and 1127 with $J\pi=11/2-$, $\beta_L=0.031$ and $J\pi=3/2+$, $\beta_L=0.026$.
1295 10	1/2+	2	0.027	
1437 [#] 10				
1456 10	+	2	0.022	
1498 [#]				

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$^{141}\text{Pr}(\text{d},\text{d}'),(\alpha,\alpha')$ 1971Ba15 (continued) **^{141}Pr Levels (continued)**

E(level) [§]	$J\pi^{\ddagger}$	$L^{\dagger}$	β_L in (α,α')	Comments
1523 10	9/2+	2	0.032	
1584 [#] 10				
1609 [#] 10				
1650 10		2	0.022	
1760 20				
1799 [#] 10				
1817 [#] 10				
1850 20				
2002 10	(9/2)-	3	0.030	
2078 10	5/2-@	3		$J\pi$: adopted value is (5/2+).
2106 10	7/2-@	3		$J\pi$: adopted value is (5/2-). $\beta_L(2078+2106)=0.023$.
2178 10	5/2-	3	0.026	
2256 10	+			
2320 10	5/2-@	3	0.035	$J\pi$: adopted value is (5/2,7/2).
2368 10	5/2-	3		
2388 10	11/2-@	3		$J\pi$: adopted value is (9/2-). $\beta_L(2368+2388)=0.044$.
2570 20				
2585 [#] 10				
2609 10	+	2	0.029	
2684 10	-	3	0.026	
2730? [#] 10				
2820 10				
2843 [#] 10				
2876 10				
2940 10				
2986 10	+	2	0.022	
3135 10				
3200 20				
3330 20				
3430 20				
3590 20				

[†] From $\sigma(\theta)$ in (α,α') .[‡] Adopted values, π from L , except whether noted otherwise.[§] From 1971Ba15. For levels ≤ 3135 , E and ΔE are from (d,d'); from (α,α') for others.[#] From (d,d') (1969El09).@ $J\pi$ value based on arguments of this dataset that is different from adopted value.**Coulomb Excitation 1980An22**p: $E=4.0-5.5$ MeV (1980An22). ^{14}N : $E=52$ MeV (1963Al30,1965Al21). ^{20}Ne : $E=28$ MeV (1961An09).Measured: γ (1980An22,1965Al21,1963Al30,1962Ri09,1961An09), $\gamma(\theta)$ (1980An22).

Data from 1980An22 contradict data from other sources. In (p,2n γ) γ from 1580 level to 7/2+ 145 level is stronger than γ to 5/2+ (g.s.) and is E1. In 1980An22 this γ was not observed at all, while γ to 5/2+(g.s.) is M1+E2 and not expected to be E1. 1980An22 assign $J\pi=1/2+$ to the level 1785 and E2 to 1785 γ and at the same time observe strong 1639 γ from this level to 7/2+ 145 level. 1980An22 report M1,E2 1493 γ from 1493 level not observed by others. 1980An22 assign M1+E2 to 1348 γ and suggest that it depopulates 1348 level, whereas, in (p,2n γ) 1348 γ is $\Delta J=2$, E2 from 1494 level.

 ^{141}Pr Levels

E(level)	$J\pi^{\dagger}$	Comments
0.0	5/2+	
145.5	7/2+	$B(E2)=0.0025$ 4 (1980An22). Others: 0.0036 7 (1965Al21,1963Al30,1961An09), ≤ 0.003 (1962Ri09).
1126.9	3/2+	$B(E2)=0.0126$ 13 (1980An22). Other: 0.054 11 (1965Al21).

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Coulomb Excitation 1980An22 (continued) ^{141}Pr Levels (continued)

E(level)	$J\pi^\dagger$	Comments
1292.6	(5/2)+	B(E2)=0.023 2 (1980An22). Other: 0.049 10 (1965Al21).
1494	11/2+	1980An22 assign 1493 γ to decay from this level.
1580.3	+	B(E2)=0.169 12 (1980An22).
1608.4	3/2+	B(E2)=0.105 110 (1980An22). Other: 0.021 6 (1965Al21).
1785	(5/2+) ‡	B(E2)=0.140 21 (1980An22). Other: 0.018 8 (1965Al21).

 † From $\gamma(0)$ (1980An22), except where noted otherwise. ‡ Adopted value. $\gamma(^{141}\text{Pr})$

E_γ	E(level)	$I_\gamma^\dagger$	Mult. ‡	$\delta^\ddagger$	Comments
145.5	145.5		M1+E2		
981.7	1126.9	12 1			
1126.9	1126.9	88 1	M1+E2	+0.47 6	Mult.: $A_2=+0.215$ 13, δ may also be +4.35 52.
1147.3	1292.6	40 1	M1+E2		Mult.: $A_2=+0.0150$ 109, δ may be -5.61 44 or -0.04 3.
1292.6	1292.6	60 1	M1+E2	-1.23 23	Mult.: $A_2=+0.0844$ 91, δ may also be -2.80 52.
1348	1494	100			Mult.: $A_2=+0.282$ 39.
Coul. ex. data on 1348 γ favor 1348 level instead of 1494 level (1980An22).					
$^{*1493}\S$					
1580.3	1580.3	100	M1+E2	-0.030 6	Mult.: $A_2=+0.0469$ 44, δ may also be -5.27 99.
1608.4	1608.4	100	M1+E2	+1.17 35	Mult.: $A_2=+0.298$ 45, δ may also be +1.32 40.
1639	1785	37 1			
1785	1785	63 1			Mult.: $A_2=+0.0085$ 101.

 † % photon branching from parent level. ‡ From $\gamma(0)$ with $E(p)=5.25$ MeV (1980An22). $\S$ Placement of transition in the level scheme is uncertain. * γ ray not placed in level scheme. $^{142}\text{Ce}(p,2n\gamma)$ 1981Ko16

E=19.6–17.4 MeV.

Measured: γ , $\gamma\gamma$, $\gamma(t)$, $\gamma(0)$, ce. ^{141}Pr Levels

E(level)	$J\pi^\dagger$	$T_{1/2}^\dagger$	Comments
0.0	5/2+	stable	
145.44	7/2+	1.85 ns	$T_{1/2}$: adopted value; similar value of $T_{1/2}$ was measured in 1981Ko16.
1117.5 2	11/2-	4.8 ns 3	$T_{1/2}$: from 19881ko16.
1126.9 2	3/2+		
1292.7 2	(5/2)+		
1298.6 2	1/2+		
1434.4 3	3/2+		
1452.2 3	(7/2)+		
1457.4 3	9/2+		
1494.1 3	11/2+		
1520.9 4	9/2+		
1580.0 4	5/2-		
1607.7 5	(3/2)+		
1651.2 5			
1657.4 3	1/2+		
1767.8 3	13/2+		
1786.2 5	(5/2+)		
1796.7 4	15/2+		
1812.2 6	(9/2+)		

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¹⁴²Ce(p,2n γ) 1981Ko16 (continued)

¹⁴¹Pr Levels (continued)

E(level)	J $\pi^{\ddagger}$	Comments
1841.8 5	(7/2+)	
1854.0 4	(11/2+)	J π : adopted value is (11/2+).
1975.7 5	(3/2+)	
1986.4 6	(13/2+)	
2003.1 6	(11/2+)	
2069.3 4	17/2+	
2104.8 5	(5/2-)	
2108.4 5	15/2(+)	
2126.3 4	(11/2+)	
2173.0	9/2-	
2206.7	11/2+	
2243.3 4		
2382.5 5	(9/2-)	
2626.8 5	(15/2-)	
2752.0 5		
2927.7 5	19/2-	

[†] For all levels, except where noted otherwise, T_{1/2}<1.5 ns.

[‡] Adopted values.

 $\gamma(^{141}\text{Pr})$
 $\alpha(\text{K})_{\text{exp}}$ were normalized to $\alpha(\text{K})_{\text{E2}}$ for 641.2 γ in ¹⁴²Ce(p,p' γ).

Presented data were taken at E(p)=17.4 MeV.

E γ	E(level)	I $\gamma^{\dagger}$	Mult.	α	Comments
(28.9)	1796.7				
122.17 10	2108.4	0.5 2			
145.44 8	145.44	100			
218.58 8	1986.4	2.5 3	M1+E2		Mult.: A ₂ =+0.24 2, A ₄ =-0.04 3.
272.6 1	2069.3	6.4 3			Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.071 8 (272.6 γ +273.7 γ).
273.7 1	1767.8	6.6 3			Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.071 8 (273.7 γ +272.6 γ).
301.4 1	2069.3	0.6 2			Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.051 6 (301.4 γ +302.6 γ).
302.6 1	1796.7	2.2 3	E2	0.0494	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.051 6 (302.6 γ +301.4 γ), A ₂ =+0.25 2, A ₄ =-0.05 3.
310.4 1	1767.8	1.1 3			Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.014 3, A ₂ =+0.32 1, A ₄ =-0.06 1 (310.4 γ +311.7 γ).
311.7 1	2108.4	2.5 3			Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.014 3, A ₂ =+0.32 1, A ₄ =-0.06 1 (311.7 γ +310.4 γ).
340.6 1	2108.4	1.0 2			
360.0 1	1812.2	1.2 2			
530.53 12	1657.4	1.1 2	E2	0.00971	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.008 2.
^x 614.43 12		0.7 2			
^x 622.52 12		1.1 2			
650.16 10	1767.8	25 4	E1	0.00212	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0016 3, A ₂ =-0.20 1, A ₄ =-0.02 2.
^x 661.9 1		3.0 5			
668.9 1	2126.3	4.5 5	M1+E2		Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0059 11, A ₂ =-0.10 2, A ₄ =-0.02 3.
749.17 10	2243.3	3.5 5	D+(Q)		Mult.: A ₂ =-0.14 2, A ₄ =+0.05 3.
858.42 15	2927.7	1.0 2	(E1)	0.00120	Mult.: $\alpha(\text{K})_{\text{exp}}$ <0.0012.
861.57 15	2382.5	1.7 3			
868.82 15	1986.4	4.5 5	E1	0.00117	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0008 2.
963.1 1	2752.0	3.0 5			
972.18 15	1117.5	52 5	M2	0.00858	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0080 9, A ₂ =+0.20 2, A ₄ =-0.06 3.
1117.65 15	1117.5	5.5 5	E3	0.00349	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0029 8, A ₂ =+0.34 3, A ₄ =-0.03 5.
1126.9 2	1126.9	21 3	M1+E2		Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0014 3, A ₂ =-0.09 2, A ₄ =-0.04 3.
1147.2 2	1292.7	6.5 5			
^x 1291.6 2		5 2			
1292.7 2	1292.7	11 3	D+(Q)		Mult.: A ₂ =-0.12 2, A ₄ =-0.02 4.
1298.6 2	1298.6	5.2 5			Mult.: A ₂ =-0.10 2, A ₄ =-0.05 3, contradict with L=0 in (³ He,d).
1306.8 2	1452.2	12 1	M1+E2		Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.00079 20, A ₂ =-0.14 1, A ₄ =-0.04 2.
1311.9 2	1457.4	16 1	M1+E2		Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.00082 20, A ₂ =-0.15 2, A ₄ =+0.04 3.
1348.7 2	1494.1	35 2	E2	0.00116	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.0012 3, A ₂ =+0.23 2, A ₄ =-0.07 3.
1375.6 3	1520.9	1.8 3			
1434.4 3	1434.4	3 1			
1434.7 3	1580.0	11 2	E1	0.00047	Mult.: $\alpha(\text{K})_{\text{exp}}$ =0.00032 9.
1452.3 4	1452.2	3 1			
1457.4 3	1457.4	6 1			
1505.7 4	1651.2	1.3 5			

Continued on next page (footnotes at end of table)

$^{142}\text{Ce}(\text{p},2\text{n}\gamma)$ 1981Ko16 (continued) **$\gamma(^{141}\text{Pr})$ (continued)**

$E\gamma$	E(level)	$I\gamma^\dagger$	Mult.	Comments
1509.1 4	2626.8	2.5 5		
1520.9 4	1520.9	20 2	E2	Mult.: $\alpha(\text{K})_{\text{exp}}=0.00076$ 10, $A_2=+0.15$ 1, $A_4=-0.07$ 2, contradict $A_2=-0.13$ 10 in $(\alpha,2\text{n}\gamma)$.
1579.9 5	1580.0	2.2 4		
^x 1583.8 5		1.6 5		
1607.7 5	1607.7	4.1 5		
1651.2 5	1651.2	8.5 8		
1667.1 5	1812.2	4.8 6	D	Mult.: $A_2=-0.33$ 4, $A_4=-0.01$ 6.
1708.6 3	1854.0	10 1	E2	Mult.: $\alpha(\text{K})_{\text{exp}}=0.00036$ 11, $A_2=+0.24$ 1, $A_4=-0.09$ 1.
1786.2 5	1786.2	3.3 6		
1841.8 5	1841.8	4.0 5		
1854.0 5	1854.0	3.2 6		
1857.7 5	2003.1	8.6 10		
1959.4 5	2104.8	2.5 5		
1975.7 5	1975.7	1.7 4		
2027.6 5	2173.0	3.2 5		
2061.3 5	2206.7	4.3 8		

[†] Relative $I\gamma$.^x γ ray not placed in level scheme. **$^{142}\text{Nd}(\text{e},\text{e}'\text{p})$ 1993La16**

1993La16: E=261, 450 MeV; measured spectra, deduced momentum distributions, deformation effects, C2S. CDWIA calculations, Nilsson plus BCS model calculations.

 ^{141}Pr Levels

E(level)	$J\pi$	L	S
0.0	5/2+	2	1.4 3
145	7/2+	4	3.1 5
1118	11/2-	5	0.56 9
1299	1/2+	0	0.05 1

 $^{142}\text{Nd}(\text{d},^3\text{He})$ 1969Ba12,1971Wi04

E(d)=29 MeV.

1969Ba12,1971Wi04: measured $\sigma(\text{E},\theta)$, DWBA analysis, deduced C^2S spectroscopic factors. 1971Wi04 list results as "STANDARD" and "MODIFIED" as from standard DWBA, and respectively using a radius of the spin-orbit term of the bound-state well reduced by 10% relative to the radius of the central well.

2001Kr01: reanalyzed existing data with a nonlocal finite-range DWBA analysis with a bound state function obtained from (e,e'p) experiments.

 ^{141}Pr Levels

E(level)	$J\pi^\dagger$	L	$\text{C}^2\text{S}^\ddagger$	Comments
0.0	5/2+	2	1.25	C^2S : 2.53 (1969Ba12), 2.12 (1971Wi04,std.), 2.70 (1971Wi04,mod.).
140 10	7/2+	4	3.79	C^2S : 6.28 (1969Ba12), 6.20 (1971Wi04,std.), 6.06 (1971Wi04,mod.).
1120 30	11/2-	(5)	0.36	C^2S : 0.74 (1969Ba12), 0.86 (1971Wi04,std.), 1.03 (1971Wi04,mod.).
1300 30	1/2+	(0)	0.07	C^2S : 0.11 (1969Ba12), 0.09 (1971Wi04,std.), 0.09 (1971Wi04,mod.).
1610 30	3/2+	(2)		C^2S : 0.35 (1969Ba12).

[†] Adopted values.

[‡] From 2001Kr01 reanalyzing 1969Ba12 data. The original results of 1969Ba12 together with those of 1971Wi04 are shown in table comments (the original data of 1969Ba12 are normalized to $\Sigma\text{C}^2\text{S}=10$; as mentioned above results of 1971Wi04 are "STANDARD" (std.) and "MODIFIED" (mod.)).

 $^{144}\text{Nd}(\text{p},\alpha)$ 1986Ga16,1983Ga04

E(p)=25 MeV.

Measured: $\sigma(\text{E},\theta)$; resolution=13.5 keV.

 ^{141}Pr Levels

E(level)§	J π †	σ ‡
0 . 0	5 / 2+	39 . 49
145	7 / 2+	23 . 25
1118	11 / 2-	22 . 15
1299	1 / 2+	6 . 82
1607	3 / 2+	10 . 47
1650		

† Adopted values.

‡ $\sigma(0^\circ \text{ to } 84^\circ)$ (integrated) in μb .

§ 1986Ga02 reported also weak level at 1453 keV.

Adopted Levels, Gammas

$Q(\beta^-) = -3670$ 14; $S(n) = 8011$ 26; $S(p) = 6791$ 7; $Q(\alpha) = -700$ 4 2012Wa38.

The reaction $^{142}\text{Nd}(\gamma, n)$ was used to study the ratio of isomer to g.s. yields: 2009PaZZ (E=27, 28, 29, 30 MeV),

2008XxZZ (E=11–16 MeV), 2007AnZX (E=7.4–13.3 MeV), 2007Pa45 (E<35 MeV), 2006AnZZ, 2005AnZX (E=15 MeV).

$\langle r^2 \rangle^{1/2} = 4.9052$ fm 28 (2004An14).

 ^{141}Nd LevelsCross Reference (XREF) Flags

A ^{141}Nd IT Decay (62.0 s)
 B ^{141}Pm ε Decay
 C $^{140}\text{Ce}(\alpha, 3n\gamma)$
 D $^{142}\text{Ce}(\alpha, 5n\gamma)$
 E $^{142}\text{Nd}(p, d)$, (d, t)

F $^{142}\text{Nd}(\beta^3\text{He}, \alpha)$
 G $^{142}\text{Nd}(\beta^{13}\text{C}, \beta^{14}\text{C})$
 H $^{143}\text{Nd}(p, t)$
 I $^{141}\text{Pr}(p, n\gamma)$
 J $^{124}\text{Sn}(\beta^{24}\text{Mg}, \alpha 3n\gamma)$

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}$	Comments
0.0	3/2+	ABCDEF GHIJ	2.49 h 3	$\% \varepsilon + \% \beta^+ = 100$. $\mu = +1.012$ 9 (1992Le09, 2011StZZ). $Q = +0.32$ 13 (1992Le09, 2011StZZ). $J\pi$: atomic beam (1976Fu06), L=2 in (p,d), (d,t). $T_{1/2}$: weighted average of 2.50 h 8 (1970Bo22), 2.60 h 12 (1968La17), 2.42 h 9 (1966Gr05), 2.62 h 17 (1963Bi19), 2.54 h 5 (1961Ra06), 2.42 h 5 (1949Wi02). Measured isotope shift, deduced $\Delta \langle r^2 \rangle$ (1992Le09).
193.684 10	1/2+	BC EFGHI	1.17 ns 15	$T_{1/2}$: from ^{141}Pm ε decay (1970Ch29). $J\pi$: L=0 in (p,d), (d,t).
756.51 5	11/2-	ABCDEF GHIJ	62.0 s 8	$\%IT > 99.95$; $\% \varepsilon + \% \beta^+ < 0.05$. $\% \varepsilon + \% \beta^+ < 0.05$ (1988Ch39); other: 0.032% 8 (1970Ab05). $T_{1/2}$: weighted average: 63.9 s 11 (1960Ja06), 61 s 2 (1960Ko02), 64.7 s 13 (1966Gr05), 60.3 s 10 (1967Ge09), 61.5 s 20 (1969Ja02), 60.9 s 10 (1988Ch39). $J\pi$: γ to 3/2+ is M4, L=5 in (p,d), (d,t). Measured isomeric Ratio, Relative population with respect to g.s., in decay of GDR in $^{142}\text{Nd}(\gamma, n)$ (1999Pa53, 2000Ma35, 2000Ts01).
1223.24 3	5/2+	BCDEFG I		$J\pi$: L=2 in (p,d), (d,t), 1223 γ to 3/2+ is $\Delta J=1$ ($\alpha, 5n\gamma$).
1345.48 4	7/2+	BCDEF I		$J\pi$: L=4 in (d,t), ($\beta^3\text{He}, \alpha$), $\log ft = 7.3$ via 5/2+ parent.
1403.4 7	(7/2-)	B E I		$J\pi$: L=3 in (p,d), (d,t); γ to 11/2-.
1416.1 10	7/2-	HI		$J\pi$: L=0 in (p,t).
1564.78 5	(3/2)+	B EFG I		$J\pi$: L=2 in (p,d), (d,t); possible E0 component in transition to 3/2+, g.s. (5/2)+ in 1984Va33.
1581.65 8		B		
1596.99 5	(5/2, 3/2)+	B E I		$J\pi$: γ 's to 5/2+, 3/2+ are M1, E2 with similar $I\gamma$.
1624.8 9	(9/2)	CD		$J\pi$: γ to 7/2+ is $\Delta J=(1)$ ($\alpha, 5n\gamma$), no γ to 1/2+, 3/2+ or 5/2+.
1670.5 10		I		
1715.2 13		I		
1804.8 7		I		
1808.31? 10		B		
1820.46 5	5/2+, 3/2+	B EFG I		$J\pi$: L=2 in (p,d), (d,t).
1870.8 10		C		
1876.0 5		I		
1890.3 7	1/2+	E I		$J\pi$: L=0 in (p,d), (d,t).
1897.3 5		B I		
1967.55 5	7/2+	BC EF I		$J\pi$: L=4 in (d,t), $\log ft = 6.4$ via 5/2+ parent.
2011 3		E		
2018.8 9		I		
2049.69 14	13/2(-)	J	<1 ns	Level resulting from relocating the 1294 γ from 4246 in ($\alpha, 3n\gamma$) and ($\alpha, 5n\gamma$) (1977Lu04) by 2011Bh01 in ($^{24}\text{Mg}, \alpha 3n\gamma$). $T_{1/2}$: from ($\alpha, 5n\gamma$) from 1293.1 γ (previously for the 4246 level). $J\pi$: γ to 11/2- is $\Delta J=1$, D+Q.
2066.39 6	3/2+, 5/2+	B I		$J\pi$: L=2 in (p,d), (d,t).
2073.61 10	(3/2+, 5/2+)	B EF I		$J\pi$: γ 's to 3/2+, 1/2+, possible L=2 in (d,t), ($\beta^3\text{He}, \alpha$).
2109.38 5	3/2+, 5/2+	B E I		$J\pi$: L=2 in (p,d), (d,t), γ to 7/2+ is E2.
2145.37 20		B I		
2180 3	1/2+	E		$J\pi$: L=0 in (d,t), (p,d).
2202.9 9		I		

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Adopted Levels, Gammas (continued) ^{141}Nd Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	XREF	T _{1/2}	Comments
2209.41 18	(11/2) ⁻	CDEF J		J π : γ to 11/2 ⁻ is D+Q, L=5 in (d,t), ($^3\text{He},\alpha$); 9/2 ⁻ less likely because upper $\Delta J=1$ transition would give 11/2 ⁻ for 2806, resulting $\Delta J=3$ for 81 γ from 17/2 ⁻ , 2887. J=11/2 ⁻ was adopted in (p,d), (d,t) (1984Va33); J=15/2 ⁻ assumed in ($^{24}\text{Mg},\alpha 3n\gamma$) (2011Bh01).
2221.0 7		HI		
2246.55 5	(7/2 ⁻ , 5/2 ⁻)	B E I		J π : L=(3) in (p,d), (d,t); strong γ to 1/2 ⁺ indicates the possibility of two distinctive levels.
2265.22 20		B		
2303.64 5	7/2 ⁺	B I		J π : γ 's to 3/2 ⁺ , L=4 in (p,d), (d,t).
2311.8 7	7/2 ⁺ , (9/2 ⁺)	B E I		J π : L=4 in (p,d), (d,t); γ to 3/2 ⁺ g.s. makes 9/2 ⁺ less likely.
2313 10	11/2 ⁻ , 9/2 ⁻	F		J π : L=5 in ($^3\text{He},\alpha$).
2327.47 21	15/2 ⁻	J		J π : γ to 13/2 ⁻ is $\Delta J=1$, D+Q.
2336.02 20	(7/2 ⁺)	B F		J π : L=(4) in ($^3\text{He},\alpha$); log ft=8.3 via 5/2 ⁺ parent; γ to 3/2 ⁺ .
2349 5	(11/2 ⁻ , 9/2 ⁻)	E		J π : L=(5) in (p,d), (d,t).
2349.3 10	13/2	CD		J π : γ to 11/2 ⁻ is $\Delta J=1$, D+Q, excitation function.
2354.36 15	(3/2, 5/2 ⁺)	B I		J π : γ 's to 3/2 ⁺ and 1/2 ⁺ , log ft=7.5 via 5/2 ⁺ parent.
2365.6 10		I		
2370.8 6		I		
2388.53 10	7/2 ⁺	B EF I		J π : L=4 in (d,t), (p,d); γ to 3/2 ⁺ .
2429.62 20		B I		
2439.5 10		I		
2460.2 7		I		
2463.45 10		B I		
2505.47 10	3/2 ⁺ , 5/2 ⁺	B I		J π : γ 's to 1/2 ⁺ and 7/2 ⁺ , log ft=6.9 via 5/2 ⁺ parent.
2514.82 20	(7/2 ⁺)	B E I		J π : L=(4) in (p,d), (d,p); γ to 3/2 ⁺ .
2537.49 15	15/2 ⁻	CD J		J π : γ to 11/2 ⁻ is $\Delta J=2$ Q, and γ to 13/2 ⁻ is $\Delta J=1$, D.
2541.55 22	(17/2 ⁻)	J		J π : γ to 15/2 ⁻ is tentatively $\Delta J=1$ D.
2581 5	(7/2 ⁻ , 5/2 ⁻)	E		J π : L=(3) in (p,d), (d,t).
2616	(9/2 ⁻ , 11/2 ⁻)	E		J π : L=(5) in (p,d), (d,t).
2619.03 20		B		
2643 5		E		
2705 5		E		
2732.53 20		B		
2764 5		E		
2803.9 4	(3/2 ⁺ , 5/2 ⁺)	B E		J π : L=2 in (d,t), (p,d).
2805.47 20	13/2 ⁻	J		J π : γ to 11/2 ⁻ is $\Delta J=1$, D.
2829.55 16	15/2 ⁻	CD J		J π : γ to 11/2 ⁻ is $\Delta J=2$, Q and γ to 13/2 ⁻ is $\Delta J=1$, D+Q.
2838 5		E		
2865.3 4		B		
2886.43 16	17/2 ⁻	CDE J		J π : γ to 13/2 ⁻ is $\Delta J=2$, Q and γ to 15/2 ⁻ is $\Delta J=1$, D+Q. T _{1/2} : 28 ns 5 was measured from 348.2 γ that in ($^{24}\text{Mg},\alpha 3n\gamma$) was shown to be a multiplet (344.9 γ , 347.2 γ , 348.9 γ , and 349.2 γ), reason for which it was not assigned to this level or other levels.
2886+x?		D	26 ns 5	T _{1/2} : 1782.2 γ and 348.2 γ in ($\alpha,5n\gamma$) (1976Lu07) have prompt and delayed (T _{1/2} =26 ns 5) components, suggesting that 2886 level is populated by delayed γ from an isomeric state 2886+x.
2915 10	11/2 ⁻ , 9/2 ⁻	EF		J π : L=5 in (d,t); (p,d) (1984Va33); L=4 in ($^3\text{He},\alpha$), (d,t) (1978VaZS).
2944.68 11	3/2 ⁺ , 5/2 ⁺	B E		J π : L=2 in (p,d), (d,t).
2951.3 9	(19/2)	CD		J π : γ to 17/2 ⁻ is $\Delta J=1$ D, no γ to J<17/2.
3007 10	(5/2 ⁺ , 3/2 ⁺)	E		J π : L=(2) in (p,d), (d,t).
3042 10	9/2 ⁺ , 7/2 ⁺	EF		J π : L=4 in (p,d), (d,t).
3056.06 7	7/2 ⁺	B		J π : L=4 in (d,t), ($^3\text{He},\alpha$); log ft=7.2 via 5/2 ⁺ parent.
3093 10	(1/2 ⁺)	E		J π : L=(0) in (d,t), (p,d).
3104.6 9	(21/2)	CD		J π : γ to (19/2) is $\Delta J=1$ D and is stronger than 218 γ to 17/2, no γ to J<17/2.
3112 10	7/2 ⁺ , 9/2 ⁺	EF		J π : L=4 in ($^3\text{He},\alpha$), (p,d).
3136.31 24	19/2 ⁻	J		J π : γ to 17/2 ⁻ is $\Delta J=1$, D.
3163 10		E		
3208 10		E		
3223.74 23	19/2 ⁻	J		J π : γ to 17/2 ⁻ is $\Delta J=1$, D.

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Adopted Levels, Gammas (continued)
¹⁴¹Nd Levels (continued)

E(level) [†]	Jπ [‡]	XREF	Comments
3262 10		E	
3315 10		E	
3355.55 22	21/2(-)	J	Jπ: γ to 19/2- is ΔJ=1, D+Q.
3369 10	3/2+, 5/2+	E	Jπ: L=2 in (d,t), (p,d).
3408 10	3/2+, 5/2+	EF	Jπ: L=2 in (³ He,α).
3498 10	3/2+, 5/2+	E	Jπ: L=2 in (p,d), (d,t).
3509.7 3	23/2(-)	J	Jπ: γ to 21/2- is ΔJ=1, D.
3578 10		E	
3618 10		E	
3657 10		E	
3890? 10		E	
3919.3 § 3	21/2(-)	J	Jπ: γ to 17/2- is ΔJ=2, Q.
4245.7 13	(23/2)	CD	1293γ intense γ ray placed in (α,3nγ) and (α,5nγ) at this level was relocated in (²⁴ Mg,α3nγ) at 13/2-, 2050. 1359γ also placed in (α,3nγ) at this level, was placed in (²⁴ Mg,α3nγ) at 4494 level, actually by reversing the order of 250γ and 1359γ. T _{1/2} : <1 ns was previously assigned to this level in (α,5nγ) from 1293γ. Jπ: γ from 25/2-, 4377 is ΔJ=1, D (however the placement at 4377 is tentative).
4377.37 25	25/2(-)	CD J	Jπ: γ to 21/2- is ΔJ=2, Q and γ to 23/2- is ΔJ=1, D.
4493.5 3	23/2(-)	CD J	Jπ: γ to 19/2- is ΔJ=2, Q and γ to 25/2- is ΔJ=1, D.
4582.4 17	(23/2)	CD	Jπ: γ to 21/2 is ΔJ=1 D, no γ to J<21/2.
4659.9 § 4	25/2(-)	J	Jπ: γ to 21/2- is ΔJ=2, Q.
5151.8 § 4	29/2(-)	J	Jπ: γ to 25/2- is ΔJ=2, Q.
5270.4 17	(25/2)	CD	Jπ: γ to 21/2 is ΔJ=2 Q, no γ to J<21/2.
5587.0 4	29/2(-)	J	Jπ: γ to 25/2- is ΔJ=2, Q.
5647.7 4	27/2(-)	J	Jπ: γ to 23/2- is ΔJ=2, Q.
5836.0 § 5	33/2(-)	J	Jπ: γ to 29/2- is ΔJ=2, Q.
5994.9 # 4	29/2(-)	J	Jπ: γ to 27/2- is ΔJ=1, D.
5996.1 4		J	
6138.9 # 5	31/2(-)	J	Jπ: γ to 29/2- is ΔJ=1, D.
6309.6 # 5	33/2(-)	J	Jπ: γ to 31/2- is ΔJ=1, D.
6559.7 # 6	35/2(-)	J	Jπ: γ to 33/2- is ΔJ=1, D+Q.
6577.7 @ 5	33/2(-)	J	Jπ: γ to 31/2- is ΔJ=1, D.
6767.5 @ 6	35/2(-)	J	Jπ: γ to 33/2- is ΔJ=1, D+Q.
6794.3 § 5	37/2(-)	J	Jπ: γ to 33/2- is ΔJ=2, Q.
7013.3 @ 6	(37/2-)	J	Jπ: γ to 35/2- is ΔJ=(1), (D+Q).
7039.8 # 6	37/2(-)	J	Jπ: γ to 35/2- is ΔJ=1, D.
7448.0 § 6	41/2(-)	J	Jπ: γ to 37/2- is ΔJ=2, Q.
7497.6 # 6	39/2(-)	J	Jπ: γ to 37/2- is ΔJ=1, D.
7909.7 # 7	41/2(-)	J	Jπ: γ to 39/2- is ΔJ=1, D.
8236.1 § 6	45/2(-)	J	Jπ: γ to 41/2- is ΔJ=2, Q.
8262.4 # 7	(43/2-)	J	Jπ: γ to 41/2- is ΔJ=(1), (D).
8646.6 6		J	
9365.3 § 6	49/2(-)	J	Jπ: γ to 45/2- is ΔJ=2, Q.

[†] From least-squares fit to Eγ data (γ's with no listed uncertainties were assigned ΔEγ=1 keV for the fit). χ² norm =2.9 greater than χ² critical=1.5.

[‡] All the levels from (²⁴Mg,α3nγ) above g.s. have negative parity tentatively assigned based on calculations and systematics (2011Bh01). Also based on the type of the reaction the J values generally increase with increasing energy.

§ (A): Band based on 21/2- (¹²⁴Sn(²⁴Mg,α3nγ), 2011Bh01).

(B): Possible 5-qp band based on 29/2- (¹²⁴Sn(²⁴Mg,α3nγ), 2011Bh01). Proposed configuration=vh_{11/2}⁻¹⊗ π(d_{5/2}g_{7/2})₆⁻²(h_{11/2})₁₀².

@ (C): Band based on 33/2- (¹²⁴Sn(²⁴Mg,α3nγ), 2011Bh01).

γ(¹⁴¹Nd)

All data for the transitions for which energy uncertainties are given are from decay data sets and from (²⁴Mg,α3nγ).

Data for other transitions are from (p,nγ), (α,3nγ), or (α,5nγ).

