$^{135}_{59}$ Pr₇₆-1

Adopted Levels, Gammas

	History		
Туре	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Alexander A. Rodionov And Yuri L. Khazov	NDS 109,517 (2008)	22-Jan-2008

 $Q(\beta^{-})=-4722\ 23;\ S(n)=10479\ 24;\ S(p)=3392\ 24;\ Q(\alpha)=4.1\times10^{2}\ 3$ 2012Wa38

Note: Current evaluation has used the following Q record -4722 23 *10490* 40 *3389* 24 *410* 30 2003Au03. Mass measurement by penning trap: 1997Be63.

Nuclear structure calculations: 1993We05 (levels, cranked-shell-model), 1992Zh10 (identical bands), 1988Go01 (levels), 1983Ch46 (yrast,near- yrast bands, cranking model), 1975To08 (levels, transition rates, μ, Q), 1975Me11 (levels, collective model).
 Additional information 1.

No level or γ information is available from ¹³⁵Nd ε decay (5.5 min).

¹³⁵Pr Levels

Cross Reference (XREF) Flags

		A ¹³⁵ Pr B ¹³⁵ Nc C ¹²⁰ Sn	IT decay l ε decay (¹⁹ F,4nγ)	(105 μ s) D ¹³⁶ Ce(p,2n γ) (12.4 min) E ¹³⁵ Nd ε decay (5.5 min):?
E(level) [†]	J ^π @	T _{1/2} ‡	XREF	Comments
0.0	3/2 ⁽⁺⁾	24 min <i>1</i>	ABCD	$%ε + %β^+ = 100$ J ^π : spin from atomic beam (1972Ek04), parity from systematics. The g.s. J ^π is 5/2 ⁺ for ¹³⁷ Pr, ¹³⁹ Pr and ¹⁴¹ Pr; (3/2 ⁺) for ¹²⁹ Pr, ¹³¹ Pr
				and ¹³³ Pr. In the model calculations of 1988Go01, 3/2[411], 3/2[422] and 5/2[413] orbitals are predicted at low energies and
				small deformations. The ¹³⁵ Pr g.s. is possibly $3/2[411]$. T _{1/2} ; weighted average of 22 min (1954Ha68), 25.4 min 5
				(1970Ab07), 27 min (1972Ar02), 24 min (1972Ek04), 21 min <i>I</i> (1973VaYZ). Uncertainty of 1 min is assigned for averaging when not quoted
41 43 <mark>&</mark> 5	$5/2^{(+)}$		ABCD	I^{π} : M1(+E2) γ to $3/2^{(+)}$ E1 γ from $7/2^{(-)}$
206.08 6	$7/2^{(+)}$		B D	J^{π} : M1+E2 γ to 5/2 ⁽⁺⁾ : log <i>ft</i> =6.8 from 9/2 ⁽⁻⁾ .
245.48 ^{<i>a</i>} 5	$7/2^{(+)}$		ABCD	J^{π} : M1 γ to 5/2 ⁽⁺⁾ ; log <i>ft</i> =6.5 from 9/2 ⁽⁻⁾ .
358.06 ^b 6	$(11/2^{-})$	105 µs 10	ABCD	%IT=100
				J^{π} : M2 γ to $7/2^{(+)}$; systematics.
				$T_{1/2}$: from γ (t) (1973Co32).
493.48 6	$7/2^{(+)}$		ΒD	J ^{π} : M1+E2 γ to 5/2 ⁽⁺⁾ ; log <i>ft</i> =6.6 from 9/2 ⁽⁻⁾ .
517.41 ^{&} 7	$9/2^{(+)}$		BCD	J^{π} : $\Delta J=2$, E2 γ to $5/2^{(+)}$.
543.17 8	$7/2^{(-)}$		ΒD	J^{π} : E1-M1 cascade to $3/2^{(+)}$; log <i>ft</i> =6.6 from $9/2^{(-)}$.
591.05 10			D	J^{π} : γ 's to $5/2^{(+)}$ and $7/2^{(+)}$ suggest $3/2^+, 5/2, 7/2, 9/2^+$.
688.10 <i>10</i>	$(9/2^+)$		ΒD	J^{π} : M1(+E2) γ to 7/2 ⁽⁺⁾ , $\Delta J=1 \gamma$ to 7/2 ⁽⁺⁾ .
730.83 ⁰ 11	$(15/2^{-})$	22.9 [#] ps <i>14</i>	BCD	J ^π : Δ J=2, E2 γ to (11/2 ⁻).
777.48 ^a 9	$(11/2^+)$		BCD	J^{π} : $\Delta J=(2)$, E2 γ to $7/2^{(+)}$.
799.25 11	$9/2^{(-)}$		ΒD	J^{π} : $\Delta J=1$, M1(+E2) γ 's to 7/2 ⁽⁻⁾ and (11/2 ⁻).
951.68 ^c 12	$(13/2^{-})$		BCD	J ^π : Δ J=1, M1+E2 γ to (11/2 ⁻); Δ J=1, (M1) γ to (15/2 ⁻).
985.38 18	$(9/2^+)$		ΒD	J^{π} : $\Delta J=1$, M1+E2 γ to 7/2 ⁽⁺⁾ ; log ft=7.0 from 9/2 ⁽⁻⁾ .
1016.86 15			D	J^{π} : γ' s to $7/2^{(+)}$ and $9/2^{(+)}$ suggest $5/2^+, 7/2, 9/2, 11/2^+$.
1089.91 15	$(5/2^+, 7/2, 9/2^+)$		D	J^{π} : γ' s to $5/2^{(+)}$ and $9/2^{(+)}$.
1104.90 17			D	J^{π} : γ' s to $7/2^{(+)}$ and $9/2^{(+)}$ suggest $5/2^+, 7/2, 9/2, 11/2^+$.
1160.2 3	$(9/2^{-})$		B D	$J^{n}: \Delta J=1, D+Q \gamma \text{ to } 7/2^{(-)}; \log ft=6.8 \text{ from } 9/2^{(-)}.$
1181.49 12	$(7/2^+, 9/2)$		D	J^{n} : $\Delta J=0,1$ d or D+Q γ to $7/2^{(+)}$; γ to $(11/2^{+})$.
1185.15 12	$(9/2^{-}, 11/2^{-})$		ΒD	J ^{n} : log <i>ft</i> =6.6 from 9/2 ⁽⁻⁾ and M1,E2 γ to (13/2 ⁻).