E(level)	Eγ	Iγ	Mult.	δ	α	Comments
193.684	193.67 5	100	M1+E2	0.39 2	0.221	B(M1)(W.u.)=0.00184 24; B(E2)(W.u.)=4.4 7.
756.51	756.51 5	100	M4		0.0916	B(M4)(W.u.)=1.94 3.
1223.24	1029.60 5	7.0 7				

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Nd})$ (continued)

E(level)	E γ	I γ	Mult.	Comments
1223.24	1223.26 5	100 5	E2,M1	
1345.48	1345.52 5	100		
1403.4	646.9 1	100		
1416.1	659.6	100		
1564.78	1371.0 1	13 1		
	1564.68 7	100 5	M1+(E0)	
1581.65	1582.0 1	100		
1596.99	1403.14 6	95 5	E2,M1	
	1596.87 7	100 5	(E2)	
1624.8	280.0	100	(D)	
1670.5	447.3	100		
1715.2	311.8	100		
1804.8	1611.3	100		
	1804.6	89		
1808.31?	1051.8 3	100 10		
	1808.3 1	1.4 5		
1820.46	597.1 1	20 2		
	1626.70 7	100 10		
	1820.5 1	27 3		
1870.8	647.6	100		
1876.0	278.6	5.3		
	530.7	37.4		
	652.8	100		
	1876.2	9.9		
1890.3	1696.7	100		
	1890.2	89		
1897.3	299.8	13.6		
	674.1	4.0		
	1703.9	37.6		
	1897.6	100		
1967.55	403.2 2	2.5 3		
	564.4	1.9		
	622.01 5	100 5		
	744.3 1	5.0 6		
	1967.6 1	20 2		
2018.8	1262.3	100		
2049.69	1293.1 2	100	D+Q [†]	
2066.39	1872.7 1	37 4		
	2066.4 1	100 13		
2073.61	1880.0 1	52 5	D,E2	
	2073.9 9	100 10	D,E2	
2109.38	289.0 2	6.2 6		
	544.0 1	2.1 2		
	886.22 5	100 5	E2	
	2109.6 1	3.1 4		
2145.37	922.8	42.9		
	1952.4	10.2		
	2145.3 2	100		
2202.9	184.1	76		
	1446.3	100		
2209.41	587.2 20	33 3		E γ ,I γ : from (α ,3n γ).
	1452.9 2	100 6	D+Q	E γ : from (^{24}Mg , α 3n γ); 1454.5 in (α ,3n γ) and (α ,5n γ). I γ : from (α ,3n γ).
2221.0	400.5	23		
	997.8	100		
2246.55	180.2 1	22 2		
	901.1 1	39 3		
	1023.2 1	100 10		
	2052.9 1	84 10		
	2246.5 1	48 6		
2265.22	2265.2 2	100		
2303.64	706.0 1	21 4		
	739.1 1	25 3		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Nd})$ (continued)

E(level)	E_γ	I_γ	Mult.	Comments
2303.64	958.5 1	58 4		
	1080.6 1	46 4		
	2303.5 1	100 13		
2311.8	966.2 1	100		
	2312.0	29.6		
2327.47	277.8 2	100	D+Q [†]	
2336.02	2336.0 2	100		
2349.3	1593.1	100	D+Q	
2354.36	2160.6 2	20 4		
	2354.4 2	100 10		
2365.6	2171.9	100		
2370.8	2177.2	100		
	2370.7	7		
2388.53	1043.1 1	67 8		
	2388.3 2	100 8		
2429.62	2429.6 2	100		
2439.5	2439.5	100		
2460.2	2266.5	100		
	2460.1	4.6		
2463.45	1118.0 1	100 22		
	2463.3 2	100 22		
2505.47	432.2 2	22 4		
	538.0 2	100 14		
	1282.0 2	31 6		
	2311.7 2	35 7		
	2505.3 2	42 4		
2514.82	2514.8 2	100		
2537.49	190.0 25	4.2 6		E_γ, I_γ : from ($\alpha, 3n\gamma$).
	487.7 2	19.4 12	D [†]	E_γ, I_γ : from ($^{24}\text{Mg}, \alpha 3n\gamma$).
	1781.0 2	100 7	Q [†]	E_γ : from ($^{24}\text{Mg}, \alpha 3n\gamma$).
2541.55	214.1 2	100	(D) [†]	
2619.03	2619.0 2	100		
2732.53	2732.5 2	100		
2803.9	2803.9 4	100		
2805.47	596.1 2	100	D [†]	
2829.55	779.8 2	75 5	D+Q [†]	
	2073.0 2	100 6	Q [†]	
2865.3	2865.3 4	100		
2886.43	56.7 3	4.8 8		E_γ, I_γ : from ($\alpha, 3n\gamma$) with uncertainty on E_γ added by evaluator.
	81.0 2	8.4 9		
	344.9 2	9.7 8		
	348.9 2	100 6	D [†]	
	836.8 2	33.1 19	Q [†]	
2886+x?	x [‡]			
2944.68	1363.1 1	67 16		
	2750.8 2	50 8		
	2943.9 5	100 25		
2951.3	64.5	100	D	
3056.06	1088.4 1	100 19		
	1235.4 1	47 10		
	1474.7 1	41 10		
	3056.5 5	16 3		
3104.6	152.9	100 8	D	
	218.5	38 4		
3136.31	249.9 2	100	D [†]	γ ray placed at 4494 in ($\alpha, 3n\gamma$) is replaced in ($^{24}\text{Mg}, \alpha 3n\gamma$) at this level by reversing the order in the cascade of 250 γ and 1357 γ .
3223.74	337.4 2	100	D [†]	
3355.55	131.9 2	100 6	D+Q [†]	
	469.0 2	22.5 22		
3509.7	154.1 2	100	D [†]	
3919.3	1032.9 2	100	Q [†]	
4245.7	1141.1	100		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Nd})$ (continued)

E(level)	E γ	I γ	Mult.	Comments
4377.37	130.5 $\frac{1}{2}$ 7		D	E γ , I γ : γ observed only in (α ,3n γ) and (α ,5n γ), but not in (^{24}Mg , α 3n γ) (uncertainty added by evaluator).
	867.7 2	66 13	D $\frac{1}{2}$	
	1021.8 2	100 12	Q $\frac{1}{2}$	
4493.5	116.1 2	13.1 9	D $\frac{1}{2}$	
	1357.2 2	100 5	Q $\frac{1}{2}$	1359 γ placed previously at 4246 level in (α ,3n γ) was relocated at this level in (^{24}Mg , α 3n γ) by reversing the order of 250 γ and 1359 γ .
4582.4	336.7	100	D	
4659.9	740.6 2	100	Q $\frac{1}{2}$	
5151.8	491.9 2	100	Q $\frac{1}{2}$	
5270.4	1024.7	100	Q	
5587.0	1209.6 2	100	Q $\frac{1}{2}$	
5647.7	1154.2 2	100	Q $\frac{1}{2}$	
5836.0	684.2 2	100	Q $\frac{1}{2}$	
5994.9	347.2 2	100	D $\frac{1}{2}$	
5996.1	409.1 2	100		
6138.9	144.0 2	100	D $\frac{1}{2}$	
6309.6	170.7 2	100	D $\frac{1}{2}$	
6559.7	250.1 2	100	D+Q $\frac{1}{2}$	
6577.7	438.8 2	100	D $\frac{1}{2}$	
6767.5	189.8 2	100	D+Q $\frac{1}{2}$	
6794.3	958.3 2	100	Q $\frac{1}{2}$	
7013.3	245.8 2	100	(D+Q) $\frac{1}{2}$	
7039.8	480.1 2	100	D $\frac{1}{2}$	
7448.0	653.7 2	100	Q $\frac{1}{2}$	
7497.6	457.8 2	100	D $\frac{1}{2}$	
7909.7	412.1 2	100	D $\frac{1}{2}$	
8236.1	788.1 2	100	Q $\frac{1}{2}$	
8262.4	352.7 2	100	(D) $\frac{1}{2}$	
8646.6	2086.9 2	100		
9365.3	1129.1 2	100	Q $\frac{1}{2}$	

$\frac{1}{2}$ From DCO ratio measurements in (^{24}Mg , α 3n γ). According to 2011Bh01 all transitions are stretched.

$\frac{1}{2}$ Placement of transition in the level scheme is uncertain.

(A) Band based on 21/2-

(B) Possible 5-qp band based on 29/2-

(C) Band based on 33/2-

$^{141}_{60}\text{Nd}_{81}$

^{141}Nd IT Decay (62.0 s) 1988Ch39

Parent ^{141}Nd : E=756.51 5; $J\pi=11/2^-$; $T_{1/2}=62.0$ s 8; %IT decay=99.925 25.

^{141}Nd -%IT decay: according to 1988Ch39 the sum of the three estimated branches from the ^{141}Nd ϵ decay (62.0 s) is less than 0.05% (see β^+, ϵ Data table in ^{141}Nd ϵ decay (62.0 s) dataset) leaving the difference to 100% to the ^{141}Nd IT decay (62.0 s) here adopted.

Measured: γ , $\gamma(t)$, K x ray (1968Be28, 1967Ge09, 1969Ja02, 1972De23).

 ^{141}Nd Levels

E(level)	$J\pi$	$T_{1/2}$	Comments
0.0	3/2+		
756.51 5	11/2-	62.0 s 8	%IT>99.95.

 $\gamma(^{141}\text{Nd})$

E_γ	E(level)	$I_\gamma^\dagger$	Mult.	α	$I(\gamma+\text{ce})^\dagger$	Comments
756.51 5	756.51	91.6	M4	0.0916	100	E_γ : from 1988Ch39. Mult.: $\alpha(K)_{\text{exp}}=0.084$ 12 from K x ray/ I_γ (1970Gr23).

† Absolute intensity per 100 decays.

Decay Scheme

Intensity: $I(\gamma+\text{ce})$ per
100 parent decays
%IT=99.925 25

^{141}Pm ϵ Decay 1976Za03

Parent ^{141}Pm : E=0.0; $J\pi=5/2^+$; $T_{1/2}=20.90$ min 5; Q(g.s.)=3670 14; % ϵ +% β^+ decay=100.

Measured: γ , $\gamma\gamma$ (1976Za03, 1975Ya04, 1970Ch29), $\gamma^+\gamma$ coin (1975Ya04), ce (1970Ch29), β^+ (1970Ch29, 1952Ki25).

Decay scheme is that of 1976Za03; no uncertainties in I_ϵ were given.

 ^{141}Nd Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	3/2+		
193.7 1	1/2+	1.17 ns 15	$T_{1/2}$: from 1970Ch29.
756.7 1	11/2-	62.0 s 8	
1223.3 1	5/2+		
1345.52 5	7/2+		
1403.6 2			
1564.68 7	(3/2)+		
1582.0 1			
1596.9 7	(5/2, 3/2)+		
1808.3? 2			
1820.5 1	5/2+, 3/2+		
1897.2 1			
1967.6 1	7/2+		

Continued on next page (footnotes at end of table)

^{141}Pm ϵ Decay $^{1976}\text{Za03}$ (continued) **^{141}Nd Levels (continued)**

E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
2066.4 1	3/2+, 5/2+	2311.4 2	7/2+, 9/2+	2514.8 2	(7/2)+
2073.8 1	(3/2+, 5/2+)	2336.0 2	(7/2+)	2619.0 2	
2109.6 1	3/2+, 5/2+	2354.4 2	(3/2, 5/2+)	2732.5 2	
2145.3 2		2388.3 2	7/2+	2803.9 4	(3/2+, 5/2+)
2246.5 1		2429.6 2		2865.3 4	
2265.2 2		2463.3 2		2944.4 4	3/2+, 5/2+
2303.4 1	7/2+	2505.3 2	3/2+, 5/2+	3056.5 3	7/2+

† Adopted values.

 β^+, ϵ Data

$\epsilon + \beta^+$ feeding of g.s. was determined from total annihilation intensity and intensity balance for each level using ϵ/β^+ from theory.

E ϵ	E(level)	$I\beta^+^\dagger$	$I\epsilon^\dagger$	Log ft	$I(\epsilon + \beta^+)^\dagger$
(614 14)	3056.5		0.031 4	6.94 6	0.031 4
(726 14)	2944.4		0.0123 19	7.50 7	0.0123 19
(805 14)	2865.3		0.0024 5	8.30 10	0.0024 5
(866 14)	2803.9		0.022 5	7.41 10	0.022 5
(938 14)	2732.5		0.0033 10	8.30 14	0.0033 10
(1051 14)	2619.0		0.026 4	7.51 7	0.026 4
(1155 14)	2514.8		0.0043 10	8.38 11	0.0043 10
(1165 14)	2505.3		0.153 15	6.83 5	0.153 15
(1207 14)	2463.3		0.026 5	7.63 9	0.026 5
(1240 14)	2429.6		0.026 4	7.66 7	0.026 4
(1282 14)	2388.3		0.095 9	7.12 5	0.095 9
(1316 14)	2354.4		0.051 6	7.42 6	0.051 6
(1334 14)	2336.0		0.0119 25	8.06 10	0.0119 25
(1367 14)	2303.4		0.284 23	6.71 4	0.284 23
(1405 14)	2265.2	4.8×10^{-5} 10	0.034 4	7.65 6	0.034 4
(1424 14)	2246.5	0.00074 13	0.43 4	6.56 5	0.43 4
(1525 14)	2145.3	7.2×10^{-5} 19	0.017 4	8.03 11	0.017 4
(1560 14)	2109.6	0.0151 19	2.70 19	5.85 4	2.72 19
(1596 14)	2073.8	0.0067 9	0.93 9	6.33 5	0.94 9
(1604 14)	2066.4	0.00049 9	0.065 11	7.49 8	0.065 11
(1702 14)	1967.6	0.0136 15	1.00 8	6.36 4	1.01 8
(1773 14)	1897.2	0.00200 22	0.102 9	7.38 4	0.104 9
(1850 14)	1820.5	0.0070 12	0.25 4	7.03 7	0.26 4
(1862 14)	1808.3?	0.0029 4	0.098 11	7.44 5	0.101 11
(2073 14)	1596.9	0.092 7	1.43 9	6.37 3	1.52 10
(2105 14)	1564.68	0.057 5	0.79 7	6.64 4	0.85 7
(2324 14)	1345.52	0.025 9	0.19 7	7.36 17	0.21 8
(2447 14)	1223.3	0.35 5	2.0 3	6.39 6	2.3 3
3730 40	0.0	49.3 6	39.4 5	5.437 8	88.7 7

† Absolute intensity per 100 decays.

 $\gamma(^{141}\text{Nd})$

$\alpha(K)\text{exp}$ were derived from I_γ (1976Za03) and $\text{Ice}(K)$ (1970Ch29) and normalized to $\alpha(K)=0.191$ for $M1+E2$ 194 γ with $\delta=0.39$ 2.

I_γ normalization: from $I_\gamma(\gamma^\pm)=2385$, balance of I_γ from each level and theoretical ϵ/β^+ .

E γ	E(level)	$I\gamma^\pm$	Mult.	$\delta^\dagger$	α	Comments
180.2 1	2246.5	0.68 7				
193.67 5	193.7	33.9 17	M1+E2	0.39 2	0.221 4	Mult., δ : K/L+=4.92 10, E2/M1=0.15 4 (1970Ch29).
289.0 2	2109.6	3.2 3				
403.2 2	1967.6	0.45 6				
432.2 2	2505.3	0.31 6				
538.0 2	2505.3	1.4 2				

Continued on next page (footnotes at end of table)

^{141}Pm ϵ Decay 1976Za03 (continued) $\gamma(^{141}\text{Nd})$ (continued)

E_γ	E(level)	$I\gamma^\dagger$	Mult.	α	Comments
544.9 1	2109.6	1.1 1			
597.1 1	1820.5	1.2 1			
622.01 5	1967.6	18.0 9		0.00244	Mult.: (E1) from $\alpha(\text{K})\text{exp}=0.0040 +12-6$ in conflict with placement.
646.9 1	1403.6	1.4 2			
706.0 1	2303.4	0.5 1			
739.1 1	2303.4	0.59 6			
744.3 1	1967.6	0.9 1			
756.7 1	756.7	1.8 2	M4	0.0915	Mult.: from ^{141}Nd IT decay.
886.22 5	2109.6	51.4 26	E2	0.00291	Mult.: $\alpha(\text{K})\text{exp}=0.0020$ 5.
901.1 1	2246.5	1.2 1			
958.5 1	2303.4	1.4 1			
966.2 1	2311.4	1.9 2			
1023.2 1	2246.5	3.1 3			
1029.60 5	1223.3	7.0 7			
1043.1 1	2388.3	0.8 1			
1051.8 1	1808.3?	2.1 2			
1080.6 1	2303.4	1.1 1			
1088.4 1	3056.5	0.32 6			
1118.0 1	2463.3	0.27 6			
1223.26 5	1223.3	100 5	E2,M1	0.0018 4	Mult.: $\alpha(\text{K})\text{exp}=0.0013$ 4.
1235.4 1	3056.5	0.15 3			
1282.0 1	2505.3	0.44 9			
1345.52 5	1345.52	28.0 14			Mult.: $\alpha(\text{K})\text{exp}=0.0036$ 10.
1363.1 1	2944.4	0.08 2			
1371.0 1	1564.68	2.3 2			
1403.14 6	1596.9	15.9 8	E2,M1	0.00138 22	Mult.: $\alpha(\text{K})\text{exp}=0.0016$ 10.
1474.7 1	3056.5	0.13 3			
1564.68 7	1564.68	17.8 9	M1+(E0)	1.32×10^{-3}	Mult.: $\alpha(\text{K})\text{exp}=0.0049$ 10.
1582.0 1	1582.0	0.22 4			
1596.87 7	1596.9	16.7 8	(E2)	9.89×10^{-4}	Mult.: $\alpha(\text{K})\text{exp}=0.0014$ 8.
1626.70 7	1820.5	6.0 6			
1703.6 1	1897.2	1.2 1			
1808.3 1	1808.3?	0.03 1			
1820.5 1	1820.5	1.6 2			
1872.7 1	2066.4	0.56 6			
1880.0 1	2073.8	6.9 7	D,E2		Mult.: $\alpha(\text{K})\text{exp}<0.0018$.
1897.2 1	1897.2	1.0 1			
1967.6 1	1967.6	3.6 4			
2052.9 1	2246.5	2.6 3			
2066.4 1	2066.4	1.5 2			
2073.79 9	2073.8	13.3 13	D,E2		Mult.: $\alpha(\text{K})\text{exp}<0.0012$.
2109.6 1	2109.6	1.6 2			
2145.3 2	2145.3	0.36 7			
2160.6 2	2354.4	0.18 4			
2246.5 1	2246.5	1.5 2			
2265.2 2	2265.2	0.72 7			
2303.5 1	2303.4	2.4 3			
2311.7 2	2505.3	0.49 10			
2336.0 2	2336.0	0.25 5			
2354.4 2	2354.4	0.89 9			
2388.3 2	2388.3	1.2 1			
^x 2418.6 2		0.16 3			
2429.6 2	2429.6	0.55 6			
2463.3 2	2463.3	0.27 6			

E_γ	E(level)	$I\gamma^\dagger$
2505.3 2	2505.3	0.59 6
2514.8 2	2514.8	0.09 2
^x 2601.7 2		0.27 5
2619.0 2	2619.0	0.55 6
2732.5 2	2732.5	0.07 2
2750.8 2	2944.4	0.06 1
2803.9 4	2803.9	0.46 9
2865.3 4	2865.3	0.05 1
2943.9 5	2944.4	0.12 3
3056.5 5	3056.5	0.05 1

† If no value given it was assumed $\delta=1.00$ for E2/M1, $\delta=1.00$ for E3/M2 and $\delta=0.10$ for the other multiplicities.

‡ For absolute intensity per 100 decays, multiply by 0.0474 25.

^x γ ray not placed in level scheme.

^{141}Pm ϵ Decay 1976Za03 (continued)

Decay Scheme

Intensities: I(γ +ce) per 100 parent decays

$^{141}_{61}\text{Pm}_{80}$
 $5/2+$ 0.0 20.90 min
 $\% \epsilon + \% \beta^+ = 100$
 $Q^+ = 3670^{14}$

^{141}Pm ϵ Decay 1976Za03 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{141}_{61}\text{Pm}_{80}$ 5/2+ 0.0 20.90 min
 $\% \epsilon + \% \beta^+ = 100$
 $Q^+ = 3670^{14}$

¹²⁴Sn(²⁴Mg,α3nγ) 2011Bh01

Includes ¹³⁰Te(¹⁶O,5nγ).

2011Bh01: E(²⁴Mg)=107 MeV, Measured Eγ, Iγ, γγ, γγ(θ)(DCO) using INGA array (18 Compton-shielded clover detectors);

E(¹⁶O)=80–85 MeV, measured Eγ, Iγ, γγ, γγ(θ)(DCO) using GDA array (9 Compton-shielded Ge detectors, 1 clover, 14 BGO).

2003LiZU: ¹³⁰Te(¹⁶O,5nγ) E(¹⁶O)=85 MeV; only give level scheme that generally confirms that of 2011Bh01.

All the data are from 2011Bh01.

¹⁴¹Nd Levels

E(level) [†]	Jπ [‡]	T _{1/2} [§]	Comments
0.0	3/2+	2.49 h 3	%ε+%β ⁺ =100.
756.51 5	11/2-	62.0 s 8	%IT=100; %ε+%β ⁺ <0.05.
2049.69 14	13/2-		Evaluator's note: There is an intensity imbalance of -15 4 at this level.
2209.40 18	15/2-		Evaluator's note: There is an intensity imbalance of -10 1 at this level.
2327.48 22	(15/2-)		
2537.49 16	15/2-		
2541.57 22	(17/2-)		
2805.48 21	17/2-		Evaluator's note: There is an intensity imbalance of -15 3 at this level.
2829.51 17	15/2-		
2886.46 17	17/2-		Evaluator's note: There is an intensity imbalance of -16 9 at this level. Imbalance may be due to missing intensity of 57-keV gamma ray.
3136.34 25	19/2-		
3223.77 24	19/2-		
3355.58 23	21/2-		
3509.7 3	23/2-		
3919.4# 3	21/2-		
4377.4 3	25/2-		
4493.5 3	23/2-		
4660.0# 4	25/2-		
5151.9# 4	29/2-		
5587.0 4	29/2-		
5647.7 4	27/2-		
5836.1# 5	33/2-		
5994.9@ 4	29/2-		
5996.1 4			
6138.9@ 5	31/2-		
6309.6@ 5	33/2-		
6559.7@ 6	35/2-		
6577.7& 5	33/2-		
6767.5& 6	35/2-		
6794.4# 5	37/2-		
7013.3& 6	(37/2-)		
7039.8@ 6	37/2-		
7448.1# 6	41/2-		
7497.6@ 6	39/2-		
7909.7@ 7	41/2-		
8236.2# 6	45/2-		
8262.4@ 7	(43/2-)		
8646.6 6			
9365.3# 6	49/2-		Jπ: From Table I of 2011Bh01, not listed in authors' Fig. 1.

[†] From least-squares fit to Eγ data.

[‡] Jπ values are from 2011Bh01 – they can differ from those in Adopted Levels, Gammas dataset.

[§] From Adopted Levels.

(A): Band based on 21/2-.

@ (B): Possible 5-qp band based on 29/2-. Proposed (2011Bh01) configuration=vh_{11/2}⁻¹⊗ π(d_{5/2}g_{7/2})₆⁻²(h_{11/2})₁₀⁻².

& (C): Band based on 33/2-.

$^{124}\text{Sn}(^{24}\text{Mg},\alpha 3n\gamma)$ 2011Bh01 (continued) $\gamma(^{141}\text{Nd})$

DCO ratios correspond to angles of 99° and 153° with gates on stretched quadrupoles and dipoles. Expected values are 1.0 for stretched quadrupoles and 0.5 for stretched dipoles when gating on quadrupoles. Expected values are 2.0 for stretched quadrupoles and 1.0 for stretched dipoles when gating on dipoles. Mixed transitions will have ratios in between these values.

$E\gamma^\ddagger$	E(level)	I_γ	Mult.§	$\alpha^\dagger$	Comments
(57)	2886.46				
81.0 2	2886.46	7.4 8	[M1]	2.59	
116.1# 2	4493.5	10.7 7	M1	0.925	DCO=1.10 21.
131.9# 2	3355.58	31.5 18	M1+E2	0.73 9	DCO=0.68 14.
144.0@ 2	6138.9	35.5 21	M1	0.504	DCO=0.56 12.
154.1# 2	3509.7	16.4 11	M1	0.417	DCO=0.45 15.
170.7@ 2	6309.6	21.4 14	M1	0.314	DCO=0.48 15.
189.8# 2	6767.5	11.2 8	M1+E2	0.234	DCO=0.83 16.
214.1# 2	2541.57	9.6 6	(M1)	0.1687	DCO=0.91 22.
245.8# 2	7013.3	9.5 6	(M1+E2)	0.108 9	DCO=0.83 24.
249.9@ 2	3136.34	89 4	M1	0.1111	DCO=0.53 8.
250.1# 2	6559.7	20.2 16	M1+E2	0.102 9	DCO=0.85 13.
277.8# 2	2327.48	12.1 9	(M1+E2)	0.075 9	DCO=0.83 21.
337.4@ 2	3223.77	46.3 25	M1	0.0502	DCO=0.48 12.
344.9 2	2886.46	8.5 7			
347.2# 2	5994.9	67 3	M1	0.0466	DCO=0.91 14.
348.9@ 2	2886.46	88 5	M1	0.0460	DCO=0.49 8.
^x 349.2		23.7 24			
352.7# 2	8262.4	11.7 9	(M1)	0.0447	DCO=1.09 22.
409.1 2	5996.1	9.3 8			
412.1# 2	7909.7	13.5 9	M1	0.0299	DCO=1.12 17.
438.8# 2	6577.7	12.8 8	M1	0.026	DCO=1.01 16.
457.8# 2	7497.6	14.6 8	M1	0.0229	DCO=0.96 17.
469.0 2	3355.58	7.1 7			
480.1# 2	7039.8	16.1 10	M1	0.0203	DCO=1.11 15.
487.7# 2	2537.49	19.4 12	M1	0.0195	DCO=1.09 14.
491.9@ 2	5151.9	13.4 10	E2	0.01230	DCO=0.99 15.
596.1# 2	2805.48	11.5 9	M1	0.01180	DCO=1.25 16.
653.7@ 2	7448.1	9.3 9	E2		DCO=1.14 15.
684.2@ 2	5836.1	11.4 8	E2		DCO=1.05 14.
740.6@ 2	4660.0	16.1 8	E2		DCO=1.09 14.
756.51 5	756.51		M4		$E\gamma$, Mult.: from Adopted Gammas.
779.8@ 2	2829.51	18.6 12	M1+E2		DCO=0.63 13.
788.1@ 2	8236.2	8.6 8	E2		DCO=1.10 16.
					DCO=1.1 16 in Table I of 2011Bh01 appears to be a misprint.
836.8# 2	2886.46	29.1 17	E2		DCO=1.75 16.
867.7# 2	4377.4	10.7 21	M1		DCO=0.48 15.
958.3@ 2	6794.4	9.8 9	E2		DCO=0.99 16.
1021.8# 2	4377.4	16.1 20	E2		DCO=1.92 16.
1032.9@ 2	3919.4	17.8 13	E2		DCO=1.03 15.
1129.1@ 2	9365.3	7.0 8	E2		DCO=1.18 20.
1154.2@ 2	5647.7	71 4	E2		DCO=0.97 11.
1209.6# 2	5587.0	12.3 7	E2		DCO=1.61 15.
1293.1# 2	2049.69	65 3	M1+E2		DCO=1.33 12.
1357.2@ 2	4493.5	82 4	E2		DCO=1.03 10.
1452.9 2	2209.40	1.38 10			
1781.0@ 2	2537.49	100 5	E2		DCO=1.00 8.
2073.0# 2	2829.51	24.9 15	E2		DCO=2.00 14.
2086.9 2	8646.6	7.5 9			

[†] From BrIcc code where 50% mixing was assumed for M1+E2 transitions.

[‡] Uncertainty of 0.2 keV is assigned on the basis of a general comment in 2011Bh01 that the uncertainty in energy is less than 0.15 keV.

[§] From 2011Bh01 based on DCO measurements by assuming that dipole transitions are M1's, quadrupole transitions are E2's, and the D+Q are M1+E2 (only those transitions having appreciable E2 components were given). There are no E1 assignments. All transitions are stretched. These assignments can differ from those in Adopted Levels, Gammas dataset.

DCO for gate on stretched dipole.

@ DCO for gate on stretched quadrupole.

^x γ ray not placed in level scheme.

$^{140}\text{Ce}(\alpha, 3n\gamma)$ 1977Lu04

E=40-52 MeV.

Measured: γ , $\gamma\gamma$, $\gamma(\theta)$, excitation function. ^{141}Nd Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
0.0	3/2+	62.0 s 8	1967.6	7/2+	3104.9	(21/2)
194.0	1/2+		2211.6	(11/2)-	4246.3	21/2
757.1	11/2-		2350.2	13/2	4376.8	25/2(-)
1224.3	5/2+		2539.3	15/2(-)	4494.9	23/2(-)
1344.3	7/2+		2831.1	15/2(-)	4583.0	(23/2)
1624.3	(9/2)		2887.5	17/2(-)	5271.0	(25/2)
1871.9			2952.0	(19/2)		

 † Adopted values. $\gamma(^{141}\text{Nd})$

E_γ	E(level)	$I_\gamma^\dagger$	Mult. ‡	Comments
56.7	2887.5	2.4 4		
64.5	2952.0	9.6 9		Mult.: $A_2 = -0.04$ 10.
x 68.7		0.4 1		
x 81.2		2.7 3		
x 86.0		0.8 1		
x 114.6		1.25 20		
121.0	1344.3	0.5 1		
x 129.0		1.3 2		
130.5	4376.8	9.0 6		Mult.: $A_2 = -0.25$ 4.
x 144.6		1.7 2		
x 146.2		3.4 2		
152.9	3104.9	7.3 6	D	Mult.: $A_2 = -0.40$ 8.
x 171.3		1.1 2		
190.0	2539.3	2.3 3		
194.0	194.0	1.3 2		
x 206.4		1.8 4		
218.5	3104.9	2.8 3		
x 246.9		4.0 4		
248.6	4494.9	9.0 7	D	Mult.: $A_2 = -0.16$ 7.
280.0	1624.3	5.3 5		
336.7	4583.0	7.8 8	D	Mult.: $A_2 = -0.17$ 6.
348.2	2887.5	50.0 25		
x 357.3		3.4 4		
x 487.5		9.8 10		E_γ : complex line.
587.2	2211.6	5.0 5		
622.4	1967.6	1.0 7		
647.6	1871.9	2.7 2		
757.1	757.1	220 10		
x 781.0		9.5 5		
x 839.0		11.0 5		
x 870.5		10.5 5		
1024.7	5271.0	9.0 8		
1030.5	1224.3	1.0 2		
x 1043.2		1.9 2		
1141.1	4246.3	3.5 5		
1224.3	1224.3	3.3 2		
1294.3 §	4246.3	42.5 25	D	Mult.: $A_2 = -0.87$ 12.
x 1324.5		2.3 3		
1344.5	1344.3	5.0 4		
x 1355.8		2.0 3		
1359.1 §	4246.3	12.5 8	Q	Mult.: $A_2 = +0.11$ 7.
x 1444.5		1.1 2		
1454.5	2211.6	15.0 9	D+Q	Mult.: $A_2 = -0.95$ 22.
x 1560.0		1.0 5		
x 1571.0		7.0 17		E_γ : observed only at $E(\alpha) = 45$ MeV.

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$^{140}\text{Ce}(\alpha,3n\gamma)$ 1977Lu04 (continued) **$\gamma(^{141}\text{Nd})$ (continued)**

E_γ	E(level)	$I_\gamma^\dagger$	Comments
1593.1	2350.2	12.7 15	I_γ : at $E(\alpha)=45$ MeV. Mult.: $A_2=+0.07$ 5.
^x 1705.0		2.0 2	
^x 1722.9		2.0 2	E_γ : observed only at $E(\alpha)=45$ MeV.
1782.2	2539.3	54.5 37	Mult.: $A_2=+0.08$ 5.
1967.6	1967.6	2.4 10	
2074.0	2831.1	18.5 12	

[†] Relative intensities at $E(\alpha)=40$ MeV.

[‡] $\gamma(\theta)$ at $E(\alpha)=52$ MeV assuming $A_4=0$.

[§] 1293 γ intense γ ray placed in $(\alpha,3n\gamma)$ and $(\alpha,5n\gamma)$ at this level was relocated in $(^{24}\text{Mg},\alpha 3n\gamma)$ at 13/2-, 2050. 1359 γ also placed in $(\alpha,3n\gamma)$ at this level, was placed in $(^{24}\text{Mg},\alpha 3n\gamma)$ at 4494 level, actually by reversing the order of 250 γ and 1359 γ .

^x γ ray not placed in level scheme.

 $^{141}\text{Pr}(\text{p},n\gamma)$ 1983Dr10

$E(\text{p})=5.35$ MeV.

Measured: γ , $\gamma\gamma$, excitation function at $E(\text{p})=3.85\text{--}5.35$ MeV.

 ^{141}Nd Levels

E(level)	$T_{1/2}$	E(level)	E(level)
0.0		1876.2	2312.0
193.5		1890.2	2355.6
756.6	62.0 s 8	1897.6	2365.4
1223.3		1967.8	2370.7
1345.7		2018.9	2388.3
1403.6		2066.7	2429.7
1416.2		2074.0	2439.5
1564.8		2110.3	2460.1
1597.4		2146.1	2464.2
1670.6		2202.9	2504.9
1715.3		2221.1	2515.8
1804.6		2247.3	
1820.7		2304.1	

 $\gamma(^{141}\text{Nd})$

E_γ	E(level)	$I_\gamma^\dagger$	E_γ	E(level)	$I_\gamma^\dagger$	E_γ	E(level)	$I_\gamma^\dagger$
184.1	2202.9	1.3	901.7	2247.3	0.5	1611.3	1804.6	0.9
193.5	193.5	84.6	922.8	2146.1	2.1	1627.5	1820.7	13.4
278.6	1876.2	0.7	958.5	2304.1	3.3	1696.7	1890.2	2.7
299.8	1897.6	4.8	966.2	2312.0	2.7	1703.9	1897.6	13.3
311.8	1715.3	15.0	997.8	2221.1	6.1	1804.6	1804.6	0.8
400.5	2221.1	1.4	1023.6	2247.3	0.8	1820.7	1820.7	4.9
447.3	1670.6	0.9	1029.8	1223.3	6.6	1873.2	2066.7	2.3
530.7	1876.2	4.9	1080.8	2304.1	0.6	1876.2	1876.2	1.3
538.0	2504.9	0.3	1118.8	2464.2	0.1	1880.5	2074.0	2.7
564.4	1967.8	0.2	1223.3	1223.3	100.0	1890.2	1890.2	2.4
597.6	1820.7	3.8	1262.3	2018.9	6.1	1897.6	1897.6	35.4
622.2	1967.8	10.4	1282.5	2504.9	0.3	1952.4	2146.1	0.5
647.1	1403.6	67.3	1345.7	1345.7	65.5	1967.8	1967.8	2.2
652.8	1876.2	13.1	1371.4	1564.8	5.4	2053.7	2247.3	1.5
659.6	1416.2	6.8	1403.9	1597.4	4.8	2066.7	2066.7	4.4
674.1	1897.6	1.4	1446.3	2202.9	1.7	2074.0	2074.0	4.0
706.8	2304.1	0.7	1564.8	1564.8	37.0	2110.3	2110.3	0.3
886.5	2110.3	6.2	1597.4	1597.4	14.3	2146.1	2146.1	4.9

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$^{141}\text{Pr}(\text{p},\text{n}\gamma)$ 1983Dr10 (continued) **$\gamma(^{141}\text{Nd})$ (continued)**

$E\gamma$	E(level)	$I\gamma^\dagger$	$E\gamma$	E(level)	$I\gamma^\dagger$	$E\gamma$	E(level)	$I\gamma^\dagger$
2171.9	2365.4	2.9	2355.6	2355.6	1.7	2464.2	2464.2	0.1
2177.2	2370.7	1.4	2370.7	2370.7	0.1	2504.9	2504.9	2.0
2247.3	2247.3	0.7	2388.3	2388.3	0.2	2515.8	2515.8	1.5
2266.5	2460.1	4.4	2429.7	2429.7	0.1			
2304.1	2304.1	2.8	2439.5	2439.5	0.3			
2312.0	2312.0	0.8	2460.1	2460.1	0.2			

 † Relative $I\gamma$. **$^{142}\text{Ce}(\alpha,5\text{n}\gamma)$ 1977Lu04**

E=51 MeV.

Measured: $\gamma(\theta)$, $\gamma\gamma$ (1977Lu04), $\gamma(\text{t})$ (1976Lu07).1782.2 γ and 348.2 γ have prompt and delayed ($T_{1/2}$ =26 ns 5) components. Delayed I(348 γ)=10 (1976Lu07). **^{141}Nd Levels**

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	3/2+		
757.1	11/2-	62.0 s 8	
1224.3	5/2+		
1344.3	7/2+		
1624.3	(9/2)		
2211.6	9/2-		
2350.2	13/2		
2539.3	15/2(-)		
2831.1	15/2(-)		
2887.5	17/2		$T_{1/2}$: 28 ns 5 was measured from 348.2 γ that in ($^{24}\text{Mg},\alpha 3\text{n}\gamma$) was shown to be a multiplet (344.9 γ , 347.2 γ , 348.9 γ , and 349.2 γ), reason for which it was not assigned to this level or other levels.
2952.0	(19/2)		
3104.9	(21/2)		
4246.3	21/2		$T_{1/2}$: <1 ns was previously assigned to this level from 1293 γ decay was moved to 2050 level where this γ ray was relocated (see Adopted Levels, Gammas and ($^{24}\text{Mg},\alpha 3\text{n}\gamma$) datasets).
4376.8	(23/2)		
4494.9	(23/2)		
4583.0	(23/2)		
5271.0	(25/2)		

 † Adopted values. **$\gamma(^{141}\text{Nd})$**

$E\gamma$	E(level)	Mult.	Comments
64.5	2952.0	D	Mult.: $A_2=-0.11$ 8, $A_4=+0.28$ 12.
121.0	1344.3		
130.5	4376.8	D	Mult.: $A_2=-0.16$ 7, $A_4=+0.09$ 10.
$^{x146.2}$			Mult.: $A_2=-0.18$ 5, $A_4=-0.14$ 7.
152.9	3104.9	D	Mult.: $A_2=-0.30$ 7, $A_4=-0.06$ 9.
$^{x246.9}$			Mult.: $A_2=-0.26$ 8, $A_4=-0.15$ 12.
248.6	4494.9	D	Mult.: $A_2=-0.11$ 2, $A_4=+0.04$ 3.
280.0	1624.3	(D)	Mult.: $A_2=-0.05$ 13, $A_4=+0.20$ 18.
336.7	4583.0	D	Mult.: $A_2=-0.14$ 6, $A_4=-0.05$ 9.
348.2	2887.5	D	Mult.: $A_2=-0.30$ 3, $A_4=+0.01$ 4.
$^{x487.5}$			Mult.: $A_2=-0.07$ 2, $A_4=+0.02$ 4.
757.1	757.1		Mult.: $A_2=-0.02$ 2, $A_4=+0.10$ 4.
$^{x781.0}$			Mult.: $A_2=-0.49$ 10, $A_4=-0.08$ 12.

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$^{142}\text{Ce}(\alpha,5n\gamma)$ 1977Lu04 (continued) $\gamma(^{141}\text{Nd})$ (continued)

$E\gamma$	E(level)	Mult.	Comments
$\times 870.5$			Mult.: $A_2=+0.33$ 5, $A_4=+0.03$ 9.
1024.7	5271.0	Q	Mult.: $A_2=+0.25$ 15.
1224.3	1224.3	(D)	Mult.: $A_2=-0.15$ 30.
1294.3	4246.3	D	Mult.: $A_2=-0.71$ 4, $A_4=+0.11$ 4.
1344.3	1344.3		
1454.5	2211.6	D+Q	Mult.: $A_2=-0.30$ 13, $A_4=+0.89$ 13.
1593.1	2350.2	D+Q	Mult.: $A_2=-0.06$ 9, $A_4=+0.30$ 13.
1782.2	2539.3	Q	Mult.: $A_2=+0.15$ 3, $A_4=+0.10$ 14.
2074.0	2831.1	Q	Mult.: $A_2=+0.30$ 60, $A_2=-0.07$ 10.

^x γ ray not placed in level scheme.

 $^{142}\text{Nd}(\text{p,d}), (\text{d,t})$ 1984Va33

E(p)=20.09, 28.06 MeV (1984Va33); 35 MeV (1971Jo04).

E(d)=10.07, 16.18 MeV (1984Va33); 17 MeV (1977El02,1971Fo10); 50 MeV (1978VaZS); 26 MeV (1976Be10).

Measured: $\sigma(E,\theta)$, DWBA analysis.

Resolution 15–20 keV for deuterons, 20–50 keV for tritons (1984Va33).

All data are from 1984Va33.

 ^{141}Nd Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}$	L	S	$E(\text{level})^\dagger$	$J\pi^\ddagger$	L	S
0.0	3/2+		2	3.57	2643			
192	1/2+		0	1.51	2705			
759	11/2-	62.0 s 8	5	7.48	2764			
1222	5/2+		2	2.57	2809	(5/2)+	2	0.04
1343	7/2+		4	1.72	2838			
1401	(7/2-)		(3)	0.02	2887			
1565	(5/2)+		2	0.24	2915	11/2-	5	0.68
1597	(3/2)+		2	0.04	2939	(5/2)+	2	0.24
1822	(5/2)+		2	0.76	3007	(5/2+)	(2)	0.04
1888	1/2+		0	0.20	3042	7/2+	4	0.64
1968	7/2+		4	0.37	3093	(1/2+)	(0)	0.02
2011					3112	7/2+	4	1.22
2070	(5/2)+		2	0.44	3163			
2111	(5/2)+		2	0.13	3208			
2180	1/2+		0	0.06	3262			
2208	11/2-		5	1.69	3315			
2247	(7/2-)		(3)	0.03	3369	(5/2)+	2	0.23
2310	7/2+		4 [§]	1.21	3407	(5/2)+	2	0.37
2349	(11/2-)		(5)	0.44	3498	(5/2)+	2	0.08
2384	7/2+		4	0.45	3578			
2512	(7/2+)		(4)	0.48	3618			
2536					3657			
2581	(7/2-)		(3)	0.20	3890?#			
2616	(11/2-)		(5)	0.12				

[†] $\Delta E=3$ to 11 from low energy to high energy levels.

[‡] Based on L, assumed for calculation of S.

[§] From 1984Va33, 1977El02, 1976Be10; L=5 in 1978VaZS.

From 1971Jo04.

$^{142}\text{Nd}(^3\text{He},\alpha)$ 1978VaZS,1977El02,1976Be10

E=75 MeV (1978VaZS), 24 MeV (1977El02), 25 MeV (1976Be10).

Measured: $\sigma(E,\theta)$, $\sigma(^3\text{He},\alpha)/\sigma(d,t)$, DWBA analysis. ^{141}Nd LevelsE, C²S are from 1977El02, except where noted otherwise.

E(level)	$J\pi^\dagger$	$T_{1/2}$	L	C ² S	Comments
0.0	3/2+		2	3.0	
194 10	1/2+		0	2.1	
757 10	11/2-	62.0 s 8	5	5.4	
1226 10	5/2+		2	1.8	
1343 10	7/2+		4	1.2	
1568 10	3/2+		2	0.10	
1822 10	5/2+		2	0.62	
1968 10	7/2+		4	0.41	
2071 10	5/2+		2	0.38	
2205 10	9/2-		5	0.9	
2313 10	11/2-		5	0.86	L: L=5 (1978VaZS). Others: L=4 (1976Be10,1977El02).
2343 [‡] 10	7/2+		(4)	0.75	
2385 [‡] 10	7/2+		4	0.35	
2924 10	11/2-		(5)	0.96	E(level): 2952 21 L=4 in 1978VaZS.
3041 10	7/2+		4	1.1	
3112 10	7/2+		4	1.8	E(level): 3137 25 in 1978VaZS; S=0.77.
3402 10	5/2+		2	0.45	

[†] Values assumed for calculations of C²S.[‡] E, L, C²S from 1976Be10. **$^{142}\text{Nd}(^{13}\text{C},^{14}\text{C})$ 1976Th05**

E=67.5 MeV.

Measured: $\sigma(E,\theta)$, DWBA analysis; resolution 70 keV. ^{141}Nd Levels

E(level) [†]	$J\pi^\dagger$	$T_{1/2}$	S	Comments
0.0	3/2+		3.4	
194	1/2+		1.9	
756	11/2-	62.0 s 8	6.8	
1223	5/2+		2.8	
1565	(3/2)+		0.76	
1820	5/2+, 3/2+		0.52	E(level): unresolved doublet 1820+1887. S: for J=5/2+.

[†] Adopted values. **$^{143}\text{Nd}(p,t)$ 1970Ya04,1971Ya10** $J\pi(^{143}\text{Nd})=7/2-$.

E=52.1 MeV.

Measured: $\sigma(E,\theta)$. ^{141}Nd Levels

E(level)	$T_{1/2}$	E(level)	$J\pi^\dagger$	L	[†] Adopted values.
0.0		1420 20	7/2-	0	
194		≈2220		(2)	
757	62.0 s 8				

Adopted Levels, GammasQ(β^-)=-4589 16; S(n)=10390 40; S(p)=3558 30; Q(α)=254 16 2012Wa38. ^{141}Pm Levels

Cross Reference (XREF) Flags

A ^{141}Sm ϵ Decay (10.2 min)
 B ^{141}Sm ϵ Decay (22.6 min)
 C $^{126}\text{Te}(^{19}\text{F},4n\gamma)$
 D $^{133}\text{Cs}(^{12}\text{C},4n\gamma)$

E $^{141}\text{Pr}(^3\text{He},3n\gamma)$
 F $^{141}\text{Pr}(\alpha,4n\gamma)$
 G $^{142}\text{Nd}(p,2n\gamma)$
 H $^{144}\text{Sm}(p,\alpha)$

E(level)	$J\pi^\dagger$	XREF	$T_{1/2}$	Comments
0.0	5/2+	ABCDEFGH	20.90 min 5	% ϵ +% β^+ =100. J π : atomic beam (1976Fu06), log ft =5.4 to 3/2+. T $_{1/2}$: from 1967B127. Other: 20.9 min 2 (1975Ya04), see 1959Gr98, 1952Ki25.
196.87 5	7/2+	BCDEFGH	0.23 ns 3	J π : 196.88 γ is (M1); M2 from 11/2-.
403.82 7	3/2+	A EFG		T $_{1/2}$: from ^{141}Sm ϵ decay (22.6 min) (1970ArZQ).
438.69 9	(1/2)+	A E GH		J π : γ to 5/2+ is $\Delta J=1$ M1+E2, log ft =5.8 via 1/2+ parent. J π : γ to 5/2+ is E2, excitation function in (p,2n γ), log ft =5.8 via 1/2+ parent; 3/2+ cannot be excluded.
628.62 7	11/2-	BCDEFGH	0.63 μ s 2	J π : γ to 5/2+ is E3, T $_{1/2}$. T $_{1/2}$: from (α ,4n γ) (1985Ar19). Others: 0.583 μ s 23 (1975Bu10), 0.59 μ s 2 (1980Pi03), 0.70 μ s 2 (1971WaZO), 0.218 μ s 9 (1970ArZQ).
728.36 10	3/2+	A EFG		J π : γ to 7/2+ is $\Delta J=2$, E2; log ft =6.7 via 1/2+ parent.
804.74 20		B G		
837.27 12	9/2+	B EFGH		J π : γ to 5/2+ is $\Delta J=2$ E2, log ft =7.0 via 11/2- parent.
858.55 15		E		
974.30 9	11/2+	BCDEFGH	<1.0 ns	J π : γ to 7/2+ is $\Delta J=2$ E2; log ft =6.8 via 11/2- parent. T $_{1/2}$: from (p,2n γ), (^3He ,3n γ); disagrees with T $_{1/2}$ =56 ns 11 from ϵ decay of ^{141}Sm (11/2-) (1970ArZQ); B(E2)(W.u.)=8 $\times 10^{-4}$ for T $_{1/2}$ =56 ns is an unreasonably small value.
1046.40 20		A		
1055.52 12	11/2-	F		J π : γ to 11/2- is $\Delta J=0$, M1+E2.
1108.31 12	9/2+	B EFGH		J π : γ to 5/2+ is much weaker than to 7/2+; γ to 7/2+ is $\Delta J=1$, M1+E2.
1153.43 10	7/2+	E G		J π : γ to 5/2+ is $\Delta J=1$, D+Q, γ to 7/2+ may be $\Delta J=0$, Q+D. Significant δ (not given) more likely is compatible with M1+E2 than with E1+M2.
1166.98 11	(9/2)-	B EFG		J π : γ to 11/2- is M1, $\Delta J=1$; no γ from J>11/2.
1242.6 3	7/2+	G		J π : γ to 5/2+ is $\Delta J=1$, (D+Q); γ to 7/2+ may be $\Delta J=0$, D+Q. Significant δ (not given) more likely is compatible with M1+E2 than with E1+M2.
1292.71 14	(3/2)+	A		J π : log ft =6.0 via 1/2+ parent, strong γ to 5/2+.
1313.20 11	13/2-	BCDEFG		J π : γ to 11/2- is $\Delta J=1$, (M1+E2).
1359.78 25	11/2, 7/2	FG		J π : γ to 7/2+ is $\Delta J=2$, Q or $\Delta J=0$, Q+D.
1414.64 11	(9/2-)	B EFG		J π : γ to 11/2- is $\Delta J=1$, (M1+E2).
1495.76 12	(1/2, 3/2)+	A		J π : allowed ϵ from 1/2+.
1510.68 12	15/2-	CDEFG		J π : γ to 11/2- is $\Delta J=2$ E2, no definite γ to J<11/2-.
1515.3 3		A		
1573.3? 12		EF		E(level): level resulting from the placement of 1068 γ +260 γ cascade in between 2641 and 1313 levels in (^3He ,3n γ) and (α ,4n γ); the reversed order proposed in (^{19}F ,4n γ) and (^{12}C ,4n γ) was adopted.
1692.8 4		G		
1794.91 22		B G		
1802.26 17		GH		
1834.1 4		B		
1874.5 4		EFGH		
1885.06 22		A		
1891.72 15	(19/2-)	D F		J π : γ to 15/2- is $\Delta J=2$, Q in (^{12}C ,4n γ) but $\Delta J=1$, D in (α ,4n γ).
1902.60 21	(1/2, 3/2)+	A		J π : allowed ϵ from 1/2+.
1970.05 12	15/2(+)	CDEFG		J π : γ to 11/2+ is $\Delta J=2$, (E2); no γ to J<11/2+.
1983.30 14	9/2-	B G		J π : log ft =5.79 via 11/2- parent, strong γ to 7/2+.
1992.0 4		A		

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Adopted Levels, Gammas (continued) ^{141}Pm Levels (continued)

E(level)	$J\pi^\dagger$	XREF	$T_{1/2}$	Comments
2004.66 20	(1/2, 3/2)+	A		$J\pi$: allowed ε from 1/2+.
2015.30 15	15/2-	C EFG		$J\pi$: γ to 13/2- is $\Delta J=1$, M1+E2; no γ to J<(13/2).
2037.98 20	(1/2, 3/2)+	A		$J\pi$: allowed ε from 1/2+.
2063.48 13		B		
2091.71 12	11/2-	B G		$J\pi$: γ to 9/2+ is E1, $\log ft=5.7$ via 11/2- parent.
2098.39 23		EFG		
2119.05 10	(9/2, 11/2, 13/2)-	B		$J\pi$: allowed ε from 11/2-.
2138.06 17	13/2(+)	CDE		$J\pi$: γ to 11/2+ is $\Delta J=1$, D+Q, no γ to J<11/2+.
2171.7 4		G		
2239.00 13	19/2-	CDEFG		$J\pi$: γ to 15/2- is $\Delta J=2$ E2, no γ to J<15/2-.
2349.52 16	19/2(-)	CD	54 ns 5	$J\pi$: γ to 19/2- is $\Delta J=1$, D+Q, no γ to J<19/2-.
				$T_{1/2}$: from 2004Bh01 ($^{12}\text{C}, 4n\gamma$)).
2361.3 4		E		
2381.68 21	15/2(-)	CD		$J\pi$: γ to 13/2- is $\Delta J=1$, D, no γ to J<13/2-.
2509.75 17	19/2-	CDEF		$J\pi$: γ to 15/2- is $\Delta J=2$ E2, no γ to J<15/2.
2530.75 17		CD F	>2 μs	$T_{1/2}$: from 1985Ar19 ($^{141}\text{Pr}(\alpha, 4n\gamma)$).
2554.40 17	21/2(-), 17/2(-)	F		$J\pi$: γ to 19/2- is $\Delta J=1$, D.
2574.4? 4		D	$\geq 2 \mu\text{s}^\ddagger$	E(level): energy of this level not well established ($^{12}\text{C}, 4n\gamma$)).
2623.22 12	17/2(+)	CDEFG		$J\pi$: γ to 15/2(+) is $\Delta J=1$ M1+E2 and γ to 13/2(+) is $\Delta J=2$ Q.
2623.60 25		C		
2640.00 21	21/2(-)	D		$J\pi$: γ to 19/2(-) is $\Delta J=1$ D+Q; no γ to J<19/2.
2641.62 22	17/2(-)	CDEF		$J\pi$: γ to 15/2(-) is $\Delta J=1$ D+Q; no γ to J<15/2.
2661.58 25	21/2(-)	CD		$J\pi$: γ to 19/2(-) is $\Delta J=1$ D+Q; no γ to J<19/2.
2702.35 21		B		
2703.20 15	21/2	CD F		$J\pi$: γ to 19/2(-) is $\Delta J=1$ D+Q, γ to 17/2(-) is $\Delta J=2$ Q.
2810.10 21	21/2(-)	CD		$J\pi$: γ to 19/2- is $\Delta J=1$ D+Q; no γ to J<19/2.
2824.6 4	(25/2-)	D		$J\pi$: γ to 21/2(-) is $\Delta J=(2)$ (Q); no γ to J<21/2.
2840.6 4		D		
2899.70 § 18	23/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 21/2(-) is $\Delta J=1$ D; no γ to J<21/2.
3079.3 6	27/2(-)	C		$J\pi$: γ to 23/2(-) is $\Delta J=2$ Q; no γ to J<23/2.
3098.6 4		D	$\leq 0.7 \text{ ns}^\ddagger$	
3122.6 3	25/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 21/2(-) is $\Delta J=2$ E2; no γ to J<21/2.
3157.6 4	23/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 21/2(-) is $\Delta J=1$ D+Q; no γ to J<21/2.
3246.80 20	25/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 23/2(-) is $\Delta J=1$ D+Q; no γ to J<23/2.
3257.2 8	31/2(-)	C		$J\pi$: γ to 27/2(-) is $\Delta J=2$ Q; no γ to J<27/2.
3333.1 9	33/2(-)	C		$J\pi$: γ to 31/2(-) is $\Delta J=1$ D+Q; no γ to J<31/2.
3465.80 20	25/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 23/2(-) is $\Delta J=1$ D+Q; no γ to J<23/2.
3581.5 § 6	27/2(-)	C		$J\pi$: γ to 23/2(-) is $\Delta J=2$ Q; no γ to J<23/2.
3702.60 $^\#$ 20	25/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 23/2(-) is $\Delta J=1$ D+Q; no γ to J<23/2.
3727.6 6	23/2(-)	C		$J\pi$: γ to 19/2(-) is $\Delta J=2$ Q; no γ to J<19/2.
3884.61 22	27/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 25/2(-) is $\Delta J=1$ D+Q; no γ to J<25/2.
3982.5 $^\#$ 6	27/2(-)	C		$J\pi$: γ to 25/2(-) is $\Delta J=1$ D+Q; no γ to J<25/2.
4063.68 21	27/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 25/2(-) is $\Delta J=1$ D+Q; no γ to J<25/2.
4075.6 6	(27/2-)	C	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 25/2(-) is $\Delta J=(1)$ (D+Q); no γ to J<25/2.
4116.0 8	27/2(-)	C		$J\pi$: γ to 23/2(-) is $\Delta J=2$ Q; no γ to J<23/2.
4270.6 § 8	31/2(-)	C		$J\pi$: γ to 27/2(-) is $\Delta J=2$ Q; no γ to J<27/2.
4335.2 $^\#$ 9	35/2(-)	C		$J\pi$: γ to 33/2(-) is $\Delta J=1$ D+Q and γ to 31/2(-) is $\Delta J=2$ Q.
4349.9 $^\#$ 8	29/2(-)	C		$J\pi$: γ to 27/2(-) is $\Delta J=1$ D+Q; no γ to J<27/2.
4376.2 6	(25/2-)	C		$J\pi$: γ to 23/2(-) is $\Delta J=(1)$ (D+Q); no γ to J<23/2.
4515.4 $^\#$ 10	37/2(-)	C		$J\pi$: γ to 35/2(-) is $\Delta J=1$ D+Q; no γ to J<35/2.
4625.68 23	29/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 27/2(-) is $\Delta J=1$ D+Q and γ to 25/2(-) is $\Delta J=2$ E2.
4683.6 9	35/2(-)	C		$J\pi$: γ to 31/2(-) is $\Delta J=2$ Q; no γ to J<31/2.
4721.83 22	29/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 27/2(-) is $\Delta J=1$ D+Q and γ to 25/2(-) is $\Delta J=2$ Q.
4773.5 $^\#$ 11	39/2(-)	C		$J\pi$: γ to 37/2(-) is $\Delta J=1$ D+Q; no γ to J<37/2.
4822.0 $^\#$ 9	31/2(-)	C		$J\pi$: γ to 29/2(-) is $\Delta J=1$ D+Q; no γ to J<29/2.
4862.22 $^\text{b}$ 23	31/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 29/2(-) is $\Delta J=1$ D+Q and γ to 27/2(-) is $\Delta J=2$ E2.
4916.6 § 9	35/2(-)	C		$J\pi$: γ to 31/2(-) is $\Delta J=2$ Q; no γ to J<31/2.
4916.7 3	31/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 29/2(-) is $\Delta J=1$ D+Q and γ to 27/2(-) is $\Delta J=2$ E2.
4938.3 10	37/2(-)	C		$J\pi$: γ to 35/2(-) is $\Delta J=1$ D+Q; no γ to J<35/2.
5047.3 10	39/2(-)	C		$J\pi$: γ to 37/2(-) is $\Delta J=1$ D+Q and γ to 25/2(-) is $\Delta J=2$ Q.
5088.0 $^\#$ 12	41/2(-)	C		$J\pi$: γ to 39/2(-) is $\Delta J=1$ D+Q; no γ to J<39/2.
5094.53 $^\text{b}$ 25	33/2(-)	CD	$\leq 0.7 \text{ ns}^\ddagger$	$J\pi$: γ to 31/2(-) is $\Delta J=1$ D+Q and γ to 29/2(-) is $\Delta J=2$ E2.
5152.1 11	(37/2-)	C		$J\pi$: γ to 35/2(-) is $\Delta J=(1)$ (D+Q); no γ to J<35/2.

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Adopted Levels, Gammas (continued)

¹⁴¹Pm Levels (continued)

E(level)	J $\pi^{\dagger}$	XREF	T _{1/2}	Comments
5337.8 4	37/2(-)	CD	≤ 0.7 ns ‡	J π : γ to 33/2(-) is $\Delta J=2$ E2; no γ to J<33/2.
5400.4 [#] 11	33/2(-)	C		J π : γ to 31/2(-) is $\Delta J=1$ D+Q; no γ to J<31/2.
5407.8 ^b 6	35/2(-)	C		J π : γ to 33/2(-) is $\Delta J=1$ D+Q; no γ to J<33/2.
5435.5 4		D	≤ 0.7 ns ‡	
5459.7 [@] 13	43/2(-)	C		J π : γ to 41/2(-) is $\Delta J=1$ D+Q; no γ to J<41/2.
5482.6 10	41/2(-)	C		J π : γ to 39/2(-) is $\Delta J=1$ D+Q and γ to 37/2(-) is $\Delta J=2$ Q.
5512.9 6	(39/2-)	C		J π : γ to 37/2(-) is $\Delta J=(1)$ (D+Q); no γ to J<37/2.
5762.6 ^b 8	37/2(-)	C		J π : γ to 35/2(-) is $\Delta J=1$ D+Q; no γ to J<35/2.
5774.1 [§] 11	39/2(-)	C		J π : γ to 35/2(-) is $\Delta J=2$ Q; no γ to J<35/2.
5902.4 [@] 14	45/2(-)	C		J π : γ to 43/2(-) is $\Delta J=1$ D+Q; no γ to J<43/2.
5998.8 ^{&} 11	43/2(-)	C		J π : γ to 41/2(-) is $\Delta J=1$ D+Q and γ to 39/2(-) is $\Delta J=2$ Q.
6025.4 ^a 12	(39/2-)	C		J π : γ to (37/2-) is $\Delta J=(1)$ (D+Q); no γ to J<37/2.
6084.8 [#] 12	35/2(-)	C		J π : γ to 33/2(-) is $\Delta J=1$ D+Q; no γ to J<33/2.
6243.8 ^a 13	(41/2-)	C		J π : γ to (39/2-) is $\Delta J=1$ D+Q; no γ to J<39/2.
6353.8 ^{&} 11	45/2(-)	C		J π : γ to 43/2(-) is $\Delta J=1$ D+Q and γ to 41/2(-) is $\Delta J=2$ Q.
6402.7 [§] 12	43/2(-)	C		J π : γ to 39/2(-) is $\Delta J=2$ Q; no γ to J<39/2.
6479.9 ^a 14	(43/2-)	C		J π : γ to (41/2-) is $\Delta J=1$ D+Q; no γ to J<41/2.
6698.5 12	43/2(-)	C		J π : γ to 39/2(-) is $\Delta J=2$ Q; no γ to J<39/2.
6792.8 ^a 15	(45/2-)	C		J π : γ to (43/2-) is $\Delta J=1$ D+Q; no γ to J<43/2.
6814.8 ^{&} 12	47/2(-)	C		J π : γ to 45/2(-) is $\Delta J=1$ D+Q; no γ to J<45/2.
7121.7 [§] 13	47/2(-)	C		J π : γ to 43/2(-) is $\Delta J=2$ Q; no γ to J<43/2.
7123.0 ^a 16	(47/2-)	C		J π : γ to (45/2-) is $\Delta J=1$ D+Q; no γ to J<45/2.
7353.7 ^{&} 13	49/2(-)	C		J π : γ to 47/2(-) is $\Delta J=1$ D+Q; no γ to J<47/2.

† The majority of J values are from ¹²⁶Te(¹⁹F,4n γ) (2011Gu12) and ¹³³Cs(¹²C,4n γ) (2004Bh01) deduced from γ -ray multiplicities based on DCO ratio measurements where, due to the heavy ion reaction type stretched transitions are typical, and as a rule spin values increase with increasing excitation energy, arguments which were tacitly applied by evaluator as well. Multiplicities deduced from $\gamma(\theta)$ were obtained in ¹⁴²Nd(p,2n γ), ¹⁴¹Pr(α ,4n γ), and ¹⁴¹Pr(³He,3n γ) and used for spin assignments as well. For levels from these datasets with γ -ray multiplicity determined by DCO or $\gamma(\theta)$ only tentative parities were assigned based on calculations and physical arguments. For states in ϵ decay datasets J π values were assigned based on log ft and $\alpha(K)_{exp}$, with $\alpha(K)_{exp}$ also measured in ¹⁴¹Pr(³He,3n γ), which allowed a more thorough assignment of parity. Some J π values assigned by evaluator can differ from those of the authors, which were listed in some particular reaction datasets.

‡ For levels 2899 and above in ¹³³Cs(¹²C,4n γ) T_{1/2} ≤ 0.7 ns limit was measured from generalized centroid-shift method (2004Bh01).

§ (A): $\Delta J=2$ band based on 23/2-. States with spins up to 47/2. Possible configuration: $\pi h_{11/2} \otimes \nu(h_{11/2}, f_{7/2} 1/2[541])$ (2011Gu12, (¹⁹F,4n γ)).

$^{\#}$ (B): $\Delta J=1$ band based on 25/2-. States with spins up to 35/2. Assigned as an oblate band by authors and used particle rotor model (PRM) calculations to determine a quasiparticle configuration of $\pi h_{11/2} \otimes \nu h_{11/2}^2$ (2011Gu12, (¹⁹F,4n γ)).

$^{\@}$ (C): $\Delta J=1$ band based on 35/2-. States with spins up to 45/2. Assigned as an oblate band (2011Gu12, (¹⁹F,4n γ)).

$^{\&}$ (D): $\Delta J=1$ band based on 43/2-. State with spins up to 49/2. Assigned as oblate-triaxial deformation (2011Gu12, (¹⁹F,4n γ)).

a (E): $\Delta J=1$ band based on (39/2-). States with spins up to 47/2. Assigned as oblate-triaxial deformation (2011Gu12, (¹⁹F,4n γ)).

b (F): $\Delta J=1$ band based on 31/2-. States with spins up to 35/2. Assigned as oblate-triaxial deformation (2011Gu12, (¹⁹F,4n γ)).

$\gamma(^{141}\text{Pm})$

Data for γ 's from levels >2702.4 are from (¹⁹F,4n γ) and (¹²C,4n γ); below this level from ϵ decays, (p,2n γ), (³He,3n γ), (α ,4n γ), and also from (¹⁹F,4n γ) and (¹²C,4n γ) (fewer). For data adopted from these two datasets E γ values were adopted preferentially from (¹²C,4n γ), which gave $\Delta E\gamma$'s, while I γ values are typically from (¹⁹F,4n γ); for E γ 's adopted from (¹⁹F,4n γ) $\Delta E\gamma=0.5$ keV was assigned uniformly by evaluator (most of these E γ 's are published without uncertainty).

E(level)	E γ	I γ	Mult.	δ	α	Comments
196.87	196.88 5	100	(M1)		0.231	B(M1)(W.u.)=0.0102 14.
403.82	403.8 1	100	M1+E2	=1.4	=0.0263	
438.69	438.8 1	100	E2		0.01758	
628.62	431.6 1	100 5	M2		0.1001	B(M2)(W.u.)=0.104 8.
	628.6 1	6.6 2	E3		0.01734	B(E3)(W.u.)=2.38 16.
728.36	324.6 1	100 16	M1		0.0604	
	531.3 2	40 8	E2		0.01046	
	728.4 3	51 10	D			I γ : deduced from combination of ¹⁴¹ Sm ϵ decay data and (p,2n γ) data where high spin level 2239 (J π =19/2-) also emitting 728 γ is not populated.
804.74	607.9 2	100				

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pm})$ (continued)

E(level)	E_γ	I_γ	Mult.	δ	α	Comments
837.27	108.9 $\frac{1}{2}$ 2					
	208.7 2					
	640.5 2					
	837.1 2	100	E2			
858.55	661.7 5	13 6				
	858.55 15	100 15				
974.30	777.6 1	100	E2			B(E2)(W.u.)>0.046.
1046.40	1046.4 2	100				
1055.52	426.9 1	100 4	D+Q			
1108.31	911.3 3	100 3	Q+D			
	1108.4 2	14 1				
1153.43	524.9 2					I_γ : weak.
	749.6 1	35 4				
	956.5 3	100 7	Q+D			
	1153.3 3	10 2	D+Q			
1166.98	538.5 2	100	M1		0.01648	
1242.6	1045.9 4	100 9	(Q+D)			
	1242.5 4	49 6	(D+Q)			
1292.71	854.3 2	19.5 13				
	888.5 3	9.4 13				
	1292.6 2	100 6				
1313.20	684.7 2	100	(M1+E2)	-0.87 8		
1359.78	1163.0 3	100	Q			
	1359.6 4					
1414.64	247.9 2	11 2				
	577.8 $\frac{1}{2}$ 3	13 4				
	785.9 1	100 6	(M1+E2)	-0.19 8		
1495.76	767.5 3	35 3				
	1057.1 2	100 6				
	1091.9 2	79 5				
	1495.7 2	55 4				
1510.68	197.3 2	1.2 6	D+Q			
	402.6 $\frac{1}{2}$ 2					
	455.1	9.2 8	Q			
	882.03 15	100 3	E2			
1515.3	1515.3 3	100				
1573.3?	260.0 $\frac{1}{2}$ 3	100				E_γ : γ ray assigned at 1573 in ($^3\text{He}, 3n\gamma$) and ($\alpha, 4n\gamma$) but to 2641 in ($^{19}\text{F}, 4n\gamma$) and ($^{12}\text{C}, 4n\gamma$), which was adopted, by reversing the order of 1068 γ +260 γ cascade in between 2641 and 1313.
1692.8	1495.9 4	100				
1794.91	820.6 2	100				
1802.26	694.0 2	100 10				
	827.9 2	17 6				
1834.1	725.7 5	100 17				
	995.8 $\frac{1}{2}$ 5	25 6				
	1029.6 6	36 8				
1874.5	1037.2 3	100				
1885.06	1446.6 4	41 12				
	1481.0 5	71 12				
	1885.0 3	100 12				
1891.72	381.0 1	100	Q			Mult.: from ($^{12}\text{C}, 4n\gamma$); D in ($\alpha, 4n\gamma$).
1902.60	1463.9 4	100 20				
	1499.1 4	31 4				
	1902.4 3	47 4				
1970.05	995.77 11	100	(E2)			
1983.30	149.1 $\frac{1}{2}$ 3	2.6 7				
	875.0 1	11 1				
	1009.1 4	27 2				
	1786.4 4	100 4				
1992.0	1587.9 5	38 19				
	1992.1 4	100 13				
2004.66	1565.9 5	5 2				

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pm})$ (continued)

E(level)	E_γ	I_γ	Mult.	δ	Comments
2004.66	1600.7 3	100 9			
	2004.8 3	22 2			
2015.30	702.1 1	100	M1+E2	-1.6 3	
2037.98	1599.9 5	21 9			
	1634.1 3	12 3			
	2037.8 3	100 8			
2063.48	648.7 3	23 5			
	750.3 3	100 15			
	896.5 1	92 10			
	955.4 5	44 3			
	1434.9 4	23 8			
2091.71	108.5 3	2.8 6			
	676.8 3	19 3			
	924.7 1	32 4			
	983.3 3	100 4	E1		
	1117.6 2	44 3			
	1463.4 6	25 4			
2098.39	206.6 2				I_γ : weak.
	785.6 $\frac{5}{2}$	100	(M1+E2)	-0.19 8	
2119.05	704.2 3	4.8 9			
	805.9 1	38 7			
	952.1 2	9.6 4			
	1145.1 2	94 3			
	1490.3 1	100 7			
2138.06	1163.8 2	100	D+Q		
2171.7	858.5 3	100			
2239.00	728.30 7	100	E2		
2349.52	110.5 1	100	D+Q		
2361.3	391.3 3	100			
2381.68	1068.5 2	100	D		
2509.75	999.09 13	100	E2		
2530.75	639.0 1	100 2			
	1020.3 3	11.6 5			
2554.40	315.4 1	100	D		
2574.4?	44.0 $\frac{3}{2}$	100			
2623.22	485.2 2	18.9 18	Q		
	653.2 1	100 3	M1+E2		
	1112.5 1	63 3	D		
2623.60	608.3 2	100			
2640.00	401.0 2	100	D+Q		
2641.62	260.0 3	100	D+Q		
	1068.2 $\frac{3}{2}$	2			E_γ : γ ray assigned at 2641 in ($^3\text{He}, 3n\gamma$) and ($\alpha, 4n\gamma$) but to 2381 in ($^{19}\text{F}, 4n\gamma$) and ($^{12}\text{C}, 4n\gamma$), which was adopted, by reversing the order of 1068 γ +260 γ cascade in between 2641 and 1313.
2661.58	312.0 2	100	D+Q		
2702.35	583.4 $\frac{3}{2}$	20 6			
	1287.6 $\frac{3}{2}$	20 9			
	1898.0 10	27 4			
	2073.7 2	100 34			
2703.20	61.6 2	44 4	(Q)		
	80.0 2	100 5	(Q)		
	353.4 5	≈ 48	D+Q		
	464.2 1	55 3	D+Q		
2810.10	170.1 2	100 8	D		E_γ : according to 2011Gu12 in ($^{19}\text{F}, 4n\gamma$) their 170 γ connects 2810 and 2662 levels, in which case it should be 148.1 γ ; however 2004Bh01 in ($^{12}\text{C}, 4n\gamma$) found that there is indeed a 170 γ depopulating 2810 but to 2640 that is missing in ($^{19}\text{F}, 4n\gamma$), which was adopted by evaluator (both datasets contain a slightly higher 2641 level).
	300.4 2	61 6	D		
2824.6	163.0 2	100	(Q)		
2840.6	179.0 2	100			
2899.70	196.5 1	100	D		
3079.3	179.6 5	100	Q		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Pm})$ (continued)

E(level)	E γ	I γ	Mult.	E(level)	E γ	I γ	Mult.
3098.6	258.0 2	100	D+Q	4862.22	798.5 2	57 8	E2 †
3122.6	312.9# 5	80# 12	E2 †	4916.6	646.1 5	100	Q
	461.0# 2	100# 6	E2 †	4916.7	291.0 2	100 11	D+Q
3157.6	496.0 2	100	D+Q		853.0 2	84 11	E2 †
3246.80	347.1 1	100	D+Q	4938.3	254.7 5	100	D+Q
3257.2	177.9 5	100	Q	5047.3	109.0 5	34 11	D+Q
3333.1	75.9 5	100	D+Q		363.7 5	100 6	Q
3465.80	218.9 5	48 5	D+Q	5088.0	314.5 5	100	D+Q
	566.1 1	100 7	D+Q	5094.53	232.3 1	58 7	D+Q
3581.5	681.8 5	100	Q		469.2 5	100 7	E2 †
3702.60	236.8 2	63 4	D+Q	5152.1	468.5 5	100	(D+Q)
	802.9 1	100 3	D+Q	5337.8	243.3 2	100	E2 †
3727.6	1488.6 5	100	Q	5400.4	578.4 5	100	D+Q
3884.61	637.8 1	100	D+Q	5407.8	313.3 5	100	D+Q
3982.5	279.9 5	100	D+Q	5435.5	341.0 2	100	
4063.68	361.1 1	100 6	D+Q	5459.7	371.7 5	100	D+Q
	597.8 5	44.4 23	D+Q	5482.6	435.3 5	46 10	D+Q
	816.9 2	10 5	D+Q		544.3 5	100 6	Q
4075.6	953.0 5	100	(D+Q)	5512.9	175.1 5	100	(D+Q)
4116.0	388.4 5	100	Q	5762.6	354.8 5	100	D+Q
4270.6	689.1 5	100	Q	5774.1	857.4 5	100	Q
4335.2	1002.1 5	100 14	D+Q	5902.4	442.7 5	100	D+Q
	1078.0 5	59 4	Q	5998.8	516.2 5	31 12	D+Q
4349.9	367.4 5	100	D+Q		951.5 5	100 12	Q
4376.2	1218.6 5	100	(D+Q)	6025.4	873.3 5	100	(D+Q)
4515.4	180.2 5	100	D+Q	6084.8	684.4 5	100	D+Q
4625.68	562.0 2	100 12	D+Q	6243.8	218.4 5	100	D+Q
	923.1 2	94 7	E2 †	6353.8	355.0 5	87 16	D+Q
4683.6	1426.4 5	100	Q		871.2 5	100 13	Q
4721.83	658.6 5	98 6	D+Q	6402.7	628.6 5	100	Q
	837.2 2	27 10	D+Q	6479.9	236.1 5	100	D+Q
	1019.2 2	100 6	Q	6698.5	924.4 5	100	Q
	1256.0 2	32 8	Q	6792.8	312.9# 5	100#	D+Q
4773.5	258.1 5	100	D+Q	6814.8	461.0# 5	100#	D+Q
4822.0	472.1 5	100	D+Q	7121.7	719.0 5	100	Q
4862.22	140.4 2	100 13	D+Q	7123.0	330.2 5	100	D+Q
	236.5 2	89 13	D+Q	7353.7	538.9 5	100	D+Q

 † Quadrupole transition, M2 excluded by RUL. ‡ Placement of transition in the level scheme is uncertain. § Multiply placed.