Continued on next page (footnotes at end of table)

¹³⁵Pr Levels (continued)

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	E(level) [†]	J ^{π @}	$T_{1/2}^{\ddagger}$	XREF	Comments
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1214.24 15	$(7/2^{-}, 9/2^{-}, 11/2^{-})$		BD	J^{π} : log ft=6.8 from 9/2 ⁽⁻⁾ and M1.E2 γ to 9/2 ⁽⁻⁾ .
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1221.5 4	$(11/2^+)$		D	J^{π} : $\Delta J=1$, D+O γ to $9/2^{(+)}$.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1232.2 ^{&} 4	$(13/2^+)$		CD	I^{π} : $AI=2$ E2 γ to $9/2^{(+)}$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1289 60 21	$(13/2^{-})$		R D	I^{π} : $\Lambda I = 1$ $M1 + E2 \gamma$ to $9/2^{(-)}$: γ to $7/2^{(-)}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1303.1.4	$(11/2^{-})$		B	I^{π} : γ to $(15/2^{-})$ and log $ft=6.8$ from $9/2^{(-)}$.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1306.63 23	(-)		D	J^{π} : (E2) γ to (15/2 ⁻) suggests 11/2 ⁻ to 19/2 ⁻ .
1351.8 0 p 1350.9 ⁶ 4 (19/2 ⁻) 2.4 [#] ps 6 CD F: $\Delta J=2$, (E2) γ to (15/2 ⁻). 1409.9 3 p F: $\Delta J=1$, $D+Q$ γ to (15/2 ⁻). D 1433.5 ² 3 (17/2 ⁻) CD F: $\Delta J=1$, $D+Q$ γ to (15/2 ⁻). 1478.2 5 (17/2 ⁻) CD F: $\Delta J=1$, $D+Q$ γ to (15/2 ⁻). 1506.0 ⁴ 5 (15/2 ⁺) CD F: $\Delta J=2$, (0) γ to (15/2 ⁻). 1507.8 3 (11/2 ⁺) D F: $\Delta J=2$, (0) γ to (15/2 ⁻). 1571.1 6 D D F: $\Delta J=2$, (0) γ to (9/2 ⁺). 1571.1 6 D D F: $\Delta J=2$, (0) γ to (9/2 ⁺). 1742.2 8 D J [*] : $\Delta J=2$, (0) γ to (9/2 ⁻) and γ to (11/2 ⁺). 1742.2 8 D J [*] : $\Delta J=2$, (0) γ to (15/2 ⁻); $\Delta J=1$, D γ to (17/2 ⁻). 1742.2 8 D J [*] : $\Delta J=2$, (0) γ to (15/2 ⁻); $\Delta J=1$, D γ to (17/2 ⁻). 1742.2 8 D J [*] : $\Delta J=2$, (0) γ to (15/2 ⁻); $\Delta J=1$, D γ to (17/2 ⁻). 1742.4 8 D D J [*] : γ to 7/2 ⁽⁺⁾ and log $f=6.1$ from 9/2 ⁽⁻⁾ . 1959.2 4 D D J [*] : γ to 7/2 ⁽⁺⁾ and log $f=6.1$ from 9/2 ⁽⁻⁾ . 1	1325.3 <i>3</i>	$(11/2^+)$		D	J^{π} : $\Delta J=1$, D+Q γ to $(9/2^+)$.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1351.8 8			D	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1390.9 <mark>b</mark> 4	$(19/2^{-})$	2.4 [#] ps 6	CD	J^{π} : $\Delta J=2$, (E2) γ to (15/2 ⁻).
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	1409.9 <i>3</i>			D	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1433.3 [°] 3	$(17/2^{-})$		CD	J^{π} : γ 's to (15/2 ⁻) and (13/2 ⁻); band assignment.
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	1460.8 4	$(11/2^+)$		D	J^{π} : $\Delta J=1$, D+Q γ to 9/2 ⁽⁺⁾ .
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1478.2 5	$(17/2^{-})$		CD	J^{π} : $\Delta J=1$, D or D+Q γ to (15/2 ⁻).
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1506.04 5	$(15/2^+)$		CD	$J^{\pi}: \Delta J = (2), (Q) \gamma \text{ to } (11/2^+).$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1507.8 3	$(11/2^{+})$		D	J ^{<i>i</i>} : $\Delta J=1$, D+Q γ to 9/2 ⁽¹⁾ .
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1551.94			ע	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1636.4.3	$(13/2^{+})$		ם ח	I^{π} : $\Lambda I = (2)$ (0) γ to $(9/2^+)$ and γ to $(11/2^+)$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1742.2 8	(15/2)		D	$J : \Delta J = (2), (Q) \neq (0, (j/2))$ and $j = (0, (11/2)).$
1794.2 6 Image: Constraint of the second secon	1766.0 6	(7/2 ⁻ ,9/2 ⁻ ,11/2 ⁻)		ΒD	J^{π} : $\Delta J=0,1$ d or D+Q γ to $9/2^{(-)}$.