Multiply placed; intensity suitably divided.

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

(E) $\Delta J=1$ band based on
(39/2-).

(F) $\Delta J=1$ band based on
31/2-.

^{141}Sm ϵ Decay (10.2 min) 1977Ke03Parent ^{141}Sm : $E=0.0$; $J\pi=1/2+$; $T_{1/2}=10.2$ min 2; $Q(\text{g.s.})=4589$ 16; $\% \epsilon + \% \beta^+$ decay=100.Measured: γ , $\gamma\gamma$, ce (1977Ke03,1973VaYZ), β^+ , $\beta\gamma$ (1983Al06,1977Ke03). ^{141}Pm Levels

E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
0.0	5/2+	1292.56 14	(3/2)+	1992.1 4	
403.87 8	3/2+	1495.65 12	(1/2, 3/2)+	2004.62 20	(1/2, 3/2)+
438.29 9	(1/2)+	1515.3 3		2037.94 20	(1/2, 3/2)+
728.27 16	3/2+	1884.95 22			
1046.40 20		1902.51 21	(1/2, 3/2)+		

 † Adopted values. β^+, ϵ DataMeasured $E\beta^+=3180$ 50, 3100 50, 2170 80, 1510 90 F-K analyses (1977Ke03), see also 1970Ar17, 1972Ep01, 1973VaYZ.No $\epsilon+\beta^+$ feeding to g.s. ($\leq 4\%$) (1977Ke03).

$E\epsilon$	E(level)	$I\beta^+^\dagger$	$I\epsilon^\dagger$	Log ft	$I(\epsilon+\beta^+)^\dagger$	Comments
2530 90	2004.62	0.93 8	4.2 3	5.83 4	5.1 4	$E\epsilon$: $E\beta^+=1510$ 90 from $(\beta^+)(1600.7\gamma)$ (1977Ke03).
(2551 16)	2037.94	0.64 7	3.1 3	5.95 5	3.7 4	
(2597 16)	1992.1	0.17 3	0.77 13	6.57 8	0.94 16	
(2686 16)	1902.51	0.73 9	2.7 3	6.05 6	3.4 4	
(2704 16)	1884.95	0.34 3	1.19 12	6.41 5	1.53 15	
(3074 16)	1515.3	0.23 3	0.45 6	6.95 6	0.68 9	$E\epsilon$: $E\beta^+=2170$ 80 from $(\beta^+)(1292.6\gamma)$ (1977Ke03).
(3093 16)	1495.65	3.1 2	5.7 3	5.849 23	8.8 4	
3190 80	1292.56	3.7 2	5.0 3	5.96 3	8.7 5	
(3543 16)	1046.40	0.74 7	0.75 7	6.85 4	1.49 13	$E\epsilon$: $E\beta^+=3100$ 50 from $(\beta^+)(438.2\gamma)$ (1977Ke03). Other: 3020 60 (1983Al06).
(3861 16)	728.27	1.6 2	1.2 2	6.74 7	2.8 4	
4120 50	438.29	20.1 10	10.6 5	5.839 25	30.7 15	$E\epsilon$: $E\beta^+=3180$ 50 from $(\beta^+)(403.9\gamma)$ (1977Ke03). Other: 3020 60 (1983Al06).
4200 50	403.87	21.2 5	10.8 3	5.837 15	32.0 7	

 † Absolute intensity per 100 decays. $\gamma(^{141}\text{Pm})$ $I\gamma$ normalization: $\Sigma I(\gamma+\text{ce})(\text{g.s.})=100\%$ assuming no ϵ or β^+ to g.s.

$E\gamma$	E(level)	$I\gamma^\dagger$	Mult. †	δ	α	Comments
324.4 2	728.27	5.9 6	M1		0.0605	Mult.: $\alpha(\text{K})\text{exp}=0.033$ 10, may be M1+E2.
403.9 1	403.87	100	E2+M1	≈ 1.4	≈ 0.0263	Mult.: $\alpha(\text{K})\text{exp}=0.022$ 2 (1977Ke03). Other: 0.018 3 (1973VaYZ).
438.2 1	438.29	88.6 30	E2		0.01764	Mult.: $\alpha(\text{K})\text{exp}=0.013$ 2 (1977Ke03). Other: 0.012 3 (1973VaYZ).
728.4 3	728.27	3.0 6				
767.5 3	1495.65	2.7 2				
854.3 2	1292.56	3.1 2				
888.5 3	1292.56	1.5 2				
1046.4 2	1046.40	3.5 3				
1057.1 2	1495.65	7.7 5				
1091.9 2	1495.65	6.1 4				
1292.6 2	1292.56	15.9 9				
^x 1336.5 4		1.2 4				
^x 1352.7 4		0.9 4				
1446.6 4	1884.95	0.7 2				
1463.9 4	1902.51	4.5 9				
1481.0 5	1884.95	1.2 2				
1495.7 2	1495.65	4.2 3				
1499.1 4	1902.51	1.4 2				
1515.3 3	1515.3	1.6 2				
1565.9 5	2004.62	0.5 2				
1587.9 5	1992.1	0.6 3				
1599.9 5	2037.94	1.4 6				

Continued on next page (footnotes at end of table)

^{141}Sm ϵ Decay (10.2 min) 1977Ke03 (continued) $\gamma(^{141}\text{Pm})$ (continued)

E_γ	$E(\text{level})$	$I_\gamma^\dagger$
1600.7 3	2004.62	9.5 9
1634.1 3	2037.94	0.8 2
1885.0 3	1884.95	1.7 2
1902.4 3	1902.51	2.1 2
1992.3 4	1992.1	1.6 2
2004.8 3	2004.62	2.1 2
2037.8 3	2037.94	6.6 5

† $\alpha(K)_{\text{exp}}$ were normalized to $\alpha(K)=0.200$ for M1 196.6 γ in ϵ decay of ^{141}Sm (22.5 min).

‡ For absolute intensity per 100 decays, multiply by 0.425 6.

* γ ray not placed in level scheme.

Decay Scheme

Intensities: $I(\gamma+\text{ce})$ per 100 parent decays **^{141}Sm ϵ Decay (22.6 min) 1972Ep01**

Parent ^{141}Sm : $E=175.9$ 3; $J\pi=11/2^-$; $T_{1/2}=22.6$ min 2; $Q(\text{g.s.})=4589$ 16; $\% \epsilon + \% \beta^+$ decay=99.69 2.

Measured: γ , $\gamma\gamma$, $\gamma(t)$, $\gamma^+\gamma^+\gamma$ coin (1972Ep01, 1977Ke03), ce , $\beta\gamma$ (1977Ke03).

Isomeric transition was observed by 1976Ke06 (0.31% 3); 1972Ep01 report an upper limit $\leq 0.2\%$ for IT decay.

 ^{141}Pm Levels

$E(\text{level})$	$J\pi^\dagger$	$T_{1/2}$	$E(\text{level})$	$J\pi^\dagger$
0.0	5/2+		1414.69 13	(9/2-)
196.86 12	7/2+	0.23 ns 3	1794.8	
628.70 9	11/2-	0.59 μs 2	1834.1 4	
804.72 22			1983.27 16	9/2-
837.10 20	9/2+		2063.47 15	
974.06 16	11/2+		2091.66 14	11/2-
1108.29 14	9/2+		2119.05 12	(9/2, 11/2, 13/2)-
1166.95 14	(9/2)-		2702.43 22	
1313.18 14	13/2-			

† Adopted values.

^{141}Sm ϵ Decay (22.6 min) $^{1972}\text{Ep01}$ (continued) β^+, ϵ Data $\epsilon + \beta^+$ feeding was determined assuming no $\epsilon + \beta^+$ to g.s. of ^{141}Pm .1977Ke03 measured $E\beta^+ = 1600$ 70, 1670 70, 2090 210, F-K analysis; other measurements: 1969He10, 1970ArZQ, 1970Ar17.

$E\epsilon$	E(level)	$I\beta^{+\dagger}$	$I\epsilon^\dagger$	Log ft	$I(\epsilon + \beta^+)^\dagger$
(2062 16)	2702.43	0.10 3	1.7 5	6.36 12	1.8 5
2620 70	2119.05	4.60 24	18.3 8	5.552 21	22.9 10
(2673 16)	2091.66	3.40 17	12.8 6	5.716 21	16.2 7
2690 70	1983.27	3.66 17	11.2 5	5.807 20	14.9 6
(2701 16)	2063.47	0.96 9	3.4 3	6.30 4	4.4 4
(2931 16)	1834.1	0.59 9	1.4 2	6.76 7	2.0 3
3110 210	1414.69	2.4 2	3.0 3	6.54 5	5.4 5
(3452 16)	1313.18	1.3 5	1.5 5	6.88 16	2.8 10
(3598 16)	1166.95	1.6 4	1.6 3	6.89 10	3.2 7
(3791 16)	974.06	3.1 6	2.4 4	6.76 8	5.5 10
(3928 16)	837.10	2.17 8	1.42 5	7.009 18	3.59 13
(3960 16)	804.72	0.06 6	0.04 4	8.6 5	0.10 10
(4136 16)	628.70	7.2 20	3.8 10	6.62 12	11 3

 † For intensity per 100 decays, multiply by 0.9969 2. $\gamma(^{141}\text{Pm})$ $\alpha(\text{K})_{\text{exp}}$ were normalized to $\alpha(\text{K})(196.6) = 0.200$ (M1). $I\gamma$ normalization: $\Sigma(I\gamma + \text{ce})(\text{g.s.}) = 99.69\%$ 3 assuming no ϵ or β^+ to g.s.

$E\gamma$	E(level)	$I\gamma^\dagger$	Mult. †	δ	α	Comments
108.5 3	2091.66	0.5 1				
149.1 $\frac{1}{2}$ 3	1983.27	0.7 2				
196.6 3	196.86	184 18	M1		0.232	Mult.: $\alpha(\text{K})_{\text{exp}} = 0.214$ 15 normalized to $\alpha(\text{K}) = 0.0914$ for 661 γ M4 in ^{137}Cs ; $\delta = +0.1$ from (432 γ)(196 γ)(θ) $A_2 = -0.056$ 40, $A_4 = -0.040$ 56 (1970ArZQ).
247.9 2	1414.69	1.9 4				
431.8 1	628.70	100 5	M2		0.0999	Mult.: $\alpha(\text{K})_{\text{exp}} = 0.082$ 8.
538.5 3	1166.95	20.9 14	M1		0.01648	Mult.: $\alpha(\text{K})_{\text{exp}} = 0.0145$ 14.
577.8 $\frac{1}{2}$ 3	1414.69	2.2 6				
583.4 $\frac{1}{2}$ 3	2702.43	0.7 2				
607.9 2	804.72	2.5 3				
628.7 1	628.70	6.6 2	[E3]		0.01733	
648.7 3	2063.47	0.9 2				
676.8 3	2091.66	3.4 5				
684.6 2	1313.18	19.6 15	E2+M1	-0.87 8		Mult.: $\alpha(\text{K})_{\text{exp}} = 0.0049$ 13, δ from (p,2n γ) (1980Pi03).
704.2 3	2119.05	1.1 2				
725.7 5	1834.1	3.6 6				
750.3 3	2063.47	3.9 6				
x 764.3 3		0.4 1				
x 768.2 5		0.4 1				
777.4 3	974.06	50.3 20	E2			Mult.: $\alpha(\text{K})_{\text{exp}} = 0.0024$ 9 (1977Ke03), (777 γ)(196 γ)(θ): $A_2 = -0.09$ 4, $A_4 = -0.07$ 9 (1970ArZQ).
785.9 1	1414.69	16.9 10	(M1+E2)	-0.19 8		Mult.: $\alpha(\text{K})_{\text{exp}} = 0.0030$ 10, δ from (p,2n γ) (1980Pi03).
805.9 1	2119.05	8.8 16				
820.7 $\frac{1}{2}$ 3	1794.8	0.4 1				
837.1 2	837.10	8.9 3				
875.0 1	1983.27	3.1 1				
x 882.0 3		0.4 1				
896.5 1	2063.47	3.6 4				
911.3 3	1108.29	22.8 6	E2			Mult.: $\alpha(\text{K})_{\text{exp}} = 0.0019$ 7.
924.7 1	2091.66	5.7 8				
952.1 2	2119.05	2.2 1				
955.4 5	2063.47	1.7 1				
x 974.1 $\frac{1}{2}$ 5		0.5 1				
983.3 3	2091.66	18.0 8	E1			Mult.: $\alpha(\text{K})_{\text{exp}} \leq 0.0008$.
995.8 $\frac{1}{2}$ 5	1834.1	0.9 2				
1009.1 4	1983.27	7.2 6				
1029.6 6	1834.1	1.3 3				

Continued on next page (footnotes at end of table)

^{141}Sm ϵ Decay (22.6 min) 1972Ep01 (continued) $\gamma(^{141}\text{Pm})$ (continued)

E_γ	E(level)	$I_\gamma^\dagger$	E_γ	E(level)	$I_\gamma^\dagger$	E_γ	E(level)	$I_\gamma^\dagger$
1108.4 2	1108.29	3.1 3	^x 1380.9 6		0.5 2	1786.4 4	1983.27	27.1 11
1117.6 2	2091.66	8.0 6	1434.9 4	2063.47	0.9 3	1898.0 10	2702.43	0.94 15
1145.1 2	2119.05	21.6 8	1463.4 6	2091.66	4.5 8	^x 1979.6 2		0.99 12
1287.6 § 4	2702.43	0.7 3	1490.3 1	2119.05	22.9 15	2073.7 2	2702.43	3.5 12

[†] $\alpha(K)_{\text{exp}}$ from 1977Ke03.

[‡] For absolute intensity per 100 decays, multiply by 0.404 3.

§ Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

Decay Scheme

Intensities: I(γ+ce) per 100 parent decays

11/2- 175.9 22.6 min
¹⁴¹Sm₇₉
 $\% \epsilon + \% \beta^+ = 99.69 \pm 2$
 $Q^+(g.s.) = 4589^{16}$

$^{126}\text{Te}(^{19}\text{F},4n\gamma)$ 2011Gu12,1989Gu10

2011Gu12: ^{19}F beam, E=90 MeV produced by the HI-3 tandem accelerator at the China Institute of Atomic Energy (CIAE).

Target=2.85 mg/cm² enriched ^{126}Te evaporated onto a 21.75 mg/cm² gold backing. γ -rays detected by twelve Compton-suppressed HPGe detectors and a clover detector consisting of four Ge crystals placed at angles of 90°, 140°, 150°, 125°, 42°, and 65° with respect to the beam direction. Measured E γ , I γ , DCO ratios. Deduced Levels, J, π , multiplicities. Comparison with particle-rotor model calculations.

1989Gu10: E=74–84 MeV, measured γ , $\gamma\gamma$, $\gamma(\theta)$, excit.

Unless noted otherwise, all the data are from 2011Gu12.

The level schemes of 2011Gu12 and 1989Gu10 are similar up to 2703 (the major difference is that the order of transitions in some cascades is inverted relative to each other). Above 2703 2011Gu12 found many more gammas than 1989Gu10, the common ones being fully relocated by 2011Gu12, so the level structure is completely different. In most cases 2011Gu12 confirm the level scheme of 2004Bh01 ($^{12}\text{C},4n\gamma$) dataset), reason for which the level scheme of 2011Gu12 is fully adopted by evaluator above 2703.

 ^{141}Pm Levels

E(level) [†] #	J π [‡]	T _{1/2}	E(level) [†] #	J π [‡]	E(level) [†] #	J π [‡]
0.0	5/2+		3332.8 10	33/2-	5094.3 ^d 8	33/2-
196.94 20	7/2+		3465.7 7	25/2-	5151.8 12	(37/2-)
628.49 19	11/2-	0.63 μs § 2	3581.2 [@] 8	27/2-	5337.8 10	37/2-
973.97 21	11/2+		3702.2 ^{&} 7	25/2-	5400.0 ^{&} 12	33/2-
1312.77 23	13/2-		3727.3 6	23/2-	5407.6 ^d 10	35/2-
1510.39 20	15/2-		3885.1 8	27/2-	5459.4 ^a 14	43/2-
1969.78 22	15/2+		3982.1 ^{&} 9	27/2-	5482.3 12	41/2-
2014.1 3			4063.5 7	27/2-	5512.9 11	(39/2-)
2137.7 3	13/2+		4076.2 8	(27/2-)	5762.4 ^d 11	37/2-
2238.69 21	19/2-		4115.7 8	27/2-	5773.8 [@] 12	39/2-
2349.5 4	19/2-		4270.3 [@] 9	31/2-	5902.1 ^a 15	45/2-
2381.0 3	15/2-		4334.9 ^a 10	35/2-	5998.5 ^b 12	43/2-
2509.48 24	19/2-		4349.5 ^{&} 10	29/2-	6025.1 ^c 13	(39/2-)
2530.3 4			4376.9 9	25/2-	6084.4 ^{&} 13	35/2-
2622.4 4			4515.1 ^a 11	37/2-	6243.5 ^c 14	(41/2-)
2623.22 22	17/2+		4625.1 7	29/2-	6353.5 ^b 12	45/2-
2641.0 4	17/2-		4683.3 11	35/2-	6402.4 [@] 13	43/2-
2662.2 5	21/2-		4722.1 7	29/2-	6479.6 ^c 15	(43/2-)
2702.90 24	21/2-		4773.2 ^a 13	39/2-	6698.2 13	43/2-
2810.4 5	21/2-		4821.6 ^{&} 11	31/2-	6792.5 ^c 16	(45/2-)
2899.4 [@] 6	23/2-		4861.7 ^d 8	31/2-	6814.5 ^b 13	47/2-
3079.0 8	27/2-		4916.4 [@] 11	35/2-	7121.4 [@] 14	47/2-
3123.2 6	25/2-		4916.7 8	31/2-	7122.7 ^c 16	(47/2-)
3158.3 7	23/2-		4938.0 11	37/2-	7353.4 ^b 14	49/2-
3246.8 7	25/2-		5047.0 11	39/2-		
3256.9 9	31/2-		5087.7 ^a 14	41/2-		

[†] From least-squares fit to E γ data, with $\Delta E\gamma=0.5$ keV assumed for each γ ray energy.

[‡] J π values are from 2011Gu12 based on measured multiplicities as well as those measured by 1989Gu10, on the reaction type, and the implicit assumption that spin is generally increasing with increasing excitation energy. These J π values can differ from those in Adopted Levels, Gammas dataset.

§ Adopted value.

If $\Delta E\gamma$ not given, ± 0.50 keV assumed for least-squares fitting.

@ (A): $\Delta J=2$ band based on 23/2-. States with spins up to 47/2. Possible configuration: $\pi h_{11/2} \otimes \nu(h_{11/2}, f_{7/2} 1/2 [541])$ (2011Gu12).

& (B): $\Delta J=1$ band based on 25/2-. States with spins up to 35/2. Assigned as an oblate band by authors and used particle rotor model (PRM) calculations to determine a quasiparticle configuration of $\pi h_{11/2} \otimes \nu h_{11/2}^2$ (2011Gu12).

a (C): $\Delta J=1$ band based on 35/2-. States with spins up to 45/2. Assigned as an oblate band (2011Gu12).

b (D): $\Delta J=1$ band based on 43/2-. State with spins up to 49/2. Assigned as oblate-triaxial deformation (2011Gu12).

c (E): $\Delta J=1$ band based on (39/2-). States with spins up to 47/2. Assigned as oblate-triaxial deformation (2011Gu12).

d (F): $\Delta J=1$ band based on 31/2-. States with spins up to 35/2. Assigned as oblate-triaxial deformation (2011Gu12).

¹²⁶Te(¹⁹F,4n γ) ²⁰¹¹Gu12,1989Gu10 (continued)

 $\gamma(^{141}\text{Pm})$

Given in the table are the A_2 , A_4 coefficients of the $\gamma(\theta)$ measured by 1989Gu10 at $E(^{19}\text{F})=80$ MeV.

Unplaced gammas are from 1989Gu10.

DCO Due to the statistics being poorer than the total coincidence matrix, the DCO ratios of some weak transitions could not be determined. Generally a quadrupole ($\Delta J=2$, E2) transition is adopted if a DCO ratio is approximately 0.51 and a dipole ($\Delta J=1$) transition is assumed if a DCO is about 1.01 (2011Gu12). The gating transition seems to be the 728.2 γ , stretched E2 (from 19/2- to 15/2-).

$E\gamma^\dagger$	E(level)	$I\gamma^{\ddagger\S}$	Mult.#	Comments
61.7	2702.90	18.1 15	E2@	
75.9	3332.8	18 3	M1+E2	DCO=1.09 8.
79.8	2702.90	41.3 22	M2@	
109.0	5047.0	2.1 7	M1+E2	DCO=0.91 15.
110.8 ^b	2349.5	52.0 18	M1+E2@	E γ : 109.98 10 (1989Gu10). Mult.: 1989Gu10 adopted E2. Mult.: $A_2=+0.23$ 4, $A_4=-0.16$ 4. DCO=0.95 6.
139.6	4861.7	6.4 8	M1+E2	Mult.: $A_2=+1.1$ 8, $A_4=+0.27$ 7.
^x 140.00 13		462 97		E γ : according to 2011Gu12 the 170.3 γ connects the 2810.7 and 2661.8 levels, in which case it should be 148.1 γ .
148.1 ^c	2810.4	9.3 7	M1@	Mult.: $A_2=-0.31$ 11, $A_4=-0.05$ 12.
^x 169.6 2		207 43		
175.1	5512.9	6.2 8	(M1+E2)	
^x 177.3 3		214 46		Mult.: $A_2=-0.23$ 13, $A_4=-0.01$ 15.
177.9	3256.9	=43	E2	DCO=0.48 8.
^x 179.3 2		268 53		Mult.: $A_2=-0.35$ 10, $A_4=+0.01$ 11.
179.6	3079.0	=46	E2	DCO=0.51 8.
180.2	4515.1	9.3 6	M1+E2	DCO=0.97 11.
196.5	2899.4		M1@	
196.9	196.94		M1@	
197.5	1510.39		M1+E2@	
218.4	6243.5	4.7 5	M1+E2	DCO=0.96 15.
218.9	3465.7	9.3 9	M1+E2	DCO=1.13 15.
232.6	5094.3	4.2 5	M1+E2	DCO=0.96 4.
236.1	6479.6	2.3 7	M1+E2	DCO=0.96 7.
236.5	3702.2	18.1 11	M1+E2@	
236.6	4861.7	5.7 8	M1+E2	DCO=0.93 3.
243.5	5337.8	7.3 7	E2	DCO=0.54 9.
^x 254.5 3		100 16		Mult.: $A_2=-0.38$ 11, $A_4=+0.21$ 14.
254.7	4938.0	9.0 9	M1+E2	DCO=1.00 6.
258.1	4773.2	8.8 7	M1+E2	E γ ,I γ : possibly same γ ray as 258.1 2 (DI γ =86 15) placed at 2641 in 1989Gu10. DCO=0.94 5.
260.0 ^a 3	2641.0	19.2 10	M1+E2@	Mult.: $A_2=+0.03$ 15, $A_4=-0.28$ 14.
279.9	3982.1	10.1 7	M1+E2	DCO=0.93 6.
^x 291.6 3				
291.6	4916.7	4.5 5	M1+E2	DCO=1.06 5.
301.0	2810.4	5.7 6	M1+E2	DCO=0.99 9.
312.6 ^b 3	2662.2	30.1 13	M1+E2	I γ : 106 20 (1989Gu10). DCO=0.97 3. Mult.: $A_2=-0.50$ 18, $A_4=-0.23$ 18.
312.9 ^d	3123.2	5.5 ^d 8	E2	DCO=0.57 5.
	6792.5	2.0 ^d 7	M1+E2	DCO=1.02 12.
313.3	5407.6	3.4 5	M1+E2	DCO=1.05 7.
^x 314.0 5		81 17		Mult.: $A_2=-0.47$ 22, $A_4=+0.27$ 22.
314.5	5087.7	8.2 7	M1+E2	DCO=0.98 6.
330.2	7122.7	1.0 5	M1+E2	DCO=0.92 23.
347.4	3246.8	25.8 8	M1+E2	DCO=0.93 4.
353.4	2702.90	=20	M1+E2	
354.8	5762.4	2.8 6	M1+E2	DCO=0.94 6.
^x 354.9 5		144 17		Mult.: $A_2=-0.85$ 15, $A_4=+0.01$ 16.
355.0	6353.5	3.3 6	M1+E2	DCO=0.93 11.
361.3	4063.5	17.1 11	M1+E2	DCO=0.93 3.
363.7	5047.0	6.2 4	E2	DCO=0.55 16.
367.4	4349.5	8.9 9	M1+E2	DCO=0.99 8.
371.7	5459.4	6.7 19	M1+E2	DCO=0.95 8.
388.4	4115.7	2.2 7	E2	DCO=0.37 18.

Continued on next page (footnotes at end of table)

$^{126}\text{Te}(^{19}\text{F},4n\gamma)$ 2011Gu12,1989Gu10 (continued) $\gamma(^{141}\text{Pm})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger\S}$	Mult.#	Comments
401.65 ^c 10	2641.0		D	$E\gamma$: measured by 1989Gu10 but inexistent in 2011Gu12; 2004Bh01 ($^{12}\text{C},4n\gamma$) placed this transition at a close lying but different level, 2639.7, populated by 170 γ from 2810. $I\gamma$: 60 20 (1989Gu10). Mult.: $A_2=-0.31$ 3, $A_4=+0.03$ 3.
431.56 7	628.49	208& 18	M2@	Mult.: $A_2=-0.02$ 1, $A_4=-0.08$ 2.
435.3	5482.3	2.9 6	M1+E2	DCO=0.99 6.
442.7	5902.1	5.9 4	M1+E2	DCO=1.02 6.
461.0 ^d	3123.2	6.9 ^d 4	E2	DCO=0.47 4.
	6814.5	3.1 ^d 6	M1+E2	DCO=0.93 14.
^x 461.4 2		78 11		Mult.: $A_2=-0.08$ 13, $A_4=-0.06$ 15.
464.21 12	2702.90	22.8 11	M1+E2	$I\gamma$: 113 12 (1989Gu10). DCO=0.96 2. Mult.: $A_2=-0.25$ 7, $A_4=-0.08$ 8.
468.5	5151.8	6.3 5	(M1+E2)	DCO=1.12 7.
469.2	5094.3	7.3 5	E2	DCO=0.60 10.
472.1	4821.6	6.2 4	M1+E2	DCO=1.14 11.
486.0	2623.22	12.4 12	E2	DCO=0.56 5.
496.1	3158.3	12.5 11	M1+E2	DCO=0.98 3.
516.2	5998.5	1.3 5	M1+E2	DCO=1.09 12.
538.9	7353.4	1.0 5	M1+E2	DCO=1.07 11.
544.3	5482.3	6.3 4	E2	DCO=0.50 4.
561.6	4625.1	11.7 14	M1+E2	DCO=1.08 4.
566.3	3465.7	19.5 13	M1+E2	DCO=1.03 4.
578.4	5400.0	5.4 4	M1+E2	DCO=1.14 11.
597.8	4063.5	7.6 4	M1+E2	DCO=1.00 5.
608.3 2	2622.4			$E\gamma$: observed by 1989Gu10 but not by 2011Gu12. $I\gamma$: 105 13 (1989Gu10). Mult.: $A_2=+0.53$ 10, $A_4=+0.07$ 9.
628.5 2	628.49	25& 3	E3@	Mult.: $A_2=+0.13$ 8, $A_4=-0.15$ 9.
628.6	6402.4	9.0 7	E2	DCO=0.59 6.
638.3	3885.1	15.4 12	M1+E2	DCO=1.08 11.
646.1	4916.4	17.8 11	E2	DCO=0.48 3.
^x 651.1 2		84 13		Mult.: $A_2=+0.61$ 10, $A_4=-0.49$ 10.
653.3 2	2623.22	65.7 16	M1+E2	Mult.: $A_2=-0.72$ 7, $A_4=+0.16$ 9. DCO=1.06 2.
658.6	4722.1	6.1 4	M1+E2	DCO=1.03 7.
681.8	3581.2	25.4 9	E2	DCO=0.45 3.
^x 682.1 2		101 13		Mult.: $A_2=+0.28$ 7, $A_4=-0.11$ 8.
684.25 13	1312.77	48.8 7	M1+E2@	Mult.: 2011Gu12 quote E2 from 2004Bh01 ($^{12}\text{C},4n\gamma$) dataset), which finally assigned M1+E2; 1989Gu10 adopt M1+E2 too. Mult.: $A_2=-0.86$ 5, $A_4=+0.08$ 6.
684.4	6084.4	4.9 5	M1+E2	DCO=1.03 4.
689.1	4270.3	21.4 10	E2	DCO=0.45 4.
701.3 2	2014.1			$E\gamma$: observed by 1989Gu10 but not by 2011Gu12. $I\gamma$: 62 10 (1989Gu10). Mult.: $A_2=-0.52$ 13, $A_4=+0.21$ 15.
719.0	7121.4	12.1 14	E2	DCO=0.55 5.
728.30 7	2238.69	100 4	E2	DCO=0.46 1. Mult.: $A_2=+0.29$ 2, $A_4=-0.08$ 2.
777.02 6	973.97	113 5	E2@	Mult.: $A_2=+0.38$ 3, $A_4=-0.11$ 4.
798.2	4861.7	3.7 5	E2	DCO=0.48 10.
802.8	3702.2	28.6 9	M1+E2	DCO=1.06 4.
816.7	4063.5	1.7 8	M1+E2	DCO=1.04 9.
837.0	4722.1	1.7 6	M1+E2	DCO=1.07 10.
853.2	4916.7	3.8 5	E2	DCO=0.47 7.
857.4	5773.8	16.8 12	E2	DCO=0.43 5.
871.2	6353.5	3.8 5	E2	$E\gamma, I\gamma$: possibly same γ ray as 871.22 14 ($\Delta I\gamma=129$ 16) placed at 2382 in 1989Gu10. DCO=0.52 6. Mult.: $A_2=+0.06$ 6, $A_4=-0.06$ 7.
873.3	6025.1	5.7 4	(M1+E2)	DCO=1.07 8.

Continued on next page (footnotes at end of table)

$^{126}\text{Te}(^{19}\text{F},4n\gamma)$ 2011Gu12,1989Gu10 (continued) $\gamma(^{141}\text{Pm})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	Mult.#	Comments
881.90 6	1510.39	207 4	E2	DCO=0.45 1. Mult.: $A_2=+0.29$ 1, $A_4=-0.06$ 1.
922.9	4625.1	11.0 8	E2	DCO=0.43 4.
924.4	6698.2	6.8 4	E2	DCO=0.45 4.
951.5	5998.5	4.2 5	E2	DCO=0.42 4.
^x 951.8 3		62 11		Mult.: $A_2=+0.63$ 18, $A_4=-0.25$ 17.
953.0	4076.2	4.2 8	(M1+E2)	DCO=0.91 5.
995.77 11	1969.78	81.5 15	E2	DCO=0.55 2. Mult.: $A_2=+0.31$ 4, $A_4=-0.10$ 4.
999.09 13	2509.48	22.2 10	E2	DCO=0.55 3. Mult.: $A_2=+0.34$ 5, $A_4=-0.11$ 5.
1002.1	4334.9	10.6 14	M1+E2	DCO=1.12 5.
1019.9 3	2530.3			$E\gamma$: observed by 1989Gu10 but not by 2011Gu12. $I\gamma$: 60 30 (1989Gu10).
1019.9	4722.1	6.2 4	E2	DCO=0.60 9.
1068.2 ^a 2	2381.0	24.1 17	M1 [@]	Mult.: $A_2=+0.15$ 14, $A_4=+0.06$ 14.
1078.0	4334.9	6.3 4	E2	DCO=0.57 9.
1112.85 10	2623.22	41.8 17	E1 [@]	Mult.: $A_2=-0.35$ 3, $A_4=+0.02$ 3.
1163.8 2	2137.7	19.2 14	M1+E2	DCO=0.91 5. Mult.: $A_2=-0.05$ 11, $A_4=-0.03$ 12.
1218.6	4376.9	11.3 11	(M1+E2)	DCO=1.08 4.
1256.4	4722.1	2.0 5	E2	DCO=0.49 15.
1426.4	4683.3	23.8 10	E2	DCO=0.42 8.
1488.6	3727.3	6.0 4	E2	DCO=0.52 7.

[†] Values with uncertainty are from 1989Gu10 and those without uncertainty are from 2011Gu12.

[‡] Relative intensities from 2011Gu12, unless noted otherwise.

[§] Relative intensities quoted from 2011Gu12 and 1989Gu10 are not directly comparable (they used different normalizations).

[#] From 2011Gu12 (based on DCO ratio measurements), unless noted otherwise; generally in agreement with those from 1989Gu10 (based on $\gamma(\theta)$ measurements). Both papers adopt E2 for Q transitions and M1 for D transitions (and M1+E2 for D+Q) based on the heavy ion type of reaction; there is only one E1 111 γ from 2623 adopted by both papers. These values can differ from those in Adopted Levels, Gammas dataset.

[@] Taken from 2004Bh01 (in $^{12}\text{C},4n\gamma$) dataset) as the DCO value for the transition could not be obtained in 2011Gu12.

[&] Calculated by evaluator from the $I\gamma$'s from 1989Gu10 and the ratio of $I\gamma$ feedings of the 628.5 level in 2011Gu12 and 1989Gu10 (2011Gu12 do not give intensities for 432 γ and 629 γ).

^a The order of transitions in cascade from 2641 to 1313 is 1068 γ –260 γ in 1989Gu10, ($^3\text{He},3n\gamma$) and ($\alpha,4n\gamma$) datasets, but 260 γ –1068 γ in the more recent 2011Gu12 and in $^{12}\text{C},4n\gamma$, which is adopted here as well.

^b The order of transitions in cascade from 2662 to 2238 adopted here is 312.6 γ –110.8 γ (from 2011Gu12; this is reversed in 1989Gu10).

^c Placement of transition in the level scheme is uncertain.

^d Multiply placed; intensity suitably divided.

^x γ ray not placed in level scheme.

 $^{133}\text{Cs}(^{12}\text{C},4n\gamma)$ 2004Bh01

2004Bh01: E=65 MeV, pulsed and 'dc' beam. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(t)$, $\gamma\gamma(\theta)$ (DCO) using an array of seven HPGe detectors with anti-Compton shields; and a multiplicity filter of 14 BGO detectors.

 ^{141}Pm Levels

Structures in ^{141}Pm are interpreted as coupling of positive- and negative-parity states in ^{140}Nd core with single-particle (proton) orbitals ($\pi h_{11/2}$, $\pi d_{5/2}$, $\pi g_{7/2}$).