1816.0.3 (^) D $J^{\pi}: M1, E2 \gamma \text{ to } (19/2^{-}) \text{ suggests } 19/2^{-}, 21/2^{-}, 23/2^{-}.$ 1904.9 B D 1928.6 (19/2^{-}) C J^{\pi}: $\Lambda J=(2), (Q) \gamma \text{ to } (15/2^{-}); \Delta J=1, D \gamma \text{ to } (17/2^{-}).$ 1959.2 D D J^{\pi}: $\gamma \text{ to } 7/2^{(+)}$ and log $ft=6.1$ from $9/2^{(-)}$. 198.0 7 (7/2,9/2,11/2^{+}) B J^{\pi}: $\gamma \text{ to } 7/2^{(-)}$ and log $ft=6.1$ from $9/2^{(-)}$. 2014.0 8 D D E(level): this level may be the same as 2159, although 768y is not reported in (p.2ny) reaction. 2158.5 ^C (21/2^{-}) C D E(level): this level may be the same as 2159, although 768y is not reported in (p.2ny) reaction. 2344.9 ^f (23/2^{-}) 0.92 ^{ff} ps 5 C 2373.0 (19/2 ⁺) C 2385.9 ^{ff} (21/2 ⁺) C 2373.0 (19/2 ⁺) C 2389.9 ^{gf} (21/2 ⁺) C 2373.0 (21/2 ⁺) C 2373.0 (21/2 ⁺) C 2373.0 (21/2 ⁺) C 2374.9 ^{ff} C C 2374.9 ^{ff} C C<	1794.2 6			D	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1816.0 <i>3</i>	(_)		D	J ^{π} : M1,E2 γ to (19/2 ⁻) suggests 19/2 ⁻ ,21/2 ⁻ ,23/2 ⁻ .
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1904.9 8	(10/2-)		D	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1928.6 6	(19/2)		C	J ^{<i>x</i>} : ΔJ=(2), (Q) γ to (15/2); ΔJ=1, D γ to (17/2).
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1939.2 4	$(7/2) 0/2 (11/2^{+})$		ע	$\pi_{\rm e}$ at to $7/2^{(\pm)}$ and log $4-6.1$ from $0/2^{(\pm)}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2002.8.8	(7/2,9/2,11/2)		ם	J . γ to $7/2^{1/2}$ and $\log f t = 0.1$ from $9/2^{1/2}$.
2104.4 8D2116.5 6 7(17/2 ⁺)2129.2? 7(7/2.9/2,11/2 ⁻)2155.9 6D2158.5 C 6(21/2 ⁻)2204.7 7(21/2 ⁻)2244.9 b 7(23/2 ⁻)0.92 $^{#}$ ps 52346.9 9(23/2 ⁻)2375.9 4(19/2 ⁺)2373.0 9(19/2 ⁺)258.9 6 7(21/2 ⁺)258.9 6 7(21/2 ⁺)2375.7 6(21/2 ⁺)2395.9 4 8(23/2 ⁻)236.9 9(23/2 ⁻)2375.7 7(21/2 ⁺)238.9 6 7(21/2 ⁺)2373.0 9(19/2 ⁺)C(21/2 ⁺)238.9 6 7(21/2 ⁺)C(21/2 ⁺)236.9 1C237.1 0C238.9 6 7(21/2 ⁺)CC238.9 6 7(21/2 ⁺)CC239.9 4 8(25/2 ⁺)CC3001.0 c 7(25/2 ⁻)CC3244.8 h 10(27/2 ⁺)CC348.8 10C350.8 8C	2014.0.8			D	
2116.5 $\ensuremath{\mathbb{C}}$ 7 (17/2 ⁺)CD2129.2? 7(7/2,9/2,11/2 ⁻)2155.9 6D2158.5 $\ensuremath{\mathbb{C}}$ 6 (21/2 ⁻)C2204.7 7(21/2 ⁻)2244.9 $\ensuremath{\mathbb{C}}$ 7 (23/2 ⁻)0.92 $\ensuremath{\mathbb{F}}$ ps 52346.9 9(23/2 ⁻)2355.9 11C2355.9 11C2355.9 11C2355.9 12C2355.9 14C2355.9 17C235.9 17C235.9 21C237.0 9(19/2 ⁺)237.1 9(19/2 ⁺)237.2 9(21/2 ⁺)CC238.9 $\ensuremath{\mathbb{C}}$ 7 (21/2 ⁺)CC234.6 9 (23/2 ⁺)CC235.9 11237.0 9(19/2 ⁺)C235.9 14C235.9 17C235.9 18C235.9 20C235.9 4 8(21/2 ⁺)C236.9 9(23/2 ⁺)C236.9 9(23/2 ⁺)C3204.9 13(25/2)C348.8 10C350.8 8C	2104.4 8			D	
2129.2?7 $(7/2.9/2,11/2^-)$ B $J^{\pi}: \gamma$ to $7/2^{(-)}$ and log $ft=6.7$ from $9/2^{(-)}$.2155.9DE(level): this level may be the same as 2159, although 768 γ is not reported in $(p,2n\gamma)$ reaction.2158.5°6 $(21/2^-)$ C2204.77 $(21/2^-)$ C2244.9 ^b 7 $(23/2^-)$ $0.92^{\text{#}} \text{ ps 5}$ 2346.9 $(23/2^-)$ C2395.9 ^a $(19/2^+)$ C258.9 ^{&} 7 $(21/2^+)$ C258.9 ^{&} 7 $(21/2^+)$ C258.9 ^{&} 7 $(21/2^+)$ C258.9 ^{&} 7 $(21/2^+)$ C258.9 ^{&} 8 $(23/2^+)$ C290.99 $(23/2^+)$ C290.99 $(23/2^+)$ C201.0 ^c 7 $(25/2^-)$ C204.8 $(25/2^-)$ C204.913 $(25/2)$ C2344.8 ^b 10 $(27/2^-)$ C3488.810C3530.8CC	2116.5 <mark>&</mark> 7	$(17/2^{+})$		CD	
2155.9 6DE(level): this level may be the same as 2159, although 768y is not reported in $(p,2ny)$ reaction.2158.5 ^c 6 $(21/2^-)$ C2204.7 7 $(21/2^-)$ C2244.9 ^b 7 $(23/2^-)$ $0.92^{\#}$ ps 52346.9 9 $(23/2^-)$ C2373.0 9 $(19/2^+)$ C2395.9 ^d 8 $(19/2^+)$ C2395.9 ^d 7 $(21/2^+)$ C2395.9 ^d 8 $(23/2^+)$ C2395.9 ^d 8 $(23/2^+)$ C2395.9 ^d 8 $(23/2^+)$ C2395.9 ^d 8 $(23/2^+)$ C2396.9 ^d 8 $(23/2^+)$ C2301.0 ^c 7 $(25/2^-)$ C3204.9 13 $(25/2^-)$ C3244.8 ^b 10 $(27/2^-)$ C3488.8 10CC350.8 8CC	2129.2? 7	$(7/2.9/2.11/2^{-})$		В	J^{π} : γ to $7/2^{(-)}$ and log $ft=6.7$ from $9/2^{(-)}$.
$\begin{array}{c} \text{reported in } (p,2ny) \text{ reaction.} \\ \hline \\ 2204.7 7 & (21/2^-) \\ 2244.9^b 7 & (23/2^-) \\ 2346.9 9 & (23/2^-) \\ 2355.9 11 \\ \hline \\ 2373.0 9 & (19/2^+) \\ 23754.7 6 \\ \hline \\ 2896.9^k 7 & (21/2^+) \\ 2617.8 7 & (21/2^+) \\ 2754.7 6 \\ \hline \\ 2846.9^a 8 & (23/2^+) \\ 2900.9 9 & (23/2^+) \\ 3001.0^c 7 & (25/2^-) \\ 3123.9^k 8 & (25/2^+) \\ 3204.9 13 & (25/2^+) \\ 3204.9 13 & (25/2^-) \\ 3244.8^b 10 & (27/2^-) \\ 3421.9^a 10 & (27/2^-) \\ 3488.8 10 \\ 3517.7 10 \\ \hline \\ 3530.8 8 \\ \hline \\ \end{array}$	2155.9 6			D	E(level): this level may be the same as 2159, although 768 γ is not
$\begin{array}{cccccccccccccccccccccccccccccccccccc$					reported in $(p,2n\gamma)$ reaction.
$2204.7 7$ $(21/2^-)$ $0.92^{\text{\#}} \text{ ps 5}$ C $2346.9 9$ $(23/2^-)$ $0.92^{\text{\#}} \text{ ps 5}$ C $2355.9 11$ C $2373.0 9$ $(19/2^+)$ C $2395.9^{d} 8$ $(19/2^+)$ C $2589.9^{dc} 7$ $(21/2^+)$ C $2395.9^{d} 8$ $(19/2^+)$ C $2589.9^{dc} 7$ $(21/2^+)$ C $2589.9^{dc} 7$ $(21/2^+)$ C $2584.9^{dc} 7$ $(21/2^+)$ C $2617.8 7$ $(21/2^+)$ C $2374.7 6$ C $23/2^+)$ C $2900.9 9$ $(23/2^+)$ C $2301.0^{c} 7$ $(25/2^-)$ C $3123.9^{dc} 8$ $(25/2^-)$ C $3244.8^{b} 10$ $(27/2^-)$ C $3421.9^{a} 10$ $(27/2^-)$ C $33488.8 10$ C $3530.8 8$ C	2158.5 [°] 6	$(21/2^{-})$		С	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2204.7 7	$(21/2^{-})$		C	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2244.9 ⁰ 7	$(23/2^{-})$	0.92 [#] ps 5	С	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2346.9 9	$(23/2^{-})$		C	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2355.9 11	$(10/2^{\pm})$		C	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2375.09	$(19/2^+)$ $(10/2^+)$		C	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2595.9 0	(1)/2) $(21/2^{+})$		C C	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2569.9 7	(21/2) $(21/2^+)$		C	
$2846.9^a \ 8$ $(23/2^+)$ C $2900.9 \ 9$ $(23/2^+)$ C $3001.0^c \ 7$ $(25/2^-)$ C $3123.9^{\&} \ 8$ $(25/2^+)$ C $3204.9 \ 13$ $(25/2)$ C $3244.8^b \ 10$ $(27/2^-)$ C $3421.9^a \ 10$ $(27/2^+)$ C $3488.8 \ 10$ C C $3517.7 \ 10$ C C $3530.8 \ 8$ C C	2754.7 6	(21/2)		c	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2846.9 ^{<i>a</i>} 8	$(23/2^+)$		C	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2900.9 9	$(23/2^+)$		С	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3001.0 [°] 7	$(25/2^{-})$		С	
3204.9 13 (25/2) C 3244.8 ^b 10 (27/2 ⁻) C 3421.9 ^a 10 (27/2 ⁺) C 3488.8 10 C C 3517.7 10 C C 3530.8 8 C C	3123.9 <mark>&</mark> 8	$(25/2^+)$		С	
3244.8 ^b 10 (27/2 ⁻) C 3421.9 ^a 10 (27/2 ⁺) C 3488.8 10 C 3517.7 10 C 3530.8 8 C	3204.9 13	(25/2)		С	
3421.9 ^a 10 (27/2 ⁺) C 3488.8 10 C 3517.7 10 C 3530.8 8 C	3244.8 <mark>b</mark> 10	$(27/2^{-})$		С	
3488.8 10 C 3517.7 10 C 3530.8 8 C	3421.9 ^{<i>a</i>} 10	$(27/2^+)$		С	
3517.770 C 3530.8 8 C	3488.8 10			C	
	551/./ 10 3530 8 8			C	
	5550.0 0			C	