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0	5/2+		
196.90 16	7/2+		
628.50 [#] 16	11/2-	0.63 μs 2	$T_{1/2}$: from Adopted Levels.
973.90 17	11/2+		
1312.70 21	13/2-		
1510.40 [#] 17	15/2-		

Continued on next page (footnotes at end of table)

$^{133}\text{Cs}(^{12}\text{C},4n\gamma)$ 2004Bh01 (continued) ^{141}Pm Levels (continued)

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
1891.40 20	19/2-		
1969.71 18	15/2+		
2137.71 22	13/2+		
2238.71# 19	19/2-		
2349.21& 22	19/2-	54 ns 5	$T_{1/2}$: mentioned by authors as half-life on page 8, but as mean lifetime on page 17 in their paper. Comparison of lifetime of 822 level in ^{139}Pr measured by the authors suggests that the value of 54 ns is half-life, not mean life.
2381.21 25	15/2-		
2509.41@ 25	19/2-		
2530.4 3	(23/2-)		
2574.4 4		$\geq 2 \mu\text{s}$	$T_{1/2}$: from $\gamma(t)$ of 381 γ , 639 γ and 882 γ . E(level): energy of this level not well established.
2622.91 18	17/2+		
2639.71 25	21/2-		
2641.31 25	17/2-		
2661.2& 3	21/2-		
2702.91# 20	21/2-		
2809.8@ 3	21/2-		
2824.2 4	25/2-		
2840.2 4	(23/2-)		
2899.41# 23	23/2-	$\leq 0.7 \text{ ns}$	
3098.2 4	(25/2-)	$\leq 0.7 \text{ ns}$	
3122.2@ 4	25/2-	$\leq 0.7 \text{ ns}$	
3157.2& 4	23/2-	$\leq 0.7 \text{ ns}$	
3246.51 24	25/2-	$\leq 0.7 \text{ ns}$	
3465.51 24	25/2-	$\leq 0.7 \text{ ns}$	
3476.7@ 4	27/2-	$\leq 0.7 \text{ ns}$	
3702.31 ^a 24	25/2-	$\leq 0.7 \text{ ns}$	
3879.7 4	(23/2-)	$\leq 0.7 \text{ ns}$	
3884.3 3	27/2-	$\leq 0.7 \text{ ns}$	
4063.4 ^a 3	27/2-	$\leq 0.7 \text{ ns}$	
4075.2 4	(27/2-)	$\leq 0.7 \text{ ns}$	
4110.2& 4	(25/2-)	$\leq 0.7 \text{ ns}$	
4427.7@ 4	(29/2-)	$\leq 0.7 \text{ ns}$	
4625.4 ^a 3	29/2-	$\leq 0.7 \text{ ns}$	
4682.2@ 5	(31/2-)	$\leq 0.7 \text{ ns}$	
4721.5 3	(29/2-)	$\leq 0.7 \text{ ns}$	
4861.9 ^a 3	31/2-	$\leq 0.7 \text{ ns}$	
4916.4 3	(31/2-)	$\leq 0.7 \text{ ns}$	
5094.2 ^a 3	33/2-	$\leq 0.7 \text{ ns}$	
5337.5 ^a 4	(35/2-)	$\leq 0.7 \text{ ns}$	
5435.2 4		$\leq 0.7 \text{ ns}$	

[†] From least-squares fit to $E\gamma$'s.

[‡] From 2004Bh01 based on measured multiplicities, reaction type, and the implicit assumption that spin is generally increasing with increasing excitation energy. These $J\pi$ values can differ from those in Adopted Levels, Gammas dataset.

[§] For levels above 2899, $T_{1/2} \leq 0.7 \text{ ns}$ from generalized centroid-shift method.

(A): γ sequence based on 11/2-.

@ (B): γ sequence based on 19/2-.

& (C): γ sequence based on 19/2-.

^a (D): γ sequence based on 25/2-.

 $\gamma(^{141}\text{Pm})$

DCO's correspond to gates on $\Delta J=2$, Q transitions, unless otherwise stated.

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	Mult. [§]	Comments
44.0 2	2574.4			$E\gamma$: taken from authors' earlier work in $^{133}\text{Cs}(^{13}\text{C},5n\gamma)$ in 2000Bh08; not seen in the present work.
61.6 2	2702.91		(E2)	
80.0 2	2702.91		(M2)	
110.5 1	2349.21	10.84	M1+E2	DCO=0.86 19.

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$^{133}\text{Cs}(^{12}\text{C},4n\gamma)$ 2004Bh01 (continued) $\gamma(^{141}\text{Pm})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	Comments
140.4 2	4861.9	3.94	M1	DCO=0.59 24.
163.0 2	2824.2	1.25	(E2)	DCO=0.9 5.
170.1 2	2809.8	7.63	M1	DCO=0.48 8.
^x 177.0 2		5.84		
179.0 2	2840.2	5.87		
196.5 1	2899.41	67.02	M1	
196.9 2	196.90		M1@	$I\gamma$: =70.
197.7 2	1510.40		M1+E2	$I\gamma$: =15.
219.0	3465.51			$E\gamma$: weak γ ray from authors' figure 7.
232.3 1	5094.2	11.99	M1	DCO=0.47 6.
236.5 2	4861.9	8.4	M1	DCO=0.55 6.
236.8 2	3702.31	8.4	(M1+E2)	
243.3 2	5337.5	3.02	(M1+E2) [#]	DCO=1.1 7.
254.5 2	4682.2	4.28	(M1)	DCO=0.45 9.
258.0 2	3098.2	4.02	M1+E2	DCO=0.35 8.
260.1 2	2641.31	6.88	M1+E2 [#]	DCO=1.44 25.
291.0 2	4916.4	2.76	(M1) [#]	DCO=1.0 6.
300.4 2	2809.8	2.11	M1	DCO=0.6 3.
312.0 2	2661.2	8.71	M1+E2	DCO=0.63 9.
				$I\gamma$: for 312.0+312.4; intensity for 312.4 γ seems 2 from authors' figure 7.
				DCO for 312.0+312.4.
312.4	3122.2			
341.0 2	5435.2	1.84		
347.1 1	3246.51	12.76	M1	DCO=0.53 8.
354.5 1	3476.7	10.13	M1	DCO=0.54 6.
361.1 2	4063.4	9.80	M1 [#]	DCO=0.8 6.
381.0 1	1891.40	19.65	E2	DCO=0.94 12.
401.0 2	2639.71	7.18	M1+E2	
431.6 2	628.50		M2@	$I\gamma$: =70.
461.0 2	3122.2	7.61	E2	DCO=1.1 3.
464.2 1	2702.91	10.41	M1+E2	DCO=0.65 10.
485.2 2	2622.91	1.85	E2	DCO=0.7 3.
496.0 2	3157.2	3.34	M1	DCO=0.49 21.
562.0 2	4625.4	5.34	M1+E2 [#]	DCO=1.4 3.
566.1 1	3465.51	11.56	M1	DCO=0.57 18.
628.5 2	628.50		E3@	$I\gamma$: =5.
637.8 1	3884.3	17.85	M1 [#]	DCO=0.95 25.
639.0 2	2530.4			
653.2 1	2622.91	12.85	M1	DCO=0.45 8.
658.1 2	4721.5	1.81	(M1+E2) [#]	DCO=1.5 10.
684.2 2	1312.70	4.49	M1+E2	DCO=0.7 4.
728.3 1	2238.71	44.89	E2	DCO=1.05 9.
777.0 1	973.90	24.63	E2@	
798.5 2	4861.9	1.73	E2	
802.9 1	3702.31	16.15	M1	DCO=0.50 11.
816.9 2	4063.4			
837.2 2	4721.5	0.81	M1+E2 [#]	DCO=1.0 5.
853.0 2	4916.4	0.91		
881.9 1	1510.40	70.87	E2@	
923.1 2	4625.4	3.41	E2	
951.0 2	4427.7	2.94	(M1+E2)	DCO=0.75 25.
953.0 2	4110.2	3.24	(M1+E2)	DCO=1.2 7.
995.8 1	1969.71	13.18	E2	DCO=0.91 22.
999.0 2	2509.41	8.12	E2	DCO=1.0 7.
1019.2 2	4721.5	1.65		
1068.5 2	2381.21	4.54		
1112.5 1	2622.91	17.81	E1@	DCO=0.67 23.
1163.8 2	2137.71	2.66	M1	DCO=0.6 4.
1218.5 2	3879.7	2.96	(M1)	DCO=0.6 3.
1251.0 2	4075.2	1.97	(M1+E2)	DCO=0.32 16.
1256.0 2	4721.5	1.00	(E2)	

[†] Uncertainty of 0.1 keV assigned to $E\gamma$'s with $I\gamma \geq 10$ and 0.2 keV for $E\gamma$'s with $I\gamma < 10$, based on a general comment by 2004Bh01.

¹³³Cs(¹²C,4n γ) 2004Bh01 (continued)

 $\gamma(^{141}\text{Pm})$ (continued)

‡ Overall uncertainty is 10% for strong γ rays and 15–20% for weak transitions.

§ From 2004Bh01 based on DCO ratio measurements, unless noted otherwise. They adopt E2 for Q transitions and M1 for D transitions (and M1+E2 for D+Q) based on the heavy ion type of reaction. These values can differ from those in Adopted Levels, Gammas dataset.

DCO corresponds to gate on $\Delta J=1$, dipole transition.

@ From literature.

^x γ ray not placed in level scheme.

¹⁴¹Pr(³He,3n γ) 1980Pi03

E=19–27 MeV.

Measured: γ , $\gamma\gamma$, $\gamma\gamma(t)$, $\gamma(\theta)$, ce, ce(t).

¹⁴¹Pm Levels

E(level)	J $\pi^{\dagger}$	Comments
0.0	5/2+	
196.9	7/2+	
403.9	3/2+	
438.5	(1/2)+	
628.8	11/2–	
728.3	3/2+	
837.0	9/2+	
858.6		
974.3	11/2+	
1108.2	9/2+	
1152.7	7/2+	
1167.0	(9/2)–	
1313.3	13/2–	
1414.5		
1510.8	15/2–	
1573.6		
1874.2		
1970.1	15/2(+)	
2015.1	15/2–	
2098.9		
2137.3		
2238.9	19/2–	
2361.4		
2509.7	19/2–	
2623.4		E(level): may be identical with 2623.5 level.
2623.5		
2640.4		

[†] Adopted values.

 $\gamma(^{141}\text{Pm})$

E γ	E(level)	I $\gamma^{\ddagger}$	Mult. ^{†‡}	Comments
196.88 5	196.9	1392 70		Mult.: A ₂ =–0.01 2, A ₄ =+0.02 3.
197.5 5	1510.8	6 4		
247.5 4	1414.5	8 3		
260.3 4	1573.6	14 3		
324.53 15	728.3	25 4		
^x 347.6 4		19 3		
^x 354.8 5		11 3		
391.3 3	2361.4	18 3		
401.5 3	2640.4	22 3		
403.85 10	403.9	106 10	M1+E2	Mult.: A ₂ =–0.07 3, A ₄ =–0.04 4; $\alpha(K)_{\text{exp}}=0.025$ 4.
431.9 3	628.8	1000	M2	Mult.: A ₂ =+0.01 1, A ₄ =+0.01 1; $\alpha(K)_{\text{exp}}=0.077$ 15.

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\text{}^3\text{He}, 3\text{n}\gamma)$ 1980Pi03 (continued) $\gamma(^{141}\text{Pm})$ (continued)

E_γ	E(level)	$I_\gamma^\dagger$	Mult. †‡	δ	Comments
438.45 20	438.5	15 3			
531.4 4	728.3	13 3			
538.2 3	1167.0	89 14	M1+E2		Mult.: $A_2=-0.26$ 2, $A_4=+0.04$ 3; $\alpha(\text{K})_{\text{exp}}=0.012$ 3.
608.3 3	2623.4	33 4	(E2)		Mult.: $\alpha(\text{K})_{\text{exp}}=0.005$ 2.
628.7 3	628.8	63 6	E3		Mult.: $A_2=+0.07$ 8, $A_4=+0.11$ 12; $\alpha(\text{K})_{\text{exp}}=0.014$ 2.
653.4 5	2623.5	35 4	E2+ (M1)		Mult.: $\alpha(\text{K})_{\text{exp}}=0.0064$ 12.
661.7 5	858.6	7 3			
684.49 10	1313.3	305 18	M1+E2	-0.87 8	Mult.: $A_2=-0.71$ 3, $A_4=+0.09$ 2; $\alpha(\text{K})_{\text{exp}}=0.0062$ 8.
701.8 3	2015.1	49 6	M1+E2	-1.6 3	Mult.: $A_2=-0.66$ 6, $A_4=+0.26$ 10; $\alpha(\text{K})_{\text{exp}}=0.0061$ 11.
^x 707.6 5		21 3			
^x 725.4 4		19 5			
728.1§ 3	728.3				
	2238.9	206 14	E2		Mult.: $A_2=+0.07$ 2, $A_4=+0.02$ 3; $\alpha(\text{K})_{\text{exp}}=0.0040$ 7.
777.38 10	974.3	306 18	E2		Mult.: $A_2=+0.18$ 2, $A_4=0.0$; $\alpha(\text{K})_{\text{exp}}=0.0038$ 6.
785.6 5	2098.9	77 11	M1+E2	-0.19 8	Mult.: $A_2=-0.48$ 5, $A_4=+0.05$ 9.
837.0 1	837.0	181 14	E2		Mult.: $\alpha(\text{K})_{\text{exp}}=0.0021$ 5.
858.55 15	858.6	54 8			Mult.: $\alpha(\text{K})_{\text{exp}}=0.0037$ 7.
882.03 15	1510.8	562 40	E2		Mult.: $+0.23$ 2, $A_4=-0.05$ 3; $\alpha(\text{K})_{\text{exp}}=0.0024$ 4.
911.33 20	1108.2	91 8	(E2+M1)		Mult.: $\alpha(\text{K})_{\text{exp}}=0.0016$ 5.
955.7 6	1152.7	25 7			
^x 962.6 5		10 3			
995.8 3	1970.1	125 11	(E2)		Mult.: $A_2=+0.42$ 9, $A_4=-0.01$ 13; $\alpha(\text{K})_{\text{exp}}=0.0015$ 6 (995.8 γ +998.9 γ).
998.9 4	2509.7	74 7	E2		Mult.: $A_2=+0.42$ 9, $A_4=-0.01$ 13; $\alpha(\text{K})_{\text{exp}}=0.0015$ 6 (998.9 γ +995.8 γ).
1037.2 5	1874.2	42 6			
1067.9 6	2640.4	32 5			
1108.2 6	1108.2	15 3			
1112.6 5	2623.5	46 7			
1163.0 10	2137.3	64 12			

† $\alpha(\text{K})_{\text{exp}}$ were normalized to $\alpha(\text{K})(\text{E}2)$ for 525.1 γ in ^{142}Nd .

‡ Measured at $\text{E}(\text{}^3\text{He})=27$ MeV.

§ Multiply placed; undivided intensity given.

^x γ ray not placed in level scheme.

 $^{141}\text{Pr}(\alpha, 4\text{n}\gamma)$ 1985Ar19

$\text{E}=47$ MeV (1985Ar19), 49 MeV, 55 MeV (1980Pi03).

Measured: γ (1985Ar19, 1980Pi03); $\gamma\gamma$, $\gamma(\theta)$, $\gamma\gamma(t)$ (1985Ar19).

 ^{141}Pm Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	5/2+		
196.6	7/2+		
403.8	3/2+		
628.4	11/2-	0.63 μs 2	$T_{1/2}$: from 1985Ar19.
728.3	3/2+		
837.1	9/2+		
974.2	11/2+		
1055.3?	11/2-		
1108.0	9/2+		
1166.6	(9/2)-		
1313.3	13/2-		
1359.6	11/2, 7/2		
1414.5?	(9/2-)		
1510.6	15/2-		
1573.6			
1874.2			
1891.9	(19/2-)		

Continued on next page (footnotes at end of table)

$^{141}\text{Pr}(\alpha,4n\gamma)$ 1985Ar19 (continued) **^{141}Pm Levels (continued)**

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
1969.9	15/2(+)		
2015.4	15/2-		
2098.8			
2238.9	19/2-		
2509.7	19/2-		
2530.9		>2 μs	$T_{1/2}$: from 1985Ar19.
2554.3	21/2(-), 17/2(-)		
2623.8 2	17/2+		
2640.9			
2703.7	21/2(-)		

† Adopted values.

 $\gamma(^{141}\text{Pm})$

1985Ar19 reported additional γ 's: 218.6 2 (3.1 2), 723.3 2 ($I_\gamma=22.3$ 5, $A_2=+0.28$ 3, $A_4=-0.02$ 5, Q), 990.8 2 ($I_\gamma=16.0$ 4, $A_2=-0.22$ 2, $A_4=+0.02$ 3; D).

1980Pi03 reported additional γ 's (at $E(\alpha)=55$ MeV): 170.1 3 (5.2 6), 354.8 5 (8.3 8) (assuming $I(431.9\gamma)=100$).

E_γ	E(level)	I_γ	Mult.	Comments
108.9 $\frac{3}{2}$ 2	837.1			
140.6 2	2238.9	10.3 12	D	Mult.: $A_2=-0.13$ 7, $A_4=-0.03$ 10.
196.6 1	196.6	138 9	D	Mult.: $A_2=-0.06$ 6, $A_4=-0.02$ 7.
197.3 $\frac{3}{2}$ 2	1510.6			
206.6 2	2098.8			I_γ : weak.
208.7 $\frac{3}{2}$ 1	837.1			
260.3 4	1573.6	6.3 6		
315.4 1	2554.3	34 1	D	Mult.: $A_2=-0.18$ 5, $A_4=+0.02$ 7.
324.6 1	728.3	5.7 1	D	Mult.: $A_2=-0.26$ 7, $A_4=+0.02$ 9.
346.3 2	2238.9	10.9 4	D	Mult.: $A_2=-0.44$ 3, $A_4=-0.01$ 4.
381.3 1	1891.9	107 3	Q	Mult.: D based on $A_2=-0.11$ 3, $A_4=+0.02$ 5 contradicts Q from Adopted Gammas.
401.5 3	2640.9	7.8 10		E_γ, I_γ : from 1980Pi03.
403.8 1	403.8	2.7 4		
426.9 1	1055.3?	21 1	D+Q	Mult.: $A_2=-0.39$ 4, $A_4=+0.03$ 5.
431.6 1	628.4	100		Mult.: $A_2=+0.02$ 2, $A_4=+0.04$ 4.
455.1 2	1510.6	7.8 7	Q	Mult.: $A_2=+0.30$ 6, $A_4=+0.04$ 8.
464.8 2	2703.7	5.1 5	D	Mult.: $A_2=-0.22$ 5, $A_4=+0.12$ 7.
538.2 3	1166.6	4.0 5		E_γ, I_γ : from 1980Pi03.
628.6 1	628.4	6.1 4		Mult.: $A_2=+0.07$ 3, $A_4=+0.04$ 4.
639.0 1	2530.9	44 1		Mult.: $A_2=-0.02$ 3, $A_4=+0.02$ 4.
653.9 2	2623.8	4.2 5	D	Mult.: $A_2=-0.50$ 7, $A_4=+0.08$ 10.
684.7 2	1313.3	11.2 4	D+Q	Mult.: $A_2=-0.89$ 2, $A_4=+0.08$ 3.
702.1 1	2015.4	3.5 3	D	Mult.: $A_2=-0.59$ 2, $A_4=+0.01$ 3.
728.3 $\dagger$	728.3			E_γ, I_γ : not given in the table in 1985Ar19.
	2238.9			E_γ, I_γ : not given in the table in 1985Ar19.
777.6 1	974.2	10.3 2	Q	Mult.: $A_2=+0.32$ 4, $A_4=+0.01$ 6.
785.3 $\dagger$ 2	1414.5?	1.3 $\dagger$ 2		Mult.: $A_2=-0.93$ 9, $A_4=+0.27$ 12.
	2098.8	1.3 $\dagger$ 2		Mult.: $A_2=-0.93$ 9, $A_4=+0.27$ 12.
837.1 1	837.1	3.1 2	Q	Mult.: $A_2=+0.22$ 8, $A_4=-0.06$ 12.
882.0 1	1510.6	85 2	Q	Mult.: $A_2=+0.06$ 2, $A_4=-0.02$ 4.
911.4 2	1108.0	1.4 2		
995.7 2	1969.9	4.8 2	Q	Mult.: $A_2=+0.41$ 3, $A_4=+0.03$ 4.
998.9 4	2509.7	11.7 11		E_γ, I_γ : from 1980Pi03.
1020.3 3	2530.9	5.1 2		Mult.: $A_2=-0.03$ 3, $A_4=-0.04$ 4.
1037.2 5	1874.2	1.5 5		E_γ, I_γ : from 1980Pi03.
1067.9 6	2640.9	5.9 9		E_γ, I_γ : from 1980Pi03.
1112.6 2	2623.8	4.1 2	D	Mult.: $A_2=-0.15$ 4, $A_4=+0.18$ 5.
1163.0 3	1359.6	1.5 1	Q	Mult.: $A_2=+0.15$ 6, $A_4=+0.02$ 9.
1359.6 4	1359.6			I_γ : weak.

† Multiply placed; undivided intensity given.

‡ Placement of transition in the level scheme is uncertain.

$^{142}\text{Nd}(\text{p},2\text{n}\gamma)$ 1985Ar19

E(p)=20 MeV (1980Pi03), 25 MeV (1985Ar19).

Measured: γ , $\gamma\gamma$, $\gamma(\theta)$ (1985Ar19,1980Pi03), $\gamma(\text{E}(\text{p}))$ (1980Pi03).

Presented data are from 1985Ar19, except where noted.

 ^{141}Pm Levels

E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
0.0	5/2+	1153.2	7/2+	1874.6	
196.6	7/2+	1167.1	9/2(-)	1969.9	
403.8	3/2+	1242.5	7/2+	1982.9	9/2-
438.8	(1/2)+	1313.3	13/2-	2015.4	15/2-
628.4	11/2-	1359.6	11/2, 7/2	2091.8	11/2-
728.3	3/2+	1414.5	(9/2-)	2098.6	
804.5		1510.6	15/2-	2171.8	
837.1	9/2+	1692.5		2238.9	19/2-
974.2	11/2+	1794.8		2623.7 $\ddagger$	
1108.0	9/2+	1802.0		2623.8	17/2(+)

 † Adopted values. $\ddagger$ From 1989Gu10. **$\gamma(^{141}\text{Pm})$** At E(p)=20 MeV 1980Pi03 observed γ 's: 604.4 4 (2.2 5), 707.6 5 (1.7 3), 725.4 4 (14.1 11), 962.6 5 (2.2 4), 998.9 4 (2.0 4).

E γ	E(level)	I γ	Mult.	Comments
196.6 1	196.6	186 11		Mult.: $A_2=-0.02$ 1, $A_4=-0.02$ 1.
197.3 † 2	1510.6			
208.7 1	837.1			I γ : weak.
247.4 2	1414.5	1.5 2		Mult.: $A_2=-0.25$ 12, $A_4=-0.03$ 19.
324.6 1	728.3	6.8 5	D	Mult.: $A_2=-0.08$ 2, $A_4=+0.05$ 3.
402.6 † 2	1510.6			
403.8 1	403.8	31 2		Mult.: $A_2=-0.10$ 2, $A_4=+0.04$ 2.
431.8 1	628.4	100		Mult.: A_2 and $A_4=0.0$.
438.8 1	438.8	12.7 12		Mult.: $A_2=-0.28$ 22, $A_4=+0.25$ 25.
524.9 2	1153.2			I γ : weak.
531.3 2	728.3	3.2 3	Q	Mult.: $A_2=+0.15$ 8, $A_4=+0.19$ 11.
538.5 2	1167.1	18.9 12		Mult.: $A_2=-0.34$ 2, $A_4=+0.02$ 2.
607.9 2	804.5	3.6 5		Mult.: $A_2=-0.06$ 6, $A_4=-0.06$ 10.
608.3 $\ddagger$	2623.7			
628.6 1	628.4	7.1 5		Mult.: $A_2=+0.01$ 2, $A_4=+0.01$ 4.
640.5 2	837.1			I γ : weak.
653.9 2	2623.8	1.2 1		
684.7 2	1313.3	29 2		Mult.: $A_2=-0.77$ 1, $A_4=+0.06$ 2.
694.0 2	1802.0	8.4 8		Mult.: $A_2=-0.11$ 4, $A_4=+0.09$ 6.
702.1 1	2015.4	5.4 6		Mult.: $A_2=-0.90$ 3, $A_4=-0.15$ 6.
728.3 1	728.3	12.8 8	D	Mult.: $A_2=-0.50$ 3, $A_4=-0.60$ 11.
	2238.9	12.8 $\ddagger$ 8		Mult.: $A_2=-0.50$ 3, $A_4=-0.60$ 11.
749.6 1	1153.2	3.4 4		
777.6 1	974.2	36 2		Mult.: $A_2=+0.27$ 1, $A_4=-0.05$ 1.
785.3 2	1414.5	10.6 8		Mult.: $A_2=-0.34$ 4, $A_4=+0.04$ 6.
	2098.6	10.6 $\ddagger$ 8		Mult.: $A_2=-0.34$ 4, $A_4=+0.04$ 6.
820.6 2	1794.8	1.9 6		
827.9 3	1802.0	1.4 5		
837.1 1	837.1	30 2		Mult.: $A_2=+0.20$ 3, $A_4=-0.06$.
858.5 3	2171.8	14.1 8		Mult.: $A_2=+0.26$ 1, $A_4=-0.02$ 1.
882.0 1	1510.6	30 2		Mult.: $A_2=+0.26$ 2, $A_4=-0.11$ 4.
911.4 2	1108.0	16.1 10	Q+D	Mult.: $A_2=+0.04$ 2, $A_4=+0.12$ 2.
924.7 3	2091.8			I γ : weak.
956.5 39	1153.2	0.8 7	Q+D	Mult.: $A_2=-0.30$ 7, $A_4=-0.30$ 12.
995.7 2	1969.9	6.6 5		Mult.: $A_2=+0.44$ 6, $A_4=+0.06$ 9.
1008.7 3	1982.9	5.0 4		Mult.: $A_2=-0.43$ 4, $A_4=-0.10$ 6.
1037.5 3	1874.6	4.1 3		Mult.: $A_2=+0.35$ 9, $A_4=-0.03$ 16.
1045.9 4	1242.5	3.5 3	(Q+D)	Mult.: $A_2=+0.14$ 1, $A_4=-0.13$ 2.

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$^{142}\text{Nd}(\text{p}, 2\text{n}\gamma)$ 1985Ar19 (continued) $\gamma(^{141}\text{Pm})$ (continued)

<u>$E\gamma$</u>	<u>E(level)</u>	<u>$I\gamma$</u>	<u>Mult.</u>	<u>Comments</u>
1108.2 6	1108.0			$E\gamma, I\gamma$: reported only in 1980Pi03 with $I(1108\gamma)/I(911\gamma)=0.14$ 3.
1153.3 3	1153.2	1.0 2	D+Q	Mult.: $A_2=-0.49$ 5, $A_4=-0.14$ 11.
1163.0 3	1359.6	3.4 3		Mult.: $A_2=+0.29$ 3, $A_4=-0.11$ 6.
1242.5 4	1242.5	1.7 2	(D+Q)	Mult.: $A_2=-0.15$ 6, $A_4=-0.05$ 9.
1495.9 4	1692.5	1.9 2		
1786.3 4	1982.9	0.6 2		

† Placement of transition in the level scheme is uncertain.

‡ Multiply placed; undivided intensity given.

 $^{144}\text{Sm}(\text{p}, \alpha)$ 1980HaZE

$E=17$ MeV.

Measured: $\sigma(E, \theta)$, resolution 23–28 keV.

 ^{141}Pm Levels

<u>E(level)</u>	<u>$J\pi$</u>	<u>Comments</u>
0.0		
197		
439		
629		
837	(9/2+)	$J\pi$: from analysis of $\sigma(\theta)$.
974		
1108		
1132		
1803		
1825		
1874		
1931		
2020		
2042		

Adopted Levels, Gammas

Q(β⁻)=-6008 14; S(n)=8549 15; S(p)=5015 40; Q(α)=1226 15 2012Wa38.

Q(εp)=1031 27 (2012Wa38).

<r²>^{1/2}=4.9396 fm 65 (2004An14).

¹⁴¹Sm Levels

Cross Reference (XREF) Flags

A ¹⁴¹Sm IT Decay (22.6 min)
B ¹⁴¹Eu ε Decay (40.7 s)
C ¹⁴¹Eu ε Decay (2.7 s)
D ¹¹⁶Cd(²⁹Si,4nγ)

E(level)	Jπ [†]	XREF	T _{1/2}	Comments
0.0	1/2+	ABCD	10.2 min 2	%ε+%β ⁺ =100. μ=-0.74 2 (2011StZZ). μ: from hfs (1988Al41). T _{1/2} : from 1977Ke03. Others: 11.0 min 10 (1973VaYZ), 11.3 min 3 (1972Ep01), 9.0 min 5 (1970Ar17). Jπ: atomic beam (1976Fu06), log ft=5.82 to 3/2+. Jπ: M4 from 11/2-, γ to 1/2+ g.s. E(level): from energy difference.
1.58 4	3/2+	AB		%ε+%β ⁺ =99.69 3; %IT=0.31 3 (1976Ke06). μ=-0.84 2 (2011StZZ). Q=+1.6 5 (2011StZZ). μ,Q: from hfs (1988Al41). T _{1/2} : weighted average: 21.2 min 12 (1993Al03), 22.1 min 3 (1972Ep01), 22.8 min 2 (1972De23), 22.5 min 5 (1970Ar17), 22.9 min 5 (1968Bl13), 22.5 min 14 (1967He23). Jπ: atomic beam (1976Fu06), log ft=5.7 to 2091.6 negative-parity level of ¹⁴¹ Pm.
175.9 ^a 3	11/2-	ABCD	22.6 min 2	Jπ: γ to 1/2+ is M1, log ft=6.0 via 5/2+ parent.
384.51 11	3/2+	B		Jπ: γ to 3/2+ is M1, log ft=5.9 via 5/2+ parent, γ to 1/2+ is much weaker than to 3/2+.
395.56 11	(5/2)+	BC		Jπ: γ to 11/2- and from 9/2-,11/2-, no ε via 11/2- and 5/2+ parent, syst for 7/2- levels in N=79 nuclei.
545.3 3	(7/2-)	BC		Jπ: log ft=6.3 via 5/2+ parent. Strong γ to 3/2+ and weak γ to 1/2+.
594.72 13	(5/2)+	B		Jπ: γ to 1/2+, log ft=6.4 via 5/2+ parent.
597.90 13	(3/2+, 5/2+)	B		Jπ: γ's to 5/2+, no γ to 1/2+ or 3/2+, ε via 5/2+ parent.
810.7 ^a 9	15/2-	D		Jπ: γ to 11/2-, log ft=7.1 via 5/2+ parent.
829.42 19	(7/2)	BC		
899.8 4	7/2-	B		
990.5 3		B		
1001.46 19		BC		
1063.6? 4	(9/2, 11/2)-	C		Jπ: log ft=5.5 via 11/2- parent, γ to (7/2-).
1083.48 16	≤5/2	B		Jπ: γ's to 1/2+, 3/2+, (5/2)+.
1085.5 9	(13/2-)	D		
1160.5 4		B		
1180.4? 5	(9/2, 11/2-)	C		Jπ: log ft=6.3 via 11/2- parent, γ's to (7/2-).
1344.9 7		B		
1521.5 5		B		
1530.4 4		B		
1629.94 23		B		
1633.8? 4	(9/2, 11/2)-	C		Jπ: log ft=5.5 via 11/2- parent, γ to (7/2-).
1766.9 3	(3/2+, 5/2+)	B		Jπ: log ft=6.23 via 5/2+ parent, γ to 1/2+.
1771.2? 4	(9/2, 11/2)-	C		Jπ: log ft=5.4 via 11/2- parent, γ to (7/2-).
1895.16 22		B		
1899.7 ^a 12	(19/2-)	D		
1911.5 11	(15/2+)	D		
1935.1 ^a 12	(17/2-)	D		
1956.3 6		B		
2139.7 11	(17/2+)	D		
2221.8 3	(3/2+, 5/2+)	B		Jπ: log ft=5.96 via 5/2+ parent, γ to 1/2+.
2290.3 5		B		
2394.8 ^a 14	(21/2)	D		
2418.8 14	(23/2-)	D		
2563.4 11	(19/2+)	D		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{141}Sm Levels (continued)

E(level)	$J\pi^\dagger$	XREF	E(level)	$J\pi^\dagger$	XREF	E(level)	$J\pi^\dagger$	XREF
2641.3 15	(23/2+)	D	4576.9 22		D	5941& 3	(39/2)	D
2722.6 ^b 12	(21/2+)	D	4769.2 $\frac{1}{2}$ 25	(33/2)	D	6207@ 3	(43/2)	D
2822.9 ^b 14	(23/2+)	D	4793.0& 25	(33/2-)	D	6350.4 $\frac{1}{2}$ 24	(41/2)	D
2977.4 ^b 15	(25/2+)	D	4859.4 [#] 21	(35/2-)	D	6414& 3	(41/2)	D
3191.2 ^b 18	(27/2+)	D	4886.9 22		D	6896& 3	(43/2)	D
3206.6 18	(27/2-)	D	5001.9@ 21	(35/2)	D	7049@ 3	(47/2)	D
3318.0 ^a 13	(23/2-)	D	5097 $\frac{1}{2}$ 3	(35/2)	D	7143.4 [#] 25	(43/2)	D
3376.6 ^a 14	(25/2-)	D	5205.9 22		D	7376 $\frac{1}{2}$ 3	(45/2)	D
3509.1& 18	(27/2-)	D	5323 3		D	7833 3	(49/2)	D
3579.8 [#] 16	(27/2-)	D	5341& 3	(35/2-)	D	7987@ 3	(51/2)	D
3624.2 ^b 20	(29/2+)	D	5434 $\frac{1}{2}$ 3	(37/2)	D	8284 $\frac{1}{2}$ 3	(49/2)	D
3818.6& 20	(29/2-)	D	5458.9@ 24	(39/2)	D	8348 [#] 3	(47/2)	D
3972.9 ^b 20	(31/2+)	D	5576.4 $\frac{1}{2}$ 23	(37/2)	D	8558@ 3	(53/2)	D
4066.9 [#] 19	(31/2-)	D	5595 3		D	9477@ 3	(57/2)	D
4265.2& 23	(31/2-)	D	5641& 3	(37/2-)	D	10586@ 4	(61/2)	D
4482.2 $\frac{1}{2}$ 22	(31/2)	D	5903.4 [#] 23	(39/2)	D	11238 4	(63/2)	D

† Unless otherwise noted, assignments are based on DCO ratios and rotational band structure as reported in 1991Ca24.

$\frac{1}{2}$ (A): $\Delta J=1$ band, based on 31/2.

$\frac{1}{2}$ (B): $\Delta J=2$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.

[#] (C): $\Delta J=2$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.

@ (D): $\Delta J=2$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.

& (E): $\Delta J=1$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.

^a (F): Configuration= $(v h_{11/2})^{-1} \otimes$ excitation of N=80 core.

^b (G): $\Delta J=1$ band.

 $\gamma(^{141}\text{Sm})$

All data with uncertainties are from decay, others are from ($^{29}\text{Si}, 4n\gamma$).

E(level)	E_γ	I_γ	Mult. †	α	Comments
1.58	(1.58 4)	100			$E_\gamma, \Delta E$: calculated by 1977De25 (^{141}Eu ϵ decay (40.7 s)) by observing five pairs of relatively intense non-coincident γ rays, 384.5–382.9, 395.6–394.0, 594.7–593.1, 597.9–596.3 and 1083.6–1081.9 keV.
175.9	174.2 3	100	M4	68.2 12	Mult.: from ^{141}Sm IT decay (22.6 min). B(M4)(W.u.)=2.38 24.
384.51	382.9 2	53.5 36			
	384.5 2	100 6	M1 $\frac{1}{2}$	0.0422	
395.56	394.0 2	100	M1 $\frac{1}{2}$	0.0396	
	395.6 2	18.2 15			
545.3	369.5 2	100			
594.72	593.1 2	100 8			
	594.7 2	14 2			
597.90	202.3 3	14 4			
	213.5 3	10 4			
	596.3 2	41 4			
	597.9 2	100 9			
810.7	634.8	100	E2		
829.42	234.6 3	10.0 19			
	433.9 2	100 10			
899.8	354.4 3	89 22			
	724.2 5	100 33			
990.5	395.8 3	51 11			
	606.0 4	100 14			
1001.46	605.9 2	100 11			
	999.8 4	27 3			
1063.6?	518.8 5	100 51			
	887.3 3	64 14			
1083.48	687.8 3	100 14			
	699.0 2	100 10			
	1081.9 3	100 14			

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Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Sm})$ (continued)

E(level)	E_γ	I_γ	Mult. [†]	α	E(level)	E_γ	I_γ	Mult. [†]	α
1083.48	1083.6 5	43 10			3376.6	58.7		M1	7.87
1085.5	909.6	100	M1			553.6			
1160.5	764.9 5	80 33			3509.1	132.5	100	M1	0.759
	776.0 6	100 50			3579.8	203.2		M1	0.231
1180.4?	116.0 6	100 30				602.5			
	635.6 5	60 20			3624.2	433.1	100		
1344.9	799.6 6	100			3818.6	309.5	100	M1	0.0744
1521.5	976.2 3	100			3972.9	348.9			
1530.4	935.7 3	100				781.6		E2	
1629.94	1234.4 3	63 13			4066.9	487.0	100	E2	0.01376
	1245.4 3	100 16			4265.2	446.6	100	M1	0.0287
1633.8?	804.4 3	100			4482.2	858	100		
1766.9	1382.1 3	53 11			4576.9	604	100		
	1766.2 5	100 20			4769.2	287	100		
1771.2?	1225.7 5	3.8 19			4793.0	527.8	100	M1	0.0188
	1595.3 3	100 19			4859.4	792.5	100	E2	
1895.16	893.6 5	23 5			4886.9	914	100		
	1300.4 3	56 10			5001.9	935	100		
	1510.7 3	100 18			5097	328	100		
1899.7	1088.8	100	E2		5205.9	1233	100		
1911.5	826.0	100	E1		5323	530	100		
1935.1	1124.5	100			5341	548.1	100		
1956.3	1560.7 5	100			5434	337	100		
2139.7	228.2				5458.9	457	100		
	1329.0				5576.4	717			
2221.8	1392.4 5	58 15			5595	254	100		
	1676.0 6	65 31			5641	299.9			
	1826.6 4	100 46				318			
	2221.6 6	73 27			5903.4	1044	100		
2290.3	1744.9 4	100			5941	300			
2394.8	495	100				346			
2418.8	519.2		E2	0.01161	6207	748	100		
2563.4	423.7				6350.4	447			
	628.3		E1			774			
	651.9				6414	473	100		
	663.6				6896	482	100		
2641.3	222.5	100	E1	0.0319	7049	842	100		
2722.6	159.3				7143.4	1240			
	823.1				7376	1026	100		
2822.9	100.2		M1	1.680	7833	784	100		
	181.6				7987	938	100		
2977.4	154.5		M1	0.493	8284	908	100		
	336.1				8348	1205	100		
3191.2	213.8	100	M1	0.201	8558	571			
3206.6	787.8	100				725			
3318.0	595.5				9477	919	100		
	923				10586	1109	100		
	1418.3				11238	652	100		

[†] From $^{116}\text{Cd}(^{29}\text{Si},4n\gamma)$, unless noted otherwise.[‡] From ^{141}Eu ϵ decay (40.7 s).

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

 (E) $\Delta J=1$ band, $((\nu h_{11/2})^{-1} (\pi h_{11/2})^2)$

 (F) $(\nu h_{11/2})^{-1} \otimes$ excitation of
N=80 core

 (G) $\Delta J=1$ band

 $^{141}_{62}\text{Sm}_{79}$

^{141}Sm IT Decay (22.6 min) 1976Ke06

Parent ^{141}Sm : $E=175.9\text{ }3$; $J\pi=11/2^-$; $T_{1/2}=22.6\text{ min }2$; %IT decay=0.31 3.

^{141}Sm -%IT decay: %IT decay=0.31 3 from Ice(K)=0.164% 13 and $\alpha(K)/1+\alpha=0.526(\text{M4})$ for 174.2 γ .

Measured: K x ray, ce-K x ray coin.

 ^{141}Sm Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	1/2+		
1.58 4	3/2+		E(level): from 1977De25.
175.9 3	11/2-	22.6 min 2	%IT=0.31 3.

† Adopted values.

 $\gamma(^{141}\text{Sm})$

E_γ	E(level)	Mult.	α	$I(\gamma+\text{ce})^\dagger$	Comments
(1.58)	1.58			100	$I(\gamma+\text{ce})$: intensity balance for 1.58 level.
174.2 3	175.9	M4	69.8	100	Mult.: K/L=1.7 4. I_γ : Ice(K)=0.164% 13 from comparison with Ice(K) for 196.6 γ in ϵ decay.

† For absolute intensity per 100 decays, multiply by 0.0031 3.

Decay Scheme

Intensities: $I(\gamma+\text{ce})$
per 100 parent decays
%IT=0.31 3

^{141}Eu ϵ Decay (40.7 s) 1977De25

Parent ^{141}Eu : $E=0.0$; $J\pi=5/2+$; $T_{1/2}=40.7\text{ s }7$; $Q(\text{g.s.})=6008\text{ }14$; % ϵ +% β^+ decay=100.

Measured: γ , $\gamma\gamma$, $\beta\gamma$, K x ray (1977De25, 1989Gi06), β^+ (1983Al06), γ , ce (1973VaYZ).

Level scheme is that of 1977De25.

Others: 1973WeZK, 1973HaWA.

% ϵ +% β^+ =73 5 to <2-keV levels of ^{141}Sm (1989Gi06); 59 4 in 1977De25.

 ^{141}Sm Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	E(level)	$J\pi^\dagger$
0.0	1/2+		899.9 4	7/2-
1.58 4	3/2+		990.5 3	
175.9 3	11/2-	22.6 min 2	1001.44 18	
384.46 11	3/2+		1083.45 16	$\leq 5/2$
395.55 11	(5/2)+		1160.5 4	
545.5 4	(7/2-)		1345.1 7	
594.71 13	(5/2)+		1521.7 5	
597.90 13	(3/2+, 5/2+)		1530.4 4	
829.41 19	(7/2)		1629.91 23	

Continued on next page (footnotes at end of table)

^{141}Eu ϵ Decay (40.7 s) $^{1977}\text{De25}$ (continued) **^{141}Sm Levels (continued)**

E(level)	$J\pi^\dagger$
1766.5 3	(3/2+, 5/2+)
1895.13 22	
1956.3 6	
2221.9 3	(3/2+, 5/2+)
2290.4 5	

† Adopted values.

 β^+, ϵ Data

ϵ feedings were determined from the imbalance of I_γ feedings and measured $\% \epsilon + \% \beta^+ = 73.5$ to 1.58 level (1989Gi06, assuming no $\epsilon + \beta^+$ to g.s.).

$\epsilon/\beta^+ = 0.22$ 2 and $I_\gamma(394\gamma) = 9\%$ 2 (1989Gi06).

E_ϵ	E(level)	$I\beta^+^\dagger$	$I\epsilon^\dagger$	Log ft	$I(\epsilon + \beta^+)^\dagger$	Comments
(3718 14)	2290.4	0.14 5	0.13 5	6.52 17	0.27 10	
(3786 14)	2221.9	0.38 12	0.31 10	6.14 14	0.69 22	
(4052 14)	1956.3	0.06 3	0.03 2	7.16 25	0.09 5	
(4113 14)	1895.13	0.40 10	0.23 6	6.34 11	0.63 16	
(4242 14)	1766.5	0.41 11	0.21 6	6.41 12	0.62 17	
(4378 14)	1629.91	0.32 8	0.15 4	6.59 12	0.47 12	
(4478 14)	1530.4	0.09 3	0.039 12	7.20 14	0.13 4	
(4486 14)	1521.7	0.12 4	0.050 15	7.09 13	0.17 5	
(4663 14)	1345.1	0.20 7	0.072 24	6.96 15	0.27 9	
(4848 14)	1160.5	0.37 15	0.12 5	6.79 18	0.49 20	
(4925 14)	1083.45	0.50 12	0.15 4	6.70 11	0.65 16	
(5007 14)	1001.44	0.86 23	0.24 7	6.50 12	1.1 3	
(5018 14)	990.5	0.38 9	0.10 3	6.87 11	0.48 12	
(5108 14)	899.9	0.25 8	0.064 21	7.10 14	0.31 10	
(5179 14)	829.41	0.39 10	0.10 3	6.93 12	0.49 13	
(5410 14)	597.90	1.7 4	0.35 9	6.41 11	2.0 5	
(5413 14)	594.71	2.3 6	0.49 12	6.27 11	2.8 7	
(5463 14)	545.5	0.51 19	0.10 4	6.95 17	0.61 23	
(5612 14)	395.55	7.1 16	1.3 3	5.87 10	8.4 19	
(5624 14)	384.46	5.9 14	1.1 3	5.95 11	7.0 17	
5950 40	1.58	64 4	9.3 6	5.08 4	73 5	E_ϵ : from $E\beta^+ = 4925.40$ (1983Al06). Other: $E\beta^+ = 4620.110$ (1977De25).

† Absolute intensity per 100 decays.

 $\gamma(^{141}\text{Sm})$

I_γ normalization: $I(394\gamma) = 9\%$ 2 (1989Gi06). Other: $I_\gamma(394\gamma) = 14\%$ 3 (1977De25).

E_γ	E(level)	$I_\gamma^\dagger$	Mult.†	α	Comments
(1.58 4)	1.58				$E_\gamma, \Delta E$: calculated by 1977De25 by observing five pairs of relatively intense non-coincident γ -rays, 384.5–382.9, 395.6–394.0, 594.7–593.1, 597.9–596.3 and 1083.6–1081.9 keV.
(174.2 3)	175.9				$E_\gamma, \Delta E$: the determination of 1.58 4 γ ray concomitantly determined this γ ray in 1977De25.
202.3 3	597.90	1.9 5			
213.5 3	597.90	1.3 6			
234.6 3	829.41	0.63 12			
354.4 3	899.9	1.6 4			
369.5 2	545.5	18.0 13			
382.9 2	384.46	33.0 23			
384.5 2	384.46	61.7 37	M1	0.0422	Mult.: $\alpha(K)_{\text{exp}} = 0.031$ 10 (1973VaYZ).
394.0 2	395.55	100	M1	0.0396	Mult.: $\alpha(K)_{\text{exp}} = 0.042$ 15 (1973VaYZ).
395.6 2	395.55	18.2 15			
395.8 3	990.5	1.8 4			
433.9 2	829.41	6.3 6			

Continued on next page (footnotes at end of table)

^{141}Eu ϵ Decay (40.7 s) 1977De25 (continued) $\gamma(^{141}\text{Sm})$ (continued)

$E\gamma$	E(level)	$I\gamma^{\dagger}$	$E\gamma$	E(level)	$I\gamma^{\dagger}$	$E\gamma$	E(level)	$I\gamma^{\dagger}$
593.1 2	594.71	32.8 25	^x 882.9 2		8.1 7	1300.4 3	1895.13	2.2 4
594.7 2	594.71	4.6 5	893.6 5	1895.13	0.9 2	1382.1 3	1766.5	2.4 5
596.3 2	597.90	5.6 5	935.7 3	1530.4	1.4 3	1392.4 5	2221.9	1.5 4
597.9 2	597.90	13.6 12	976.2 3	1521.7	1.9 3	1510.7 3	1895.13	3.9 7
605.9 2	1001.44	10.5 12	^x 990.0 5		1.6 3	1560.7 5	1956.3	1.0 4
606.0 4	990.5	3.5 5	^x 996.1 3		4.1 4	1676.0 6	2221.9	1.7 8
687.8 3	1083.45	2.1 3	999.8 3	1001.44	2.8 3	^x 1691.6 7		1.5 8
699.0 2	1083.45	2.1 2	^x 1052.0 3		2.2 3	1744.9 4	2290.4	3.0 9
724.2 5	899.9	1.8 6	^x 1053.4 4		1.0 5	1766.2 5	1766.5	4.5 9
764.9 5	1160.5	2.4 10	1081.9 3	1083.45	2.1 3	1826.6 4	2221.9	2.6 12
776.0 6	1160.5	3.0 15	1083.6 5	1083.45	0.9 2	^x 1839.0 5		2.4 7
799.6 6	1345.1	3.0 7	1234.4 3	1629.91	2.0 4	2221.6 6	2221.9	1.9 7
^x 817.4 3		0.9 2	1245.4 3	1629.91	3.2 5			

[†] From $\alpha(\text{K})\text{exp.}$ [‡] For absolute intensity per 100 decays, multiply by 0.09 2.^x γ ray not placed in level scheme.

Decay Scheme

Intensities: I(γ+ce) per 100 parent decays

5/2+ 0.0 40.7 s
¹⁴¹₆₃Eu₇₈
 %ε+%β⁺=100
 Q⁺=6008¹⁴

¹⁴¹Eu e Decay (40.7 s) ¹⁹⁷De25 (continued)

^{141}Eu ϵ Decay (2.7 s) 1977De25,1989Gi06

Parent ^{141}Eu : $E=96.45$ 7; $J\pi=11/2^-$; $T_{1/2}=2.7$ s 3; $Q(\text{g.s.})=6008$ 14; $\% \epsilon + \% \beta^+$ decay=13 3.

$^{141}\text{Eu}-\% \epsilon + \% \beta^+$ decay: 13% 4-2 (1989Gi06); branching=67% in 1977De25.

Measured: γ , K x ray (1977De25,1989Gi06).

Other: 1973VaYZ.

$\epsilon + \beta^+$ feedings were determined from balance of I_γ for each level and absolute $I(1595\gamma)=0.4\%$ deduced from measurement of growth and decay of 196.6γ in daughter ^{141}Sm activity.

 ^{141}Sm Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	E(level)	$J\pi^\dagger$
0.0	1/2+		1001.5 3	
1.6 3	3/2+		1063.5? 11	(9/2, 11/2)-
175.8 11	11/2-	22.6 min 2	1180.2? 12	(9/2, 11/2)-
395.60 20	(5/2)+		1633.9? 5	(9/2, 11/2)-
545.2 11	(7/2-)		1771.0? 11	(9/2, 11/2)-
829.5 3	(7/2)			

† Adopted values.

 β^+, ϵ Data

$E\epsilon$	E(level)	$I\beta^+^\dagger$	$I\epsilon^\dagger$	Log ft	$I(\epsilon + \beta^+)^\dagger$
(4333 14)	1771.0?	0.28 9	0.14 4	5.44 15	0.42 13
(4471 14)	1633.9?	0.31 8	0.13 4	5.49 13	0.44 12
(4924 14)	1180.2?	0.09 3	0.027 9	6.25 16	0.12 4
(5041 14)	1063.5?	0.6 2	0.1 1	5.54 20	0.7 3
(5103 14)	1001.5	0.11 6	0.029 14	6.26 23	0.14 7
(5929 14)	175.8	10 3	1.5 4	4.69 13	11 3

† Absolute intensity per 100 decays.

 $\gamma(^{141}\text{Sm})$

$I(395.6\gamma + 394.0\gamma)=95$ 20; $I(395.6\gamma)/I(394.0\gamma)=0.182$ 15 from ^{141}Eu g.s. ϵ decay.

I_γ normalization: from $I(1595\gamma)=0.4\%$ deduced from measurement of growth and decay of 196.6γ in daughter ^{141}Sm activity.

E_γ	E(level)	$I_\gamma^{\dagger\ddagger}$	Comments
116.0 6	1180.2?	10 3	
(174.2)	175.8		
369.5 2	545.2	40 7	
394.0 2	395.60	80 17	
395.6 2	395.60	15 4	
433.9 2	829.5	57 20	
518.8 5	1063.5?	59 30	
605.9 2	1001.5	19 7	
635.6 5	1180.2?	6 2	
804.4 3	1633.9?	58 8	
^x 882.9 2		72 9	
887.3 3	1063.5?	38 8	
1225.7 5	1771.0?	2 1	
1595.3 3	1771.0?	53 10	I_γ : $I_\gamma=0.4\%$ (1977De25).

† Relative to $I_\gamma(96.4\gamma)=100$ in IT decay.

‡ For absolute intensity per 100 decays, multiply by 0.0076 18.

^x γ ray not placed in level scheme.

^{141}Eu ϵ Decay (2.7 s) 1977De25,1989Gi06 (continued)

Decay Scheme

Intensities: I(γ +ce) per 100 parent decays **$^{116}\text{Cd}(^{29}\text{Si}, 4n\gamma)$ 1991Ca24, 1993La10**Includes $^{142}\text{Nd}(\alpha, 5n\gamma)$ from 1993La10.1991Ca24: $^{116}\text{Cd}(^{29}\text{Si}, 4n\gamma)$ E=128 MeV. Measured γ , $\gamma\gamma$ using an array six Ge detectors and 14 BaF2 detectors.1993La10: $^{142}\text{Nd}(\alpha, 5n\gamma)$ E=77, 80 MeV. Measured γ , $\gamma\gamma$, ce, $\gamma(\theta)$.

Level scheme is from 1991Ca24.

 ^{141}Sm Levels

E(level)	J $\pi^\dagger$	E(level)	J $\pi^\dagger$	E(level)	J $\pi^\dagger$
(0.0)	1/2+	3508.9 ^b	(27/2-)	5576 [@]	(37/2)
(1.6)	3/2+	3579.7 ^{&}	(27/2-)	5595 ^b	
175.8 ^{‡c}	11/2-	3624.0 ^d	(29/2+)	5640.9 ^b	(37/2-)
810.6 ^c	15/2-	3818.4 ^b	(29/2-)	5903 ^{&}	(39/2)
1085.3 ^c	(13/2-)	3972.8 ^d	(31/2+)	5941 ^b	(39/2)
1899.5 ^c	(19/2-)	4066.7 ^{&}	(31/2-)	6207 ^a	(43/2)
1911.3	(15/2+)	4265.0 ^b	(31/2-)	6350 [@]	(41/2)
1935.0 ^c	(17/2-)	4482 [#]	(31/2)	6414 ^b	(41/2)
2139.5	(17/2+)	4577		6896 ^b	(43/2)
2394.6 ^c	(21/2)	4769 [#]	(33/2)	7049 ^a	(47/2)
2418.7	(23/2-)	4792.8 ^b	(33/2-)	7143 ^{&}	(43/2)
2563.2	(19/2+)	4859.2 ^{&}	(35/2-)	7376 [@]	(45/2)
2641.1	(23/2+)	4886.8		7833 ^a	(49/2)
2722.5 ^d	(21/2+)	5001.7 ^a	(35/2)	7987 ^a	(51/2)
2822.8 ^d	(23/2+)	5097 [#]	(35/2)	8284 [@]	(49/2)
2977.2 ^d	(25/2+)	5206		8348 ^{&}	(47/2)
3191.0 ^d	(27/2+)	5323 ^b		8558 ^a	(53/2)
3206.5 [§]	(27/2-)	5340.9 ^b	(35/2-)	9477 ^a	(57/2)
3317.8 ^c	(23/2-)	5434 [#]	(37/2)	10586 ^a	(61/2)
3376.4 ^c	(25/2-)	5459 ^a	(39/2)	11238 ^a	(63/2)

[†] Based on DCO ratios and rotational structure.[‡] %IT decay=0.3.[§] From 1993La10 only.[#] (A): $\Delta J=1$ band, based on 31/2.[@] (B): $\Delta J=2$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.[&] (C): $\Delta J=2$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.^a (D): $\Delta J=2$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.^b (E): $\Delta J=1$ band, configuration= $((v h_{11/2})^{-1} (\pi h_{11/2})^2)$.^c (F): Configuration= $(v h_{11/2})^{-1} \otimes$ excitation of N=80 core.^d (G): $\Delta J=1$ band.

$^{116}\text{Cd}(^{29}\text{Si},4n\gamma)$ 1991Ca24,1993La10 (continued) $\gamma(^{141}\text{Sm})$

$E\gamma^{\dagger}$	E(level)	Mult. ‡	$E\gamma^{\dagger}$	E(level)	Mult. ‡	$E\gamma^{\dagger}$	E(level)	Mult. ‡
(1.58 §)	(1.6)		446.6	4265.0	M1	781.6	3972.8	E2
58.7	3376.4	M1	447	6350		784	7833	
100.2	2822.8	M1	457	5459		787.8 $^{\#}$	3206.5	
132.5	3508.9	M1	473	6414		792.5	4859.2	E2
154.5	2977.2	M1	482	6896		823.1	2722.5	
159.3	2722.5		487.0	4066.7	E2	826.0	1911.3	E1
174.2 §	175.8	M4	495	2394.6		842	7049	
181.6	2822.8		519.2	2418.7	E2	858	4482	
203.2	3579.7	M1	527.8	4792.8	M1	908	8284	
213.8	3191.0	M1	530	5323		909.6	1085.3	M1
222.5	2641.1	E1	548.1	5340.9		914	4886.8	
228.2	2139.5		553.6	3376.4		919	9477	
254	5595		571	8558		923	3317.8	
287	4769		595.5	3317.8		935	5001.7	
299.9	5640.9		602.5	3579.7		938	7987	
300	5941		604	4577		1026	7376	
309.5	3818.4	M1	628.3	2563.2	E1	1044	5903	
318	5640.9		634.8	810.6	E2	1088.8	1899.5	E2
328	5097		651.9	2563.2		1109	10586	
336.1	2977.2		652	11238		1124.5	1935.0	
337	5434		663.6	2563.2		1205	8348	
346	5941		717	5576		1233	5206	
348.9	3972.8		725	8558		1240	7143	
423.7	2563.2		748	6207		1329.0	2139.5	
433.1	3624.0		774	6350		1418.3	3317.8	

 † From 1993La10 when quoted to nearest tenth of a keV, others are from 1991Ca24. ‡ From 1993La10. § From adopted gammas. $^{\#}$ From 1993La10 only.

Adopted Levels, Gammas

$Q(\beta^-) = -6701.23$; $S(n) = 11010.50$; $S(p) = 1759.18$; $Q(\alpha) = 1722.18$ 2012Wa38.

$Q(\epsilon p) = 990.40$ (2012Wa38).

1992Le09: measured isotope shift.

$\langle r^2 \rangle^{1/2} = 4.9718$ fm 9 (2004An14).

 ^{141}Eu LevelsCross Reference (XREF) Flags

A ^{141}Eu IT Decay (2.7 s)

B ^{141}Gd ϵ Decay (14 s)

C ^{141}Gd ϵ Decay (24.5 s)

D $^{99}\text{Ru}(^{48}\text{Ti}, 3p3n\gamma)$

E $^{110}\text{Cd}(^{35}\text{Cl}, 2p2n\gamma)$

F $^{144}\text{Sm}(\alpha, p6n\gamma)$

E(level) [†]	J $\pi^{\ddagger}$	XREF	T _{1/2} [#]	Comments
0.0	5/2+	ABCDEF	40.7 s 7	$\% \epsilon + \% \beta^+ = 100$. T _{1/2} : weighted average: 40.0 s 7 (1977De25), 41.4 s 7 (1993Al03), see also 1989Gi06. Others: 37 s 3 (1973WeZK), 28 s 6 (1973VaYZ). J π : hfs (LASER) (1985Ah02), log $ft = 5.2$ to 3/2+. $\mu = +3.494$ 8 (1985Ah02, 2011StZZ). μ : hfs (LASER). Q = +0.85 4 (1985Ah02, 2011StZZ). Q: hfs (LASER). $\% \epsilon + \% \beta^+ = 13 + 4 - 2$; $\% \text{IT} = 87 + 2 - 4$ (1989Gi06). J π : log $ft = 5.7$ from 11/2-; E3 γ to 5/2+. T _{1/2} : from 1989Gi06. Others: 3.3 s 3 (1977De25), 4 s +6-2 (1973VaYZ). Note that in the older paper (1977De25) with $\% \epsilon + \% \beta^+ = 67$, log $ft(11/2- \text{ to } 11/2-) = 4.1$ is significantly lower than expected. J π : log $ft = 5.2$ from 1/2+.
96.45@ 7	11/2-	A CDEF	2.7 s 3	
215.77 8	1/2+, 3/2+	B		
320.35 13		C		
336.23 8	1/2+, 3/2+	B		J π : log $ft = 5.3$ from 1/2+.
447.75 9		C		
457.59 8	(9/2+)	C		
509.28 12	1/2+, 3/2+	B		J π : log $ft = 5.9$ from 1/2+.
525.92 11	1/2+, 3/2+	B		J π : log $ft = 5.3$ from 1/2+.
622.56@ 13	15/2-	CDEF		
656.82 11		C		
671.98 15	13/2-	CDE		
749.35 13		C		
837.05 11		C		
869.87 10		C		
923.19 10		C		
967.65 16		C		
1047.43 10		C		
1072.64 11		C		
1154.6 3	15/2(+)	DE		
1309.48 21	(17/2-)	DE		
1344.93@ 21	19/2-	DEF		
1408.62 12	1/2+, 3/2+	B		J π : log $ft = 5.5$ from 1/2+.
1605.8 5	(17/2)	D		
1636.3 3	15/2(+)	DE		
1795.68 16		C		
1820.65 13		C		
1902.68 ^a 21	17/2(+)	DEF		
2019.56 13		C		
2030.6 ^a 3	19/2(+)	DEF		
2116.9 3	(21/2-)	E		
2177.1@ 4	23/2-	DEF		
2229.2 ^a 4	21/2(+)	DEF		
2441.0 ^a 5	23/2(+)	DEF		
2596.9 ^b 5	25/2(+)	DE		
2750.3 ^d 6	(25/2+)	DEF		
2847.9 ^a 5	27/2(+)	DEF		
3009.1 ^e 4	(25/2-)	DE		
3024.1@ 4	27/2-	DEF		
3076.0 ^e 4	27/2-	DEF		
3162.7 4	27/2-	DE		

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Adopted Levels, Gammas (continued)
¹⁴¹Eu Levels (continued)

E(level) [†]	Jπ ^{‡§}	XREF	T _{1/2} [#]	E(level) [†]	Jπ ^{‡§}	XREF	T _{1/2} [#]
3183.0 ^b 5	(29/2+)	DE		5390.2 [@] 11	39/2-	D	
3417.7 ^e 4	29/2-	DEF	0.76 ps +28-21	5391.7 15		D	
3446.3 ^d 12		D		5399.7 15		D	
3589.7 ^a 6	(31/2+)	DE		5640.7 ^{&} 16		D	
3596.6 [@] 5	31/2-	DEF		5657.9 ^f 11	(41/2-)	D	0.38 ps +17-14
3684.1 ^e 4	31/2-	DEF	1.7 ps +7-3	5676.1 ^c 13		D	
3857.1 ^c 10		D		5975.9 ^{&} 18		D	
3935.1 5	31/2-	E		5994.2 ^f 11	(43/2-)	DE	0.55 ps 14
4039.4 ^b 6	(33/2+)	DE		6324.6 ^{&} 18		D	
4156.1 ^e 5	33/2-	DEF	0.76 ps +28-21	6432.1 [@] 13	(43/2-)	D	
4369.2 [@] 6	35/2-	DEF		6621.9 ^f 15	(45/2-)	D	0.20 ps +14-10
4417.2 [?] 12	(35/2+)	E		6727.3 ^{&} 18		D	
4562.7 ^a 12	(33/2+)	D		7048.1 [@] 16	(47/2-)	D	
4583.3 ^d 16		D		7196.4 ^{&} 19		D	
4650.4 11	(35/2)	D		7639.4 ^{&} 19		D	
4766.1 ^c 13		D		7861.2 [@] 19	(51/2-)	D	
4847.2 ^e 5	(35/2-)	DE		7964.2 19		D	
4934.9 ^b 7	(37/2+)	DE		8112.4 ^{&} 20		D	
5021.2 ^f 6	(37/2-)	DE		8543.4 ^{&} 20		D	
5191.6 ^f 7	(39/2-)	DE		9035.4 ^{&} 21		D	

[†] From least-squares fit to E_γ data (γ's with no listed uncertainties were assigned ΔE_γ=1 keV for the fit).

[‡] J>11/2 from γ(0), RUL and assumption of a stretched character of E2 and D γ's and band assignments in (³⁵Cl,2p2nγ), (α,p6nγ), and (⁴⁸Ti,3p3nγ) (the last also measured γ(lin pol) but with no details provided); Jπ=9/2-,11/2- from log ft=6.1 via 11/2- parent; J≤3/2 from log ft≤5.5 via 1/2+ parent and syst.

[§] π=+ bands have been assigned on the basis of 1280 transition (from 1903, 17/2(+) level) being an (E1), possible suggested configuration are configuration=((π g_{7/2})(π h_{11/2})²) or configuration=((π d_{5/2})(π h_{11/2})²). See 1991Xu01, 2003Ma95, and 2004Po13 for discussion of possible configurations for the π=- bands.

[#] From 2004Po13 by Doppler-Shift Attenuation Method (DSAM); T_{1/2}<6 ns for levels with E>96 seen in (α,p6nγ).

[@] (A): 11/2- band.

[&] (B): Magnetic rotational band #1.

^a (C): Band based on (17/2+).

^b (D): γ cascade based on 25/2(+).

^c (E): γ sequence.

^d (F): γ cascade based on (25/2+).

^e (G): vh⁻²_{11/2}πh¹_{11/2}, magnetic rotational band #2. (configuration from (⁴⁸Ti,3p3nγ), 2004Po13).

^f (H): πh¹_{11/2}⊗vh⁻⁴_{11/2} magnetic rotational band #3. (configuration from (⁴⁸Ti,3p3nγ), 2004Po13; vh⁻²_{11/2}πh¹_{11/2} g⁻²_{9/2} in 2003Ma95).

^γ(¹⁴¹Eu)

Data are from ε decay, (³⁵Cl,2p2nγ), and (⁴⁸Ti,3p3nγ).

E(level)	E _γ	I _γ	Mult.	α	Comments
96.45	96.4 1	100	E3	46.3	B(E3)(W.u.)=0.091 11.
215.77	215.8 1	100			
320.35	223.9 1	100			
336.23	120.6 1	54 6			
	336.2 1	100 11			
447.75	351.1 1	100			
457.59	361.2 1	100 10			
	457.6 1	21 5			
509.28	173.1 1	100 33			
	293.3 2	67 33			
	509.0 [†] 5				
525.92	189.7 1	20 6			
	525.9 2	100 17			
622.56	526.0 2	100	E2	0.01171	
656.82	560.5 1	100 11			
	657.0 2	15 7			
671.98	574.9 3	100	M1+E2	0.013 4	
749.35	652.9 1	100			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Eu})$ (continued)

E(level)	E γ	I γ	Mult.	α	E(level)	E γ	I γ	Mult.	α
837.05	389.2 1	78 11			3183.0	586.2 3	100.0 22	E2	
	740.7 1	100 11			3417.7	341.8 3	100.0 20	M1+E2	0.051 12
869.87	412.2 1	87 13				393.5 3	19.5 8		
	773.5 1	100 13			3446.3	696	100		
923.19	300.7 1	77 15			3589.7	741.8 3	100		
	475.4 1	100 15			3596.6	433.9 3	63.1 9	E2	0.0197
	826.7 1	69 15				572.4 3	100.0 18	E2	
967.65	647.3 1	100			3684.1	266.5 3	100.0 19	M1+E2	0.103 19
1047.43	590.0 1	100 15				608.1 3	≤ 23		
	599.6 1	92 15				659			
1072.64	976.2 1	100 22			3857.1	833	100		
	1072.6 2	22 11			3935.1	911.0 3	100	E2	
1154.6	482.8 3	100	(E1)		4039.4	856.4 3	100	E2	
	532				4156.1	471.9 3	100	M1+E2	0.021 6
1309.48	638.2 3	100 4				738.0			
	686.5 3	77.8 23			4369.2	772.6 3	100	E2	
1344.93	722.4 2	100	E2		4417.2?	828.3 [†] 3	100.0		
1408.62	1072.6 2	14 7			4562.7	973	100		
	1192.8 1	100 14			4583.3	1137	100		
1605.8	261				4650.4	494.3	100		
	934				4766.1	909	100		
	983				4847.2	690.9 3	≤ 51		
1636.3	964					1163.3 3	100 3		
	1013.4 3	100	E1		4934.9	895.5 3	100	(E2)	
1795.68	1338.0 2	100 50			5021.2	174.1 3	100	M1+E2	0.365 22
	1348.0 2	100 33				864.5			
1820.65	1148.5 1	100 40			5191.6	170.4 3	100	M1+E2	0.390 21
	1164.0 1	100 40			5390.2	1021	100	E2	
1902.68	266.0 3	≤ 22			5391.7	829			
	297				5399.7	837			
	558				5640.7	241			
	593					249			
	748.3 3	≤ 22			5657.9	466.3	100	M1+E2	0.022 6
	1231				5676.1	910	100		
	1279.9 3	100.00 9	E1		5975.9	335	100		
2019.56	972.2 1	100 20			5994.2	336.3	100	M1+E2	0.053 12
	1922.8 2	60 20				802.6			
2030.6	127.6 3	100.0 15	M1+E2	0.97 5	6324.6	349	100		
	425					684			
	721.4 3	≤ 37			6432.1	756			
2116.9	772.1 3	≤ 63				1042			
	807.5 3	100.0 25	E2		6621.9	627.7	100		
2177.1	832.1 3	100	E2		6727.3	403	100		
2229.2	53					751			
	198.5 3	100	M1+E2	0.245 25	7048.1	616	100		
2441.0	211.7 3	100	M1+E2	0.202 24	7196.4	469	100		
2596.9	155.5 3	59 3	M1+E2	0.517 14		872			
	367.8 3	100.0 20	E2	0.0315	7639.4	443	100		
2750.3	309.3 3	100	D			912			
2847.9	250.5 3	≤ 56			7861.2	813	100		
	407.3 3	100 6	E2	0.0235	7964.2	916	100		
3009.1	892.3 3	100			8112.4	473	100		
3024.1	846.9 3	100	E2			916			
3076.0	(53)				8543.4	431	100		
	67.0 3	70.7				904			
	898.8 3	100.0 11	E2		9035.4	492	100		
3162.7	985.7 3	100	E2			923			
3183.0	335.0 3								

[†] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

^{141}Eu IT Decay (2.7 s)

Parent ^{141}Eu : E=96.45 7; J π =11/2-; T $_{1/2}$ =2.7 s 3; %IT decay=87 3.

Measured: γ , ce (1989Gi06,1977De25,1973WeZK,1973VaYZ).

 ^{141}Eu Levels

E(level)	J π [†]	T $_{1/2}$	Comments
0.0	5/2+	40.7 s 7	
96.4 1	11/2-	2.7 s 3	%IT=87 +2-4 (1989Gi06).

[†] Adopted values.

 $\gamma(^{141}\text{Eu})$

E γ	E(level)	I γ [†]	Mult.	α	I(γ +ce) [†]	Comments
96.4 1	96.4	1.895	E3	46.3	87 3	Mult.: α (K)exp=5.3 6 (1977De25).

[†] Absolute intensity per 100 decays.

Decay Scheme

Intensity: I(γ +ce)
per 100 parent decays
%IT=87 3

^{141}Gd ϵ Decay (14 s) 1989Gi06

Parent ^{141}Gd : E=0.0; J π =1/2+; T $_{1/2}$ =14 s 4; Q(g.s.)=6701 23; % ϵ +% β^+ decay=100.

Measured: γ , $\gamma\gamma$, ce, X γ (1989Gi06,1988TuZY), γ (1986Re11,1988HaZL,1987Pl05), delayed protons (1986Wi15,1989Gi06).

Delayed proton emission probability=0.03% 1 (1989Gi06), E(p)=2200-4900 (1986Wi15,1984Ni03).

Absence of delayed proton- γ coin suggests low J of p-decaying states and, therefore, low J for the parent ϵ decaying ^{141}Gd (1988GiZV).

All authors measured γ -spectra in the mixture of high spin and low spin ^{141}Gd . In the recent more complete papers (1989Gi06,1988TuZY) the reported γ spectra are more or less similar but are assigned to ϵ decaying 11/2- and 1/2+ ^{141}Gd isomers in very different ways. These authors also reported sharply different values of T $_{1/2}$ for low spin ^{141}Gd isomer (T $_{1/2}$ =1.3 s (1988TuZY) and T $_{1/2}$ =14 s (1989Gi06)). Evaluator adopted ^{141}Gd ϵ decay schemes and all data from 1989Gi06.

 ^{141}Eu Levels

E(level) [†]	J π
0.0	5/2+
215.77 8	1/2+, 3/2+
336.23 8	1/2+, 3/2+
509.28 12	1/2+, 3/2+
525.92 11	1/2+, 3/2+
1408.62 12	1/2+, 3/2+

[†] From least-squares fit to E γ data.