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			¹³⁵ Pr Levels (continued)								
E(level) [†]	J ^π @	XREF	E(level) [†]	J ^π @	XREF	E(level) [†]	J ^π @	XREF			
3642.9 16	(27/2)	С	4964.9 ^{<i>a</i>} 17	$(35/2^+)$	С	6510.8 24		С			
3658.9 <mark>&</mark> 11	$(29/2^+)$	С	5030.8 16		С	6879.8 ^b 19	$(43/2^{-})$	С			
3862.8 9		С	5069.0 [°] 15	$(33/2^{-})$	С	6978.9 ^a 23	$(43/2^+)$	С			
3957.0 [°] 11	$(29/2^{-})$	С	5163.8 ^b 13	$(35/2^{-})$	С	7515? ^{&} 3	$(45/2^+)$	С			
4107.9 ^{<i>a</i>} 14	$(31/2^+)$	С	5336.8 15		С	7802.8 ^b 22	$(47/2^{-})$	С			
4219.9 <i>12</i>	(31/2)	С	5420.9 <mark>&</mark> 18	$(37/2^+)$	С	7899? <mark>a</mark> 3	$(47/2^+)$	С			
4292.8 11		С	5454.8 19		С	8716? ^b 3	$(51/2^{-})$	С			
4319.8 ^b 12	$(31/2^{-})$	С	5953.8 22		С	9004? ^a 3	$(51/2^+)$	С			
4393.8 14		С	5973.9 ^a 20	$(39/2^+)$	С	9678? ^b 3	$(55/2^{-})$	С			
4464.9 ^{&} 15	$(33/2^+)$	С	5997.8 ^b 16	$(39/2^{-})$	С	10745? ^b 3	$(59/2^{-})$	С			
4704.8 13		С	6500.9 ^{&} 21	$(41/2^+)$	С						