^{141}Gd ϵ Decay (14 s) 1989Gi06 (continued) β^+, ϵ Data

E ϵ	E(level)	I $\beta^+ \dagger$	I $\epsilon \dagger \ddagger$	Log ft	I($\epsilon + \beta^+$) $\ddagger$
(5292 23)	1408.62	6.2 10	1.6 3	5.31 15	7.8 13
(6175 23)	525.92	19 3	2.8 5	5.20 15	22 4
(6192 23)	509.28	5.3 16	0.75 22	5.77 18	6.0 18
(6365 23)	336.23	26 4	3.3 6	5.14 15	29 5
(6485 23)	215.77	32 8	3.9 10	5.09 17	36 9

 $\dagger$ From 1989Gi06, details are not given. $\ddagger$ Absolute intensity per 100 decays. $\gamma(^{141}\text{Eu})$ I γ normalization: from $\Sigma I(\gamma + \text{ce})$ to g.s.=100.

E γ	E(level)	I $\gamma \dagger$	Mult.	α
120.6 1	336.23	19 2	[M1, E2]	1.16 8
173.1 1	509.28	6 2	[M1, E2]	0.371 22
189.7 1	525.92	7 2	[M1, E2]	0.281 24
215.8 1	215.77	111 12	[M1, E2]	0.190 24
293.3 2	509.28	4 2		
336.2 1	336.23	35 4	[M1, E2]	0.053 12
509.0 $\ddagger$	509.28			
525.9 2	525.92	35 6		
1072.6 2	1408.62	2 1		
1192.8 1	1408.62	14 2		

 $\dagger$ For absolute intensity per 100 decays, multiply by 0.49 4. $\ddagger$ Placement of transition in the level scheme is uncertain.

Decay Scheme

Intensities: I γ per 100 parent decays **^{141}Gd ϵ Decay (24.5 s) 1989Gi06**Parent ^{141}Gd : E=377.76 9; J π =11/2-; T $_{1/2}$ =24.5 s 5; Q(g.s.)=6701 23; $\epsilon + \beta^+$ decay=89 2. ^{141}Gd - $\epsilon + \beta^+$ decay: I($\gamma + \text{ce}$) normalization, branching: from $\Sigma I(\gamma + \text{ce})$ to g.s.=89 2 with I($\gamma + \text{ce}$)(96 γ) corrected for isomeric state branching.See comment in 14-s ^{141}Gd ϵ decay.Measured: γ , $\gamma\gamma$, X γ , ce (1989Gi06, 1988TuZY, 1988HaZL), γ (1986Re11, 1988HaZL, 1987Pl05).

All data are from 1989Gi06.

Branching=0.89 2 (1989Gi06).

^{141}Gd ϵ Decay (24.5 s) $^{1989}\text{Gi06}$ (continued) ^{141}Eu Levels

E(level) [†]	J π	T _{1/2}	E(level) [†]	J π	E(level) [†]
0.0	5/2+	2.7 s	656.73 10	(9/2+)	967.66 16
96.46 7	11/2-		671.65 11		1047.44 10
320.36 13			749.36 13		1072.65 11
447.75 9			837.05 11		1795.68 16
457.60 8	(9/2+)		869.88 10		1820.45 12
622.45 13	15/2-		923.15 10		2019.57 13

[†] From least-squares fit to E γ data (χ^2 norm=3.89 greater than χ^2 critical=2.18).

 β^+, ϵ Data

E ϵ	E(level)	I β^+ [†]	I ϵ [†]	Log ft	I($\epsilon+\beta^+$) [†]
(5059 23)	2019.57	1.7 5	0.50 14	6.01 12	2.2 6
(5258 23)	1820.45	1.1 4	0.28 10	6.29 16	1.4 5
(5283 23)	1795.68	1.4 5	0.34 12	6.21 16	1.7 6
(6006 23)	1072.65	1.3 3	0.20 5	6.55 12	1.5 4
(6031 23)	1047.44	1.8 5	0.28 8	6.41 13	2.1 6
(6111 23)	967.66	2.8 5	0.41 8	6.25 9	3.2 6
(6156 23)	923.15	3.8 8	0.56 11	6.13 9	4.4 9
(6209 23)	869.88	3.4 6	0.48 9	6.20 8	3.9 7
(6242 23)	837.05	3.9 7	0.53 10	6.16 8	4.4 8
(6329 23)	749.36	2.6 5	0.34 7	6.37 9	2.9 6
(6407 23)	671.65	6.4 12	0.81 16	6.01 9	7.2 14
(6422 23)	656.73	3.2 7	0.40 9	6.31 10	3.6 8
(6621 23)	457.60	2.3 9	0.26 10	6.52 17	2.6 10
(6631 23)	447.75	6.8 17	0.77 19	6.06 11	7.6 19
(6758 23)	320.36	6.2 14	0.65 14	6.15 10	6.8 15
(6982 23)	96.46	28 14	2.7 13	5.56 21	31 15

[†] Absolute intensity per 100 decays.

 $\gamma(^{141}\text{Eu})$

E γ	E(level)	I γ [†]	Mult.	α	E γ	E(level)	I γ [†]
96.4 1	96.46	13 2	E3	46.3	^x 700.6 1		8 2
223.9 1	320.36	72 7			740.7 1	837.05	18 2
300.7 1	923.15	10 2			^x 746.4 1		7 2
351.1 1	447.75	100 10			773.5 1	869.88	15 2
361.2 1	457.60	42 4			826.7 1	923.15	9 2
389.2 1	837.05	14 2			^x 841.4 1		7 2
412.2 1	869.88	13 2			^x 864.4 1		6 2
457.6 1	457.60	9 2			972.2 1	2019.57	10 2
475.4 1	923.15	13 2			976.2 1	1072.65	9 2
^x 487.5 1		12 2			^x 1036.4 1		4 2
526.0 2	622.45	19 5			1072.6 2	1072.65	2 1
^x 544.3 1		5 2			^x 1097.6 1		12 2
^x 557.5 1		25 2			1148.5 1	1820.45	5 2
560.5 1	656.73	27 3			1164.0 1	1820.45	5 2
574.9 1	671.65	57 6			^x 1172.2 1		6 2
590.0 1	1047.44	13 2			1338.0 2	1795.68	6 3
599.6 1	1047.44	12 2			1348.0 2	1795.68	6 2
647.3 1	967.66	23 2			^x 1397.2 2		9 2
652.9 1	749.36	21 2			1922.8 2	2019.57	6 2
657.0 2	656.73	4 2					

[†] For absolute intensity per 100 decays, multiply by 0.139 21.

^x γ ray not placed in level scheme.

¹⁴¹Gd ε Decay (24.5 s) 1989Gi06 (continued)

⁹⁹Ru(⁴⁸Ti,3p3nγ) 2004Po13,2003Ma95

Includes ¹¹⁴Sn(³²S,3p2nγ) from 2004Po13.

2003Ma95: ⁹⁹Ru(⁴⁸Ti,3p3nγ) E=240 MeV. Measured E_γ, I_γ, γγ, γγ(θ), γ(lin pol), (charged particle)γ coin with the EUROBALL III array of cluster, clover and tapered detectors, and the charged-particle detector array ISIS, consisting of 40 Si detector telescopes. Based on these measurements 2003Ma95 adopted γ-ray multiplicities and J_π values; however there is no supporting evidence, except for the J_π values on their level scheme drawing.

2004Po13: ¹¹⁴Sn(³²S,3p2nγ) E=160 MeV. Measured lifetimes by the Doppler-Shift Attenuation Method (DSAM) using the EUROBALL IV array, consisting of 14 cluster, 26 clover and 30 individual Compton-suppressed Ge detectors; EUROBALL also equipped with an inner BGO ball and the particle detector array EUCLIDES. This experiment was performed to minimize sidefeeding lifetimes.

2003Ma95 and 2004Po13 are published by essentially the same group of authors. The levels scheme is from 2003Ma95.

¹⁴¹Eu Levels

E(level) [†]	Jπ [‡]	T _{1/2}	E(level) [†]	Jπ [‡]	T _{1/2}
0.0	5/2+		3008.0 ^f 7	(25/2-)	
96.45 [§] 7	11/2-	2.7 s 3	3023.8 [§] 6	27/2-	
622.4 [§] 3	15/2-		3075.4 ^f 6	27/2-	
671.5 6	13/2		3162.5 6	27/2-#	
1154.5 7	15/2		3181.6 ^c 16	(29/2+) [@]	
1309.5 7	17/2		3416.7 ^f 6	29/2-	0.76 ps +28-21
1344.6 [§] 4	19/2-		3446.6 ^e 19		
1605.5 6	17/2		3590.6 ^b 19	(29/2+)	
1635.5 7	15/2		3595.9 [§] 7	31/2-	
1902.5 ^b 6	17/2(+)		3683.0 ^f 6	31/2-	1.7 ps +7-3
2030.5 ^b 7	19/2(+)		3856.8 ^d 11		
2176.7 [§] 5	23/2-		4037.6 ^c 19	(33/2+) [@]	
2229.6 ^b 9	21/2(+)		4154.7 ^f 6	33/2-	0.76 ps +28-21
2441.6 ^b 12	23/2(+)		4368.9 [§] 11	35/2-	
2595.6 ^c 12	25/2(+) [@]		4563.6 ^b 21	(33/2+)	
2750.6 ^e 16	(25/2+)		4583.6 ^e 21		
2848.6 ^b 16	(25/2+)		4649.0 7	(35/2)	

Continued on next page (footnotes at end of table)

⁹⁹Ru(⁴⁸Ti,3p3n γ) 2004Po13,2003Ma95 (continued)

¹⁴¹Eu Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	T _{1/2}	E(level) [†]	J $\pi^{\ddagger}$	T _{1/2}
4765.8 ^d 14			6325.5 ^a 25		
4845.0 ^f 7	35/2-		6431.9 ^{&} 15	(43/2-)	
4933.6 ^c 21	(37/2+) [@]		6619.7 ^g 8	(45/2-)	0.20 ps +14-10
5019.2 ^g 7	37/2-		6728 ^a 3		
5189.4 ^g 7	39/2-		7047.9 ^{&} 18	(47/2-)	
5389.9 ^{&} 14	(39/2-)		7197 ^a 3		
5392.6 23			7640 ^a 3		
5400.6 23			7860.9 ^{&} 20	(51/2-)	
5641.6 ^a 24			7963.9 20		
5655.7 ^g 8	41/2-	0.38 ps +17-14	8113 ^a 3		
5675.8 ^d 15			8544 ^a 3		
5976.8 ^a 25			9036 ^a 3		
5992.0 ^g 8	43/2-	0.55 ps 14			

[†] From least-squares fit to E γ 's; $\Delta E\gamma=0.3$ keV for transitions whose energy is given to one decimal place. For all other transitions, $\Delta E\gamma=1$ keV was assigned.

[‡] Given by 2004Po13 and 2003Ma95 (they can differ from those adopted in Adopted Levels, Gammas dataset).

[§] From Adopted Levels, Gammas dataset.

[#] From 2004Po13 only.

[@] From Adopted Levels, Gammas dataset.

[&] (A): 11/2- band.

^a (B): Magnetic rotational band #1.

^b (C): Band based on (17/2+).

^c (D): γ first cascade based on (25/2+).

^d (E): γ sequence.

^e (F): γ second cascade based on (25/2+).

^f (G): $\nu h^{-2}_{11/2}\pi h^1_{11/2}$, magnetic rotational band #2.

^g (H): $\pi h^1_{11/2}\otimes\nu h^{-4}_{11/2}$ magnetic rotational band #3. This band was assigned the configuration $(\nu h^{-2}_{11/2}\pi h_{11/2} g^{-2}_{9/2})$ in 2003Ma95.

 $\gamma(^{141}\text{Eu})$

E $\gamma^{\dagger}$	E(level)	Mult. [‡]	Comments
52	3075.4		
53	2229.6		
67.4	3075.4		
96	96.45		
128	2030.5		
154	2595.6		
170.2	5189.4	M1+E2 [§]	
174.3	5019.2	M1+E2 [§]	
199	2229.6		
212	2441.6		
241	5641.6		
249	5641.6		
261	1605.5		
266.3	3683.0	M1+E2 [§]	
267	1902.5		
297	1902.5		
309	2750.6		
335	5976.8		
336.3 [#]	5992.0	M1+E2 [§]	E γ : 336.3 and 341.2 form a doublet structure.
341.2	3416.7	M1+E2 [§]	E γ : 336.3 and 341.2 form a doublet structure.
349	6325.5		
366	2595.6		
392.9	3416.7		
403	6728		
407	2848.6		
425	2030.5		
431	8544		
434	3595.9		
443	7640		

Continued on next page (footnotes at end of table)

$^{99}\text{Ru}(^{48}\text{Ti},3\text{p}3\text{n}\gamma)$ 2004Po13,2003Ma95 (continued) $\gamma(^{141}\text{Eu})$ (continued)

$E\gamma^{\dagger}$	E(level)	Mult. ‡	Comments
466.3 #	5655.7	M1+E2§	E γ : 466.3 and 471.7 form a doublet structure.
469	7197		
471.7	4154.7	M1+E2§	E γ : 466.3 and 471.7 form a doublet structure.
473	8113		
483	1154.5		
492	9036		
494.3	4649.0		
526.0	622.4		
532	1154.5		
558	1902.5		
572.0	3595.9		
575	671.5		
586	3181.6		
593	1902.5		
607.6	3683.0		
616	7047.9		
627.7	6619.7		
638	1309.5		
659	3683.0		
684	6325.5		
687	1309.5		
690.4	4845.0		
696	3446.6		
721	2030.5		
722.2	1344.6		
738.0	4154.7		
742	3590.6		
748	1902.5		
751	6728		
756	6431.9		
773	4368.9		
802.6	5992.0		
813	7860.9		
829	5392.6		
832.1	2176.7		
833	3856.8		
837	5400.6		
847.1	3023.8		
856	4037.6		
864.5	5019.2		
872	7197		
896	4933.6		
898.7	3075.4		
904	8544		
909	4765.8		
910	5675.8		
912	7640		
916	7963.9		
	8113		
923	9036		
934	1605.5		
964	1635.5		
973	4563.6		
983	1605.5		
985.8	3162.5		
1013	1635.5		
1021	5389.9		
1042	6431.9		
1137	4583.6		
1161.9	4845.0		
1231	1902.5		
1280	1902.5		

Footnotes continued on next page

⁹⁹Ru(⁴⁸Ti,3p3n γ) 2004Po13,2003Ma95 (continued)

 $\gamma(^{141}\text{Eu})$ (continued)

[†] The E γ values with decimal point are from 2004Po13, while 2003Ma95 gave only rounded-off E γ values.

[‡] Results of angular distributions ratios and preliminary results of analysis of polarization in 2003Ma95 confirm the M1 character of γ -transitions belonging to considered dipole bands.

[§] Multipolarity assigned to transition is based on values of the DCO ratio, obtained by gating on low-lying E2 transitions, which range from 0.3 to 0.6. The transition has spin change of $\Delta J=1$.

[#] The ordering of the 336.3–466.3 cascade (with 336 γ at higher excitation energy as adopted here) was reversed in 2003Ma95.

¹¹⁰Cd(³⁵Cl,2p2n γ) 1991Xu01

Measured γ , $\gamma\gamma$, $\gamma(0)$, $\gamma(t)$, excit.

¹⁴¹Eu Levels

E(level)	J $\pi^{\dagger}$	T _{1/2}	E(level)	J $\pi^{\dagger}$	E(level)	J $\pi^{\dagger}$
0.0	5/2+		2749.5 [‡] 12	(25/2+)	4417.2 [‡] § 12	(35/2+)
96.0 [@] 10	11/2-	2.7 s 3	2847.1 [§] 12	27/2(+)	4846.8 ^b 12	(35/2-)
622.2 [@] 11	15/2-		3008.6 ^a 11	(25/2-)	4934.2 [#] 13	(37/2+)
670.8 ^{&} 11	13/2-		3023.6 [@] 11	27/2-	4985.1 ^c 12	
1153.7 11	15/2(+)		3075.5 ^a 11	27/2-	5020.9 ^b 12	(37/2-)
1308.8 ^{&} 11	(17/2-)		3162.2 12	27/2-	5191.3 ^b 13	(39/2-)
1344.4 [@] 11	19/2-		3182.3 [#] 12	(29/2+)	5284.6 ^{@c} 12	(39/2-)
1635.9 11	15/2(+)		3417.2 ^a 11	29/2-	5528.2 ^b 13	(41/2-)
1902.1 [‡] 11	17/2(+)		3588.9 [§] 12	(31/2+)	5994.7 ^b 13	(43/2-)
2029.9 [‡] 11	19/2(+)		3596.1 [@] 12	31/2-	6008.2 ^c 13	
2116.4 ^{&} 11	(21/2-)		3683.6 ^a 12	31/2-	6336.6 [?] 13	(43/2-)
2176.6 [@] 11	23/2-		3934.6 12	31/2-	6539.2 [?] 14	(45/2-)
2228.4 [‡] 11	21/2(+)		4038.7 [#] 12	(33/2+)	7049.2 13	
2440.2 [‡] 12	23/2(+)		4155.7 ^a 12	33/2-		
2596.1 [#] 12	25/2(+)		4368.7 [@] 12	35/2-		

[†] $\pi=+$ bands have been assigned on the basis of 1280 transition (from 1902, 17/2(+) level) being an (E1), possible suggested configurations are configuration= $((\pi g_{7/2})(\pi h_{11/2})^2)$ or configuration= $((\pi d_{5/2})(\pi h_{11/2})^2)$. See 1991Xu01 for discussion of possible configurations for the $\pi=-$ bands.

[‡] (A): $\pi=+$, $\Delta J=1$ band.

[§] (B): $\pi=+$, $\Delta J=2$ band-1.

[#] (C): $\pi=+$, $\Delta J=2$ band-2.

[@] (D): $\pi=-$, h11/2 band, favored members.

[&] (E): $\pi=-$, h11/2 band, unfavored members.

^a (F): $\pi=-$, $\Delta J=1$ band-1.

^b (G): $\pi=-$, $\Delta J=1$ band-2.

^c Level not adopted because its γ transitions were relocated in the adopted levels, gammas dataset.

 $\gamma(^{141}\text{Eu})$

E γ	E(level)	I γ	Mult.#	α	E γ	E(level)	I γ	Mult.#	α
(53 [†])	3075.5				336.9 3	5528.2	9.0 [‡] 2	M1+E2	0.053 13
67.0 3	3075.5	14.0 [§]			341.8 3	3417.2	25.7 [‡] 5	M1+E2	0.051 12
(96 [†])	96.0				367.8 3	2596.1	10.1 2	E2	0.0317
127.6 3	2029.9	13.4 2	M1+E2	0.98 5	393.5 3	3417.2	5.0 [‡] 2		
155.5 3	2596.1	6.0 3	M1+E2	0.524 14	407.3 3	2847.1	9.0 [§] 5	E2	0.0235
170.4 3	5191.3	9.8 [‡] 2	M1+E2	0.39 2	433.9 3	3596.1	7.0 1	E2	0.0197
174.1 3	5020.9	10.1 3	M1+E2	0.37 2	466.5 3	5994.7	≤ 5		
198.5 3	2228.4	37.9 3	M1+E2	0.25 3	471.9 3	4155.7	20.8 [‡] 1	M1+E2	0.022 6
211.7 3	2440.2	32.0 3	M1+E2	0.20 3	482.8 3	1153.7	9.1 1	(E1)	
250.5 3	2847.1	≤ 5			526.1 3	622.2	100	E2	0.0118
266.0 3	1902.1	≤ 5			544.5 [@] 3	6539.2 [?]	≤ 5		
266.5 3	3683.6	21.9 [‡] 4	M1+E2	0.104 19	572.4 3	3596.1	11.1 2	E2	
309.3 3	2749.5	9.9 [‡] 3			574.9 3	670.8	16.5 2	M1+E2	0.013 4
335.0 3	3182.3				586.2 3	3182.3	9.4 2	E2	

Continued on next page (footnotes at end of table)

$^{110}\text{Cd}(^{35}\text{Cl},2\text{p}2\text{n}\gamma)$ 1991Xu01 (continued) $\gamma(^{141}\text{Eu})$ (continued)

$E\gamma$	E(level)	$I\gamma$	Mult.#	$E\gamma$	E(level)	$I\gamma$	Mult.#
608.1 3	3683.6	≤ 5		856.4 3	4038.7	7.0 2	E2
616.4 3	4985.1	7.5 $\frac{\ddagger}{2}$		892.3 3	3008.6	7.9 2	
638.2 3	1308.8	9.0 $\frac{\ddagger}{3}$		895.5 3	4934.2	≤ 5	(E2)
686.5 3	1308.8	7.0 $\frac{\ddagger}{2}$		898.8 3	3075.5	19.8 2	E2
690.9 3	4846.8	≤ 5		911.0 3	3934.6	11.9 2	E2
721.4 3	2029.9	≤ 5		915.9 3	5284.6	9.9 2	E2
722.3 3	1344.4	76.8 4	E2	985.7 3	3162.2	6.0 1	E2
741.8 3	3588.9	9.0 $\frac{\S}{5}$		1013.4 3	1635.9	15.5 2	E1
748.3 3	1902.1	≤ 5		1023.1 3	6008.2	9.0 $\frac{\ddagger}{2}$	E2
772.1 3	2116.4	≤ 5		1041.0 3	7049.2	≤ 5	
772.6 3	4368.7	17.3 2	E2	1052.0@ 3	6336.6?	≤ 5	
807.5 3	2116.4	8.0 2	E2	1163.3 3	4846.8	9.9 $\frac{\ddagger}{3}$	
828.3@ 3	4417.2?	≤ 5		1279.9 3	1902.1	23.29 2	E1
832.1 3	2176.6	54.9 3	E2				
846.9 3	3023.6	34.8 3	E2				

† Transition deduced, not observed.

‡ From coin data.

§ Lower limit from feeding transition intensity.

Only those multipolarities are given for which the A_2 , A_4 values are given in 1991Xu01.

@ Placement of transition in the level scheme is uncertain.

 $^{144}\text{Sm}(\alpha,\text{p}6\text{n}\gamma)$ 1988Gu09

E=95, 107 MeV.

Measured: γ , $\gamma\gamma$, $\gamma(\theta)$, DCO. ^{141}Eu Levels

E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$	E(level)	$J\pi^\dagger$
0.0	5/2+	2177.3	23/2-	3076.4	27/2-
96.4	11/2-	2229.1?	21/2(+)	3417.6	29/2-
622.5	15/2-	2441.1	23/2(+)	3596.6	31/2-
1344.9	19/2-	2750.5	(25/2+)	3684.2	31/2-
1902.8	17/2(+)	2848?	27/2(+)	4156.3	33/2-
2030.6?	19/2(+)	3024.3	27/2-	4370.4	35/2-

† Adopted values.

 $\gamma(^{141}\text{Eu})$

$E\gamma$	E(level)	$I\gamma$	Mult. †	α	Comments
(52)	3076.4				Required by $\gamma\gamma$ data.
96.4	96.4				
127.8 3	2030.6?	12 3	D		Mult.: $A_2=-0.29$ 3, $A_4=-0.03$ 4; DCO=1.91 17.
198.5 2	2229.1?	20 3	D		Mult.: $A_2=-0.32$ 3, $A_4=+0.00$ 4; DCO=1.82 13 for $198.5\gamma(^{141}\text{Eu})+197.2\gamma(^{19}\text{F})$.
212.0 1	2441.1	18 3	D		Mult.: $A_2=-0.33$ 3, $A_4=+0.04$ 4; DCO=1.88 14 for $212.0\gamma(^{141}\text{Eu})+211.6\gamma(^{138}\text{Pm})$.
266.5 1	3684.2	12 2	D		Mult.: $A_2=-0.42$ 13, $A_4=+0.07$ 15; DCO=2.12 26.
309.4 2	2750.5	6 2	D		Mult.: $A_2=-0.31$ 4, $A_4=+0.01$ 5; DCO=1.7 7 for $309.4\gamma(^{141}\text{Eu})+309.5\gamma(^{141}\text{Sm})+310.2\gamma(^{142}\text{Gd})$.
341.2 $\frac{\ddagger}{2}$	3417.6	12 2	D		Mult.: $A_2=-0.40$ 8, $A_4=+0.16$ 16; DCO=1.75 18.
407.1 2	2848?	4 2			
472.2 2	4156.3	9 2	D		Mult.: DCO=1.8 3.
526.1 2	622.5	100 5	E2	0.0118	Mult.: $A_2=+0.20$ 2, $A_4=-0.07$ 3; DCO=0.99 5.
572.3 2	3596.6	13 3	E2		Mult.: $A_2=+0.20$ 10, $A_4=-0.10$ 13; DCO=1.15 18.

Continued on next page (footnotes at end of table)

$^{144}\text{Sm}(\alpha, p6n\gamma)$ 1988Gu09 (continued) $\gamma(^{141}\text{Eu})$ (continued)

$E\gamma$	E(level)	$I\gamma$	Mult. [†]	Comments
686.2 [‡] 3	2030.6?	10 3		Mult.: $A_2=+0.12$ 4, $A_4=-0.04$ 7; DCO=2.03 24; $\Delta J=0$. Placement not adopted from this level.
722.4 2	1344.9	62 15	E2	Mult.: $A_2=+0.14$ 2, $A_4=-0.09$ 3; DCO=1.15 18 for $722\gamma(^{141}\text{Eu}) + 723\gamma(^{142}\text{Eu})$.
773.8 3	4370.4	10 2	E2	Mult.: $A_2=+0.08$ 4, $A_4=-0.04$ 6; DCO=1.21 23 for $773.8\gamma(^{141}\text{Eu}) + 773.7\gamma(^{140}\text{Nd})$.
832.4 2	2177.3	44 8	E2	Mult.: $A_2=+0.16$ 4, $A_4=-0.12$ 5; DCO=1.00 5.
847.0 3	3024.3	24 3	E2	Mult.: $A_2=+0.23$ 3, $A_4=+0.00$ 4; DCO=1.06 8 for $847.0\gamma(^{141}\text{Eu}) + 846.8\gamma(^{142}\text{Gd})$.
899.1 3	3076.4	11 3	E2	Mult.: $A_2=+0.36$ 8, $A_4=+0.12$ 10; DCO=1.02 15 for $899.1\gamma(^{141}\text{Eu}) + 899\gamma$ (unknown origin).
1280.3 2	1902.8	18 3	D	Mult.: $A_2=-0.30$ 8, $A_4=-0.08$ 10; DCO=1.70 20.

[†] From $\gamma(\theta)$ and RUL Q γ 's are E2, D+Q is M1+E2.[‡] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

$Q(\beta^-) = -86.8 \times 10^2$ 11; S(n)=9510 30; S(p)=3530 60; $Q(\alpha) = 2380$ 50 2012Wa38.

$Q(\epsilon p) = 4943$ 23 (2012Wa38).

1988WiZN: measured β -delayed Ep, (x-ray)-p coin, γ -p coin, $T_{1/2}(p)$ β^+p (partly superseded by 1989Gi06).

 ^{141}Gd Levels**Cross Reference (XREF) Flags**

A ^{141}Tb ϵ Decay (3.5 s)
 B ^{141}Gd IT Decay (24.5 s)
 C $^{112}\text{Sn}(^{32}\text{S}, 2p n \gamma)$

E(level) [†]	J $\pi^{\ddagger}$	XREF	T _{1/2}	Comments
0.0	1/2+	ABC	14 s 4	% ϵ +% β^+ =100; % β^+p =0.03 1 (1989Gi06). J π : see 377.8 level. T _{1/2} : from 1989Gi06; other: 20 s 4 (1986Wi15); note that 1989Gi06 did not see T _{1/2} =1.3 s 7 reported by 1988TuZY.
113.16 7	(3/2+)	ABC		J π : γ from 5/2+ is M1, syst for N=77 odd-A nuclei.
198.32 7	(3/2+)	ABC		J π : γ to 3/2+ is M1, γ from 5/2+ is M1, syst for N=77 nuclei.
258.17 6	5/2+	ABC		J π : see 377.8 level.
377.76 ^c 9	11/2-	ABC	24.5 s 5	% ϵ +% β^+ =89 2; %IT=11 2 (1989Gi06). T _{1/2} : from 1989Gi06. Others: 20.8 s 8 (1988TuZY), 22 s 3 (1986Re11). J π : cascade E3-E2 to g.s., log ft =5.7 to 11/2-, syst for N=77 odd-A nuclei suggests J π =11/2- for 377.8 level, 5/2+ for 258.2 level and 1/2+ for 0.0 level.
492.35 7	(5/2+, 3/2-)	A C		J π : γ to 1/2+, γ from (7/2-).
514.47 10	(9/2, 11/2-)	A C		J π : γ to 11/2-, γ from (7/2-), no ϵ via (5/2-) parent.
551.59 8	(7/2-) §	A C		
646.16 10	(7/2-) §	A		
661.43 10	(3/2-, 5/2-)	A		J π : γ to 3/2+, log ft =6.0 via (5/2-) parent.
752.64 9	(3/2-, 5/2-)	A		J π : log ft =5.3 via (5/2-) parent, γ to 3/2+.
758.35 11	(3/2-, 5/2-, 7/2-)	A		J π : log ft =5.4 via (5/2-) parent.
895.15 8	(7/2-) §	A C		
907.4 ^c 9	(15/2-)	C		
940.53 11	(7/2-) §	A C		
989.72 11	(7/2-) §	A C		
995.0 9	13/2-	C		
1100.07 14	(7/2-) §	A		
1131.87 14	(7/2-) §	A		
1282.3 ^b 7	(9/2-)	C		
1547.5 7	(11/2-)	C		
1661.5 10	17/2-	C		
1671.2 ^c 11	(19/2-)	C		
1873.1 ^b 12	(13/2-)	C		
2136.6 12	(19/2-)	C		
2149.9 [#] 12	(13/2+)	C		
2254.2 11	(15/2-)	C		
2276.3 11	(15/2-)	C		
2447.6 12	(21/2-)	C		
2516.7 ^a 16	(23/2-)	C		
2561.4 ^c 14	(23/2-)	C		
2597.4 ^b 16	(17/2-)	C		
2685.2 [#] 16	(17/2+)	C		
2759.4 ^a 19	(25/2-)	C		
2874.7 [@] 12	(19/2-)	C		
3148.2 ^{&} 14	(25/2-)	C		
3233.2 [#] 19	(21/2+)	C		
3278.3 [@] 16	(23/2-)	C		
3307.8 ^{&} 15	(27/2-)	C		
3383.4 ^a 21	(27/2-)	C		
3594.3 ^{&} 18	(29/2-)	C		
3778.9 [@] 19	(27/2-)	C		
3808.3 ^a 23	(29/2-)	C		
3813.9 [#] 21	(25/2+)	C		
3915.7 ^{&} 21	(31/2-)	C		
4058.2 ^a 23	(31/2-)	C		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
¹⁴¹Gd Levels (continued)

E(level) [†]	Jπ [‡]	XREF	E(level) [†]	Jπ [‡]	XREF
4299.9& 23	(33/2-)	C	6926# 3	(41/2+)	C
4449.4@ 21	(31/2-)	C	7031@ 3	(43/2-)	C
4471.0# 24	(29/2+)	C	7874# 3	(45/2+)	C
4679.0& 25	(35/2-)	C	8112@ 3	(47/2-)	C
4894.3 ^a 25	(35/2-)	C	8855# 4	(49/2+)	C
5214# 3	(33/2+)	C	9379?@	(51/2)	C
5265.3@ 24	(35/2-)	C	9884# 4	(53/2+)	C
5775 ^a 3	(39/2-)	C	10959# 4	(57/2+)	C
6036# 3	(37/2+)	C	12109# 4	(61/2+)	C
6124@ 3	(39/2-)	C	13320?#	(65/2+)	C

[†] From least-squares fit to Eγ data (χ² norm=1.85 greater than χ² critical=1.73).

[‡] Unless otherwise noted, assignments are based on DCO ratios and rotational band structure as reported in 1993Mu05. Where bandhead spin and parity assignments are not firm, values are given in parentheses.

§ J=(7/2-) from γ to 11/2-, (9/2) and log ft≤6.0 via (5/2-) parent.

(A): Neutron i_{13/2} band, α=+1/2.

@ (B): ΔJ=2, based on 19/2-.

& (C): ΔJ=1, based on 25/2-.

^a (D): ΔJ=1, based on 23/2-.

^b (E): ΔJ=2, based on 9/2-.

^c (F): ΔJ=2, based on 11/2-.

γ(¹⁴¹Gd)

All data for Eγ with uncertainty are from ε decay, others are from (³²S,2pnγ).

E(level)	Eγ	Iγ	Mult.	α	Comments
113.16	113.2 1	100	M1	1.412	
198.32	85.2 1	12.5 23	M1	3.19	
	198.4 1	100 10	M1	0.293	
258.17	59.8 1	14.3 29	M1	8.88	
	145.0 1	31 4	M1	0.700	
	258.2 1	100 10	E2	0.0964	
377.76	119.6 1	100	E3	15.93	B(E3)(W.u.)=0.00078 15.
492.35	234.5 1	12.2 49			
	379.2 1	71 7			
	492.2 1	100 10			
514.47	136.7 1	100			
551.59	59.3 1	18 4			
	173.9 1	15 2			
	293.3 1	100 10			
646.16	94.5 1	2.1 21			
	131.6 1	100 11			
	268.3 2	62 6			
661.43	463.4 1	100			
752.64	91.5 1	5.0 25			
	494.3 1	100 10			
	554.2 1	50 5			
758.35	206.7 2	7.4 56			
	500.2 1	100 9			
895.15	248.8 1	5.2 21			
	343.6 1	100 10			
	402.9 1	28.9 72			
	517.5 1	27.8 31			
	636.9 1	11.3 21			
907.4	529.6				
940.53	389.0 1	100 18			
	426.0 1	64 18			
989.72	475.4 1	100 10			
	611.8 1	16 4			
995.0	617.3				
1100.07	585.6 1	100			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{141}\text{Gd})$ (continued)

E(level)	E γ	I γ	E(level)	E γ	E(level)	E γ
1131.87	617.4 <i>I</i>	100	2597.4	724.3	4449.4	670.5
1282.3	342.0		2685.2	535.3	4471.0	657.1
	387.5		2759.4	242.7	4679.0	379.1
1547.5	265.7		2874.7	598.5	4894.3	836.1
	557.3			620.5	5214	742.6
	606.9		3148.2	700.4	5265.3	815.9
1661.5	666.5		3233.2	548.0	5775	880.6
	754.0		3278.3	403.6	6036	822.4
1671.2	763.9		3307.8	159.5	6124	859.0
1873.1	590.8			746.6	6926	889.6
2136.6	465.4		3383.4	624.0	7031	906.4
	475.0		3594.3	286.5	7874	948.3
2149.9	602.4		3778.9	500.6	8112	1081.2
2254.2	706.7		3808.3	425.0	8855	981.0
2276.3	728.8		3813.9	580.7	9379?	1268 [†]
2447.6	776.2		3915.7	321.4	9884	1028.9
	786.1		4058.2	250.0	10959	1075
2516.7	380.1			674.8	12109	1150
2561.4	890.3		4299.9	384.2	13320?	1212 [†]

[†] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

 (E) $\Delta J=2$, based on $9/2^-$.

 (F) $\Delta J=2$, based on
 $11/2^-$.

 $^{141}_{64}\text{Gd}_{77}$

^{141}Gd IT Decay (24.5 s) 1989Gi06

Parent ^{141}Gd : $E=377.76$ 9; $J\pi=11/2^-$; $T_{1/2}=24.5$ s 5; %IT decay=11 2.

Measured: γ , $\gamma\gamma$, ce, $X\gamma$.

 ^{141}Gd Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}$	
0.0	1/2+		
113.20 7	(3/2+)		
198.40 7	(3/2+)		
258.20 7	5/2+		
377.76 9	11/2-	24.5 s 9	

† From least-squares fit to $E\gamma$ data.
 ‡ Adopted values.

 $\gamma(^{141}\text{Gd})$

$I\gamma$ normalization: from branching=0.11 2.

$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$	Mult.	α
59.8 1	258.20	5 2	M1	8.88
85.2 1	198.40	3 1	M1	3.19
113.2 1	113.20	9 2	M1	1.412
119.6 1	377.76	5 2	E3	15.93
145.0 1	258.20	6 2	M1	0.700
198.4 1	198.40	27 3	M1	0.293
258.2 1	258.20	23 2	E2	0.0964

† For absolute intensity per 100 decays, multiply by 0.13 3.

Decay Scheme

Intensities: $I(\gamma+\text{ce})$ per 100 parent decays
 %IT=11 2

^{141}Tb ϵ Decay (3.5 s) 1989Gi06

Parent ^{141}Tb : $E=0.0$; $J\pi=(5/2^-)$; $T_{1/2}=3.5$ s 2; $Q(\text{g.s.})=8680$ 110; % ϵ +% β^+ decay=100.

Measured: γ , $\gamma\gamma$, $X\gamma$ (1989Gi06, 1988TuZY, 2001BeZY).

1989Gi06 placed all observed γ 's in the proposed decay scheme.

1988TuZY arranged similar but much fewer experimental data in a very different decay scheme.

2001BeZY confirmed the level scheme of 1989Gi06.

 ^{141}Gd Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\ddagger$
0.0	1/2+	
113.16 7	(3/2+)	
198.32 7	(3/2+)	
258.17 6	5/2+	
377.76 9	11/2-	24.5 s 5

Continued on next page (footnotes at end of table)

^{141}Tb ϵ Decay (3.5 s) 1989Gi06 (continued) **^{141}Gd Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{level})^\dagger$	$J\pi^\ddagger$
492.35 7	(5/2+, 3/2-)	661.43 10	(3/2-, 5/2-)	940.52 11	(7/2-)
514.46 10	(9/2, 11/2-)	752.64 9	(3/2-, 5/2-)	989.71 11	(7/2-)
551.58 8	(7/2-)	758.37 12	(3/2-, 5/2-, 7/2-)	1100.06 14	(7/2-)
646.16 10	(7/2-)	895.14 8	(7/2-)	1131.86 14	(7/2-)

† From least-squares fit to $E\gamma$ data (χ^2 norm=2.83 greater than χ^2 critical=1.93).

‡ Adopted values.

 β^+, ϵ Data

$E\epsilon$	$E(\text{level})$	$I\beta^{+\#}$	$I\epsilon^\#$	$\text{Log } ft$	$I(\epsilon+\beta^+)^\dagger\ddagger\S$
(7550 110)	1131.86	4.4	0.34	5.7	4.7
(7580 110)	1100.06	3.2	0.25	5.8	3.5
(7690 110)	989.71	9.31	0.69	5.4	10.0
(7740 110)	940.52	2.9	0.21	5.9	3.1
(7780 110)	895.14	27.6	1.97	5.0	29.6
(7920 110)	758.37	9.37	0.63	5.5	10.0
(7930 110)	752.64	10.7	0.72	5.4	11.4
(8020 110)	661.43	2.3	0.15	6.1	2.5
(8030 110)	646.16	13.0	0.83	5.4	13.8
(8130 110)	551.58	7	0.4	5.7	7

† $\beta^+/I(293\gamma)=4.25$ 100; $\epsilon/I(293\gamma)=2.5$ (1989Gi06).

‡ γ 's included in the decay scheme (after correction for internal conversion for assumed multiplicities) account for $\approx 85\%$ of the total β strength.

$\S$ From imbalance of $I(\gamma+\text{ce})$ assuming direct $\epsilon+\beta^+$ only to levels with $E>552$ and multiplicities M1 or E1 (from assumed $J\pi$); $\approx 4.4\%$ of $\epsilon+\beta^+$ is unaccounted for (1989Gi06).

$\#$ Absolute intensity per 100 decays.

 $\gamma(^{141}\text{Gd})$

$I\gamma$ normalization: arguments not given.

$E\gamma^\dagger$	$E(\text{level})$	$I\gamma^\dagger\ddagger$	Mult.	α	Comments
59.3 1	551.58	18 4			
59.8 1	258.17	10 2	M1	8.88	
85.2 1	198.32	11 2	M1	3.19	
91.5 1	752.64	2 1			
94.5 1	646.16	1 1			
113.2 1	113.16	47 5	M1	1.412	
119.6 1	377.76		E3	15.93	$I\gamma$: because of large $T_{1/2}=24.5$ s measured $I\gamma$ belongs to ^{141}Gd IT decay, not to ^{141}Tb ϵ decay with $T_{1/2}=3.5$ s.
131.6 1	646.16	47 5			
136.7 1	514.46	85 9			
145.0 1	258.17	22 3	M1	0.700	
173.9 1	551.58	15 2	[E2]	0.356	
198.4 1	198.32	88 9	M1	0.293	
206.7 $\S$ 2	758.37	4 3			
234.5 1	492.35	5 2			
248.8 1	895.14	5 2			
258.2 1	258.17	70 7	E2	0.0964	
268.3 2	646.16	29 3			
293.3 1	551.58	100 10			
343.6 1	895.14	97 10			
379.2 1	492.35	29 3			
389.0 1	940.52	11 2			
402.9 1	895.14	28 7			
$\times$ 406.8 1		8 2			
426.0 1	940.52	7 2			
463.4 1	661.43	22 3			

Continued on next page (footnotes at end of table)

¹⁴¹Tb ε Decay (3.5 s) 1989Gi06 (continued)

^γ(¹⁴¹Gd) (continued)

E [†]	E(level)	I [‡]	E [†]	E(level)	I [‡]
475.4 1	989.71	51 5	^x 530.9 2		15 2
^x 480.3 1		32 3	554.2 1	752.64	20 2
492.2 1	492.35	41 4	585.6 1	1100.06	21 2
494.3 1	752.64	40 4	611.8 1	989.71	8 2
500.2 1	758.37	54 5	617.4 1	1131.86	28 3
517.5 1	895.14	27 3	636.9 1	895.14	11 2

[†] From 1989Gi06. Values for transitions following decay of the 378 level have been corrected to include only the 3.5-s component.

[‡] For absolute intensity per 100 decays, multiply by 0.168.

§ Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

Decay Scheme

Intensities: I_γ per 100 parent decays

¹¹²Sn(³²S,2pn^γ) 1993Mu05

1993Mu05: ¹¹²Sn(³²S,2pn^γ) E=155 MeV and ¹¹²Sn(³³S,2n2p^γ) E=170 MeV. Measured γ, γγ using 8π array with 20 Ge detectors and 70 BGO inner-ball detectors. Evaporated charged particles detected with array of 24 CsI(Tl) crystals.

1993Ca14: ¹¹²Sn(³⁵Cl,αpn^γ) E=159 MeV and ⁸⁹Y(⁵⁸Ni,αpn^γ) E=250 MeV. Measured γ, γγ using an array of six Ge detectors and 14 BaF₂ detectors.

The level scheme from 1993Ca14 is less complete than that from 1993Mu05. There are two differences in the placement of transitions in partial level scheme of 1993Ca14: 1. Ordering of 243–624 is reversed. 2. The 287 transition is placed above 2447 level instead of its location much higher up in the level scheme as given by 1993Mu05.

¹⁴¹Gd Levels

E(level) [†]	Jπ [‡]	E(level) [†]	Jπ [‡]	E(level) [†]	Jπ [‡]
0.0	1/2+	491.2 11	(5/2+)	940.0 11	7/2-
112.6 8	3/2+	514.0 12	9/2-	989.4 14	7/2-
197.1 8	3/2+	550.9 10	7/2-	994.6 13	13/2-
257.6 7	5/2+	894.5 11	(7/2-)	1281.7 ^a 12	9/2-
377.4 ^b 10	11/2-	907.0 ^b 13	15/2-	1547.0 13	11/2-

Continued on next page (footnotes at end of table)

¹¹²Sn(³²S,2pn γ) ¹⁹⁹³Mu05 (continued)

¹⁴¹Gd Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$
1661.1 14	17/2-	3232.7 $\S$ 22	21/2(+)	5213 $\S$ 3	33/2(+)
1670.8 ^b 15	19/2-	3277.8 [#] 19	23/2-	5265 [#] 3	35/2-
1872.5 ^a 16	(13/2-)	3307.4 [@] 18	27/2-	5775 $\&$ 3	39/2(-)
2136.2 16	19/2-	3383.0 $\&$ 24	27/2(-)	6035 $\S$ 3	37/2(+)
2149.4 $\S$ 16	13/2(+)	3593.9 [@] 21	29/2-	6124 [#] 3	39/2-
2253.7 15	15/2-	3778.5 [#] 22	27/2-	6925 $\S$ 3	41/2(+)
2275.8 15	15/2-	3807.9 $\&$ 25	29/2(-)	7030 [#] 3	43/2-
2447.2 16	21/2-	3813.4 $\S$ 24	25/2(+)	7873 $\S$ 4	45/2(+)
2516.3 $\&$ 19	23/2(-)	3915.3 [@] 23	31/2-	8111 [#] 3	47/2-
2561.0 ^b 17	23/2-	4057.8 $\&$ 25	31/2(-)	8854 $\S$ 4	49/2(+)
2596.8 ^a 19	(17/2-)	4299.5 [@] 25	33/2-	9379? [#]	(51/2)
2684.7 $\S$ 19	17/2(+)	4449.0 [#] 24	31/2-	9883 $\S$ 4	53/2(+)
2759.0 $\&$ 21	25/2(-)	4470 $\S$ 3	29/2(+)	10958 $\S$ 4	57/2(+)
2874.3 [#] 16	19/2-	4679 [@] 3	35/2-	12108 $\S$ 4	61/2(+)
3147.8 [@] 18	25/2-	4894 $\&$ 3	35/2(-)	13320? $\S$	(65/2+)

[†] From least-squares fit to E γ data with $\Delta E\gamma=1$ keV for E γ 's without uncertainty assigned by evaluator.

[‡] Based on rotational band structure and DCO ratios.

 $\S$ (A): Neutron i_{13/2} band, $\alpha=+1/2$.

[#] (B): $\Delta J=2$, based on 19/2-.

[@] (C): $\Delta J=1$, based on 25/2-.

 $\&$ (D): $\Delta J=1$, based on 23/2-.

^a (E): $\Delta J=2$, based on 9/2-.

^b (F): $\Delta J=2$, based on 11/2-.

 $\gamma(^{141}\text{Gd})$

E γ	E(level)	E γ	E(level)	Mult. [†]	E γ	E(level)	Mult. [†]
59.8	257.6	425.0	3807.9		724.3	2596.8	
113.1	112.6	426.1	940.0		728.8	2275.8	
119.5	377.4	465.4	2136.2		742.6	5213	E2
136.5	514.0	475.0	2136.2		746.6	3307.4	
145.0	257.6	475.1	989.4		754.0	1661.1	
159.5	3307.4	500.6	3778.5		763.9	1670.8	
173.5	550.9	529.6	907.0		776.2	2447.2	
196.3	197.1	535.3	2684.7	E2	786.1	2447.2	
242.7 $\ddagger$	2759.0	548.0	3232.7	E2	815.9	5265	
250.0	4057.8	557.3	1547.0		822.4	6035	E2
257.9	257.6	562.5	940.0		836.1	4894	
265.7	1547.0	580.7	3813.4	E2	859.0	6124	
286.5 $\S$	3593.9	590.8	1872.5		880.6	5775	
293.1	550.9	598.5	2874.3		889.6	6925	E2
321.4	3915.3	602.4	2149.4	(D) [#]	890.3	2561.0	
342.0	1281.7	606.9	1547.0		906.4	7030	
343.3	894.5	617.3	994.6		948.3	7873	E2
379.1	491.2	620.5	2874.3		981.0	8854	E2
	4679	624.0 $\ddagger$	3383.0		1028.9	9883	E2
380.1	2516.3	657.1	4470	E2	1075	10958	E2
384.2	4299.5	666.5	1661.1		1081.2	8111	
387.5	1281.7	670.5	4449.0		1150	12108	E2
389.0	940.0	674.8	4057.8		1212 [@]	13320?	(E2)
403.6	3277.8	700.4	3147.8		1268 [@]	9379?	
403.7	894.5	706.7	2253.7				

[†] Stretched quadrupole transitions connecting members of i_{13/2} band have a mean DCO=1.9 and are assumed stretched E2.

 $\ddagger$ Reversed ordering of 243-624 cascade in 1993Ca14.

 $\S$ This transition is placed above 2447 level by 1993Ca14.

[#] $\Delta J=1$, DCO=1.1, $\delta=-0.025$ indicating probable E1.

[@] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

$Q(\beta^-) = -9160$ SY; $S(n) = 12130$ 810; $S(p) = 50$ 110; $Q(\alpha) = 3150$ SY 2012Wa38.

$\Delta Q(\beta^-) = 320$, $\Delta Q(\alpha) = 220$ (2012Wa38, syst).

$Q(\epsilon p) = 5160$ 120 (2012Wa38).

 ^{141}Tb Levels

Cross Reference (XREF) Flags

- A ^{141}Dy ϵ Decay
 B ^{142}Ho ϵp Decay: 0.4 s
 C $^{92}\text{Mo}(^{54}\text{Fe}, 3p2n\gamma)$
 D $^{92}\text{Mo}(^{54}\text{Fe}, \alpha p\gamma)$

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}$	Comments
0.0	(5/2-)	A	3.5 s 2	$\% \epsilon + \% \beta^+ = 100$. $J\pi$: significant direct ϵ to (7/2-) and (3/2,5/2) levels, Nilsson model. $T_{1/2}$: from 1989Gi06. Other: 4.5 s 8 (1988TuZY).
0+x?			7.9 s 6	$\% \epsilon + \% \beta^+ = 100$. $T_{1/2}$: from 1988TuZY; isomer found by 1988TuZY was not confirmed by 1989Gi06; later 2001BeZY confirmed 1989Gi06 (see also ^{141}Tb ϵ decay (3.5 s) dataset).
0.0+y §	(11/2-)	BCD		
307.3+y § 2	(15/2-)	BCD		
811.1+y § 4	(19/2-)	BCD		
1458.6+y § 6	(23/2-)	CD		
2203+y §	(27/2-)	D		
2969+y §	(31/2-)	D		
3737+y §	(35/2-)	D		
4594+y §	(39/2-)	D		
5585+y §	(43/2-)	D		
6712+y §	(47/2-)	D		

[†] From $^{92}\text{Mo}(^{54}\text{Fe}, 3p2n\gamma)$ for the first three excited levels of the rotational band and from $^{92}\text{Mo}(^{54}\text{Fe}, \alpha p\gamma)$ for the upper levels.

[‡] For excited states based on syst for $J=11/2-$ aligned bands and γ -ray multipolarities.

§ (A): Yrast $\pi h_{11/2}$ decoupled band.

 $\gamma(^{141}\text{Tb})$

E(level)	$E\gamma^{\dagger}$	I_{γ}
307.3+y	307.3 2	100
811.1+y	503.8 3	100
1458.6+y	647.5 4	
2203+y	742	
2969+y	766	
3737+y	768	
4594+y	857	
5585+y	991	
6712+y	1126	

[†] Gammas given with decimal point are from $(^{92}\text{Mo}, 3p2n\gamma)$ and those without decimal point are from $(^{54}\text{Fe}, \alpha p\gamma)$.

Adopted Levels, Gammas (continued)

(A) yrast $\pi h_{11/2}$
decoupled band.

(47/2-)	6712+y
(43/2-)	5585+y
(39/2-)	4594+y
(35/2-)	3737+y
(31/2-)	2969+y
(27/2-)	2203+y
(23/2-)	1458.6+y
(19/2-)	811.1+y
(15/2-)	307.3+y
(11/2-)	0.0+y

$^{141}_{65}\text{Tb}_{76}$

^{141}Dy ϵ Decay 1986Wi15

Parent ^{141}Dy : E=0.0; $J\pi=(9/2-)$; $T_{1/2}=0.9$ s 2; Q(g.s.)=9160 syst; % ϵ +% β^+ decay=100.

^{141}Dy : $\Delta Q(\beta^-)=320$ (2012Wa38,syst).

Measured: delayed protons, p-K x ray coin, $p\gamma$ (1986Wi15,1984Ni03); observed β -delayed protons with E(p)=2100-7200 in coin with ^{140}Gd γ 's: 329 γ (2+ to 0+), 508 γ (4+ to 2+).

^{141}Tb Levels

E(level)

x

^{142}Ho ϵp Decay: 0.4 s 2001Xu02

Parent ^{142}Ho : E=0.0; $J\pi=(7-,8+)$; $T_{1/2}=0.4$ s 1; Q(g.s.)=10000 510; % ϵp decay=?

^{142}Ho -E,J, $T_{1/2}$: from 2011Jo05.

^{142}Ho -Q(ϵp): from 2012Wa38 based on syst.

2001Xu02: $^{106}\text{Cd}(^{40}\text{Ca},3np)$ E=232 MeV at the cyclotron of IMP Lanzhou. Used He jet and tape transport, Si surface barrier detectors and HPGe detectors. Measured β -delayed proton spectra, E γ , I γ , p- γ coin, $T_{1/2}(^{141}\text{Ho})$.

^{141}Tb Levels

E(level) [†]	$J\pi^{\dagger}$
0.0+y	(11/2-)
307.3+y 2	(15/2-)
811.1+y 4	(19/2-)

[†] From Adopted Levels, Gammas dataset.

Delayed protons

E(^{141}Tb)	I(p) [†]
307.3+y 2	100
811.1+y 4	10 [‡]

[†] Normalized to 100 for proton branch to 307.3+y.

[‡] Estimated by 2001Xu02.

^{142}Ho ep Decay: 0.4 s 2001Xu02 (continued) $\gamma(^{141}\text{Tb})$

$E\gamma^\dagger$	E(level)
307.3 2	307.3+y
503.8 ‡ § 3	811.1+y

 † From Adopted Levels, Gammas dataset. ‡ γ ray swamped in the background in Fig. 1 "The measured γ -ray spectrum in coincidence with 2.5–6.5 MeV protons" of 2001Xu02 reason for which this γ ray and its proton branch are uncertain.

§ Placement of transition in the level scheme is uncertain.

Decay Scheme

$^{92}\text{Mo}(^{54}\text{Fe},\alpha p\gamma)$ 2004Me25

2004Me25: E=240 MeV; used tandem XTU at LNL Legnaro, multidetector array Gasp composed of 40 Compton-suppressed HPGe detectors with BGO and ISIS light charged particle detector (40 ΔE -E detectors), and the recoil mass spectrometer CAMEL. Measured charged particle- γ , mass- γ and γ - γ coin, DCO ratios.

 ^{141}Tb Levels

E(level)	$J\pi^\dagger$
0.0+y ‡	(11/2-)
307+y ‡	(15/2-)
813+y ‡	(19/2-)
1461+y ‡	(23/2-)
2203+y ‡	(27/2-)
2969+y ‡	(31/2-)
3737+y ‡	(35/2-)
4594+y ‡	(39/2-)
5585+y ‡	(43/2-)
6712+y ‡	(47/2-)

 † Based on syst for J=11/2- aligned bands and γ -ray multiplicities. ‡ (A): Yrast $\pi h_{11/2}$ decoupled band. $\gamma(^{141}\text{Tb})$

$E\gamma$	E(level)	$E\gamma$	E(level)
307	307+y	768	3737+y
505	813+y	857	4594+y
648	1461+y	991	5585+y
742	2203+y	1126	6712+y
766	2969+y		

⁹²Mo(⁵⁴Fe,3p2nγ) ¹⁹⁸⁷Go35

E=260 MeV.
Measured: γ, nγ, pγ, γγ, Xγ; Ge, Si, scintillation detectors, enriched targets.

¹⁴¹Tb Levels

<u>E(level)[†]</u>	<u>Jπ[‡]</u>
0.0+y	(11/2-)
307.3+y 2	(15/2-)
811.1+y 4	(19/2-)
1458.6+y 6	(23/2-)

[†] From least-squares fit to Eγ data by evaluator.
[‡] From syst for J=11/2- aligned bands.

γ(¹⁴¹Tb)

<u>Eγ</u>	<u>E(level)</u>	<u>Iγ</u>
307.3 2	307.3+y	100 8
503.8 3	811.1+y	85 9
647.5 4	1458.6+y	

Adopted Levels

$Q(\beta^-) = -11020$ SY; $S(n) = 10620$ SY; $S(p) = 2190$ SY; $Q(\alpha) = 3410$ SY 2012Wa38.

$\Delta Q(\beta^-) = 590$, $\Delta S(n) = 590$, $\Delta S(p) = 850$, $\Delta Q(\alpha) = 420$ (2012Wa38,syst).

$Q(\epsilon p) = 9110$ 300 (2012Wa38,syst).

 ^{141}Dy Levels

E(level)	J π	T _{1/2}	Comments
0.0	(9/2-)	0.9 s 2	<p>%ϵ+%β^+=100; %β^+p=?</p> <p>Produced in $^{92}\text{Mo}(^{54}\text{Fe},\alpha n)$ E=274 MeV (1984Ni03); and $^{106}\text{Cd}(^{40}\text{Ca},\alpha n)$ at E=232 MeV (2006Xu03). Measured β-delayed protons in coincidences with Tb K x ray (1984Ni03), observed β-delayed protons in coin with ^{140}Gd γ's: 329γ (2+ to 0+), 508γ (4+ to 2+) (1986Wi15); γ(x-rays) gated on β-delayed protons and β-delayed protons gated on 329γ of ^{140}Gd daughter (2006Xu03). E(p)=2.1-7.2 MeV (1986Wi15), E(p)=3.0-7.0 MeV (2006Xu03); other: 1984Ni03. T_{1/2}: from 1986Wi15 and 2006Xu03; 1.0 s 2 (1984Ni03), 0.8 s 2 (1988WiZN). Jπ: from analysis of feeding of 2+ and 4+ in ^{140}Gd by delayed protons from ^{141}Dy ϵ decay and Nilsson model (1989Gi06); and respectively of 0+ g.s., 2+, 4+, and 6+, and configuration-constrained nuclear potential energy surfaces using Woods-Saxon-Strutinsky method (2006Xu03; they also allow 9/2+).</p>

Adopted Levels, Gammas

S(n)=13180 SY; S(p)=-1177 7; Q(α)=4180 SY 2012Wa38.
S(p): based on E(p)=1169 8 (1988Da03) and includes electron screening; also -1177 7 (2012Wa38, without electron screening).
ΔS(n)=710, ΔQ(α)=710 (2012Wa38,syst).
Q(εp)=8830 950 (2012Wa38,syst).
Experimental works:
1998Da03, 1999Ry04, 2001Se03, 2002Cu01, 2002Kr04, 2003BaZZ, 2005Bi24, 2007KaZO, 2008Ka16, all of them using the ⁹²Mo(⁵⁴Fe,p4n) reaction.
Ground-state deformation: from the analysis of the proton radioactivity data, β=0.3 was deduced (1998Da03, 1999Ry04, 1999Ma05, 2000Bb02, 2000Kr07, 2001Es01). A similar value was deduced following the study of the high-spin data (2001Se03). More recent calculations deduced generally larger values of deformation, β=0.3-0.4 (2005Fe06, 2007Ka60, 2008Ka16).
Theoretical works:
2012Qi01, 2011Sh13, 2010Qi09: calculated T_{1/2}.
2012Qi03: calculated T_{1/2}, proton formation probability.
2011FeZZ: calculated single-particle levels, Jπ, deformation, rotational band, proton emission Γ.
2011Sa60: calculated T_{1/2}.
2010Zh16: T_{1/2}, spectroscopic factors for deformed and microscopic factors for spherical emitters.
2009Ar12: calculated rotational level energies.
2008Ka16: β₂=0.35, β₄=-0.05.
2007Ka60: β₂=0.3-0.35.
2007Me28: calculated T_{1/2}.
2006De07: analyzed proton decay T_{1/2}, Q(p) and deduced systematic trends.
2005Ba04: calculated α-decay T_{1/2} from proton emitter.
2005DaZZ, 2004Da10: calculated decay width and branching ratio.
2005Fe06: β₂=0.30-0.40.
2005Vo20: analyzed partial decay widths, Coriolis suppression factor.
2004Ge16: calculated proton separation energy, deformation.
2004Kr09: calculated resonance parameters, level energies and configurations, proton decay T_{1/2}.
2004Ma67: calculated level configuration for proton-decaying states.
2003Fi05: calculated proton decay width, T_{1/2}, pairing interaction effects.
2002Da29: calculated proton decay widths.
2002Du16: calculated proton emission T_{1/2}.
2002Fe03: calculated proton decay widths, T_{1/2}.
2002Ma62: analyzed proton-decay data, unified description for spherical and deformed nuclei.
2002Ma75: analyzed T_{1/2}, deduced parent levels Jπ, configurations, deformation.
2002Ry05, 2002RyZX: compiled, analyzed proton-decay data, E(p), branching ratios.
2002So02: compiled, evaluated structure data, proton-decay data.
2001Es01: calculated proton decay partial widths.
2001Go20: β₂=0.31, β₄=-0.04, S(p)=-0.6 MeV.
1997Mo25: S(p)=-0.89 MeV, S(2p)=1.21 MeV, Q(α)=4.09 MeV, T_{1/2}(β)=0.2712 s, T_{1/2}(α)=13800 s.
1995Mo29: β₂=0.286, β₄=-0.063, β₆=0.006.
1995Ab38: β₂=0.35, β₄=-0.04, S(p)=-1.0 MeV.
1976Li30: S(p)=-1.15 MeV, Q(α)=4.44 MeV.

¹⁴¹Ho Levels

Cross Reference (XREF) Flags

A ⁹²Mo(⁵⁴Fe,p4n) p Data
B ⁹²Mo(⁵⁴Fe,p4n) γ Data

E(level) [†]	Jπ [‡]	XREF	T _{1/2}	Comments
0.0 §	(7/2-)	AB	4.1 ms 1	%p=100. Decay modes other than p were not observed and their calculated T _{1/2} are far larger than the experimental T _{1/2} ; as a consequence we adopt %p=100. Configuration=π([523]7/2-) (1998Da03). Jπ: from Nilsson model analysis of lifetime. T _{1/2} (calc) for [523] state=19.1 ms (2000Bb02). T _{1/2} : weighted average of 4.2 ms 4 (1998Da03), 3.9 ms 5 (1999Ry04), and 4.1 ms 1 (2008Ka16). Proton decay of Jπ(p)=7/2-, T _{1/2} (p)=4.1 ms 1 g.s.: 1) to 0+ g.s. in ¹⁴⁰ Dy: E(p)(0+ g.s.)=1169 keV 8, Q(p)=1190 keV 8 (1998Da03), B(p)=0.991 2. 2) fine structure - proton decay to first 2+ state in ¹⁴⁰ Dy: E(p)(2+)=968 keV 10 (2008Ka16, 201 keV 6 smaller than E(p)(0+ g.s.)), B(p)=0.009 2 (2008Ka16).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{141}Ho Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}$	Comments
66@ 12	(1/2+)	AB	7.3 μs 3	<p>$\sigma=250$ nb at 76 MeV at and 88 MeV of excitation energy (1998Da03); $\sigma=130$ nb at 95 MeV of excitation energy (1999Ry04); 1.4 μb at 300 MeV of excitation energy (2008Ka16).</p> <p>%p=100.</p> <p>Decay modes other than p were not observed and their calculated $T_{1/2}$ are far larger than the experimental $T_{1/2}$; as a consequence we adopt %p=100.</p> <p>Configuration=$\pi([411]1/2+)$ (1999Ry04).</p> <p>Jπ: from Nilsson model analysis of lifetime. $T_{1/2}(\text{calc})$ for [411] state=14.6 μs (2000Bb02).</p> <p>$T_{1/2}$: weighted average of 8 μs 3 (1999Ry04), 6.5 μs +9-7 (2001Se03), and 7.4 μs 3 (2008Ka16).</p> <p>E(level): from energy difference in Q(p)'s.</p> <p>Proton decay of Jπ(p)=1/2+, $T_{1/2}(\text{p})=7.3$ μs 3 isomer:</p> <p>1) to 0+ g.s. in ^{140}Dy: E(p)(0+ g.s.)=1234 keV 8 (weighted average of 1230 keV 20 (1999Ry04) and 1235 keV 9 (2001Se03)), Q(p)=1256 keV 8, B(p)=0.983 5.</p> <p>2) fine structure – proton decay to first 2+ state in ^{140}Dy: E(p)(2+)=1030 keV 14 (2008Ka16, 204 keV 11 smaller than E(p)(0+ g.s.)), B(p)=0.017 5 (2008Ka16).</p> <p>$\sigma=30$ nb at 95 MeV of excitation energy (1999Ry04); 240 nb at 290 MeV of excitation energy (2008Ka16).</p> <p>E(level): x =20 keV from particle-rotor calculations (2001Se03).</p>
66+x@	(3/2+)	B		
77.8# 4	(9/2-)	B		
169.1§ 4	(11/2-)	B		
277.7+x?@ 4	(7/2+)	B		
386.7# 5	(13/2-)	B		
499.6§ 5	(15/2-)	B		
623.2+x?@ 6	(11/2+)	B		
978.1§ 7	(19/2-)	B		
1062.5+x?@ 7	(15/2+)	B		
1565.4+x?@ 8	(19/2+)	B		
1595.5§ 10	(23/2-)	B		
2333.1§ 13	(27/2-)	B		
3165.7§ 17	(31/2-)	B		
4084.6§ 21	(35/2-)	B		

[†] From least-square fit to $E\gamma$ for γ decaying states.[‡] For γ decaying states, the assignments are based on the γ energy and intensity pattern expected for band members, supported by cranked-shell model calculations and comparisons with neighboring nuclei.§ (A): $\pi 7/2[523]$, $\alpha=-1/2$. Possible hexadecapole deformation and triaxial shape in the g.s.# (B): $\pi 7/2[523]$, $\alpha=+1/2$.@ (C): $\pi 1/2[411]$. $\gamma(^{141}\text{Ho})$

E(level)	$E\gamma$	$I\gamma$	E(level)	$E\gamma$	$I\gamma$	E(level)	$E\gamma$	$I\gamma$
77.8	78.4 5	100	499.6	113.1 6	23 7	1595.5	617.4 7	100
169.1	91.1 6	100 23		330.4 3	100 13	2333.1	737.6 9	100
	168.5 5	54 18	623.2+x?	345.5 4	100	3165.7	832.6 11	100
277.7+x?	211.7 4	100	978.1	478.5 4	100	4084.6	918.9 12	100
386.7	217.2 4	100 22	1062.5+x?	439.3 4	100			
	309.5 4	95 22	1565.4+x?	502.9 4	100			

Adopted Levels, Gammas (continued) **$^{92}\text{Mo}(^{54}\text{Fe}, p4n)$ p Data 1998Da03, 1999Ry04, 2001Se03**

1998Da03: first observation of ^{141}Ho p radioactivity, deformation deduced, $^{92}\text{Mo}(^{54}\text{Fe}, p4n)$ $E=285-305$ MeV (ANL).

1999Ry04: observation of isomer, $^{92}\text{Mo}(^{54}\text{Fe}, p4n)$, $E=315$ MeV (ORNL).

2001Se03: $^{92}\text{Mo}(^{54}\text{Fe}, p4n)$ in both direct and inverse kinematics, $E(\text{cm})=184-186$ MeV. High statistics work.

2008Ka16, 2007KaZO, 2005Bi24, 2002Kr04: $^{92}\text{Mo}(^{54}\text{Fe}, p4n)$ $E=290, 400$ MeV (ORNL HRIBF), measured $E(p)$ from $7/2-$ g.s. and $1/2+$ isomer to ^{140}Dy g.s. and first $2+$ excited state.

 ^{141}Ho Levels

E(level) [†]	$J\pi^{\dagger}$	$T_{1/2}^{\dagger}$	Comments
0.0	(7/2-)	4.1 ms 1	<p>%p=100.</p> <p>Configuration=$\pi([523]7/2-)$ (1998Da03).</p> <p>$T_{1/2}$: weighted average of 4.2 ms 4 (1998Da03), 3.9 ms 5 (1999Ry04), and 4.1 ms 1 (2008Ka16).</p> <p>Proton decay of $J\pi(p)=7/2-$, $T_{1/2}(p)=4.1$ ms 1 g.s.</p> <p>1) to 0+ g.s. in ^{140}Dy: $E(p)(0+ \text{ g.s.})=1169$ keV 8, $Q(p)=1190$ keV 8 (1998Da03), $B(p)=0.991$ 2.</p> <p>2) fine structure – proton decay to first $2+$ state in ^{140}Dy: $E(p)(2+)=968$ keV 10 (2008Ka16, 201 keV 6 smaller than $E(p)(0+ \text{ g.s.})$), $B(p)=0.009$ 2 (2008Ka16).</p> <p>$\sigma=250$ nb at 76 MeV and 88 MeV of excitation energy (1998Da03); $\sigma=130$ nb at 95 MeV of excitation energy (1999Ry04); 1.4 μb at 300 MeV of excitation energy (2008Ka16).</p> <p>In the high-statistics work of 2001Se03, fine structure – proton decay to $2+$ state in ^{140}Dy was not observed and a limit of 1% was set for the $2+$ branching ratio.</p>
66 12	(1/2+)	7.3 μs 3	<p>%p=100.</p> <p>Configuration=$\pi([411]1/2+)$ (1999Ry04).</p> <p>E(level): from energy difference in $Q(p)$'s.</p> <p>$T_{1/2}$: weighted average of 8 μs 3 (1999Ry04), 6.5 μs +9-7 (2001Se03), and 7.4 μs 3 (2008Ka16).</p> <p>Proton decay of $J\pi(p)=1/2+$, $T_{1/2}(p)=7.3$ μs 3 isomer:</p> <p>1) to 0+ g.s. in ^{140}Dy: $E(p)(0+ \text{ g.s.})=1234$ keV 8 (weighted average of 1230 keV 20 (1999Ry04) and 1235 keV 9 (2001Se03)), $Q(p)=1256$ keV 8, $B(p)=0.983$ 5.</p> <p>2) fine structure – proton decay to first $2+$ state in ^{140}Dy: $E(p)(2+)=1030$ keV 14 (2008Ka16, 204 keV 11 smaller than $E(p)(0+ \text{ g.s.})$), $B(p)=0.017$ 5 (2008Ka16).</p> <p>$\sigma=30$ nb at 95 MeV of excitation energy (1999Ry04); 240 nb at 290 MeV of excitation energy (2008Ka16).</p>

[†] From adopted levels.

$^{92}\text{Mo}(^{54}\text{Fe},\text{p}4\text{n}\gamma)$ γ Data 2001Se03

Reaction studied in both direct and inverse kinematics.

2001Se03: E(cm)=184–186 MeV. Measured $E\gamma$, $I\gamma$ and $\gamma\gamma$ using Gammasphere array in coincidence with Fragment Mass

Analyzer (FMA); 97 Compton-suppressed HPGe detectors and four LEPS's.

Recoil-decay tagging method was used to select γ -ray transitions belonging to ^{141}Ho .

 ^{141}Ho Levels

E(level) [†]	$J\pi^{\S}$	$T_{1/2}^{\ddagger}$	Comments
0.0#	7/2-	4.1 ms 1	
66& 12	1/2+	7.3 μs 3	
66+x&	(3/2+)		E(level): x =20 keV from particle-rotor calculations (2001Se03).
77.8@ 4	(9/2-)		
169.1# 4	(11/2-)		
277.7+x?& 4	(7/2+)		
386.7@ 5	(13/2-)		
499.6# 5	(15/2-)		
623.2+x?& 6	(11/2+)		
978.1# 7	(19/2-)		
1062.5+x?& 7	(15/2+)		
1565.4+x?& 8	(19/2+)		
1595.5# 10	(23/2-)		
2333.1# 13	(27/2-)		
3165.7# 17	(31/2-)		
4084.6# 21	(35/2-)		

[†] From least-squares fit to $E\gamma$'s.

[‡] From adopted values.

[§] High-spin data: from the γ energy and intensity pattern expected for band members, supported by cranked-Shell Model calculations and comparisons with neighboring nuclei.

(A): $\pi 7/2[523]$, $\alpha=-1/2$. Possible hexadecapole deformation and triaxial shape in the g.s.

@ (B): $\pi 7/2[523]$, $\alpha=+1/2$.

& (C): $\pi 1/2[411]$.

 $\gamma(^{141}\text{Ho})$

$E\gamma$	E(level)	$I\gamma$	$E\gamma$	E(level)	$I\gamma$	$E\gamma$	E(level)	$I\gamma$
78.4 5	77.8	42 13	309.5 4	386.7	39 9	617.4 7	1595.5	68 15
91.1 6	169.1	39 9	330.4 3	499.6	92 12	^x 657		
113.1 6	499.6	21 6	345.5 4	623.2+x?	18 6	737.6 9	2333.1	37 12
168.5 5	169.1	21 7	439.3 4	1062.5+x?	26 7	832.6 11	3165.7	22 10
211.7 4	277.7+x?	22 7	478.5 4	978.1	100 14	918.9 12	4084.6	17 9
217.2 4	386.7	41 9	502.9 4	1565.4+x?	19 6			
^x 301			^x 611					

^x γ ray not placed in level scheme.

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