Adopted Levels, Gammas (continued)

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

[‡] For all excited states seen in the ¹³⁶Ce(p,2n γ) reaction, except the 358 level, 1985Ko18 suggest T_{1/2}≤1.5 ns from γ (t).

[#] From recoil-distance Doppler shift method in 123 Sb(16 O,4n γ) reaction (1998Bo33) listed in 136 Ce(p,2n γ) dataset.

[@] For high spin states (J>15/2) above 2 MeV, the assignments are from 1986Se07 based on $\gamma\gamma(\theta)$ (DCO) and/or band associations. [&] Band(A): $\pi g_{7/2}$ 5/2[413] (α =+1/2). The first band crossing is observed at 320 keV interpreted as due to alignment of a pair of h_{11/2} protons ('ab' crossing) and the second band crossing is observed at 490 keV due possible to a pair of h_{11/2} neutrons ('AB' crossing). The shape is nearly prolate ($\gamma \approx 0^{\circ}$) before the first crossing but $\gamma \approx +10^{\circ}$ due to alignment of a pair of h_{11/2} protons. The 1128 γ and 1172 γ present in the $\gamma\gamma$ coin spectrum (figure 5b in 1986Se07) may form a cascade above 1014 γ thus extending the band up to 53/2⁺. VMI analysis: parameter Δ =182 keV, 173 keV for both signature partners treated as one band.

^{*a*} Band(B): $\pi g_{7/2}$ 5/2[413] (α =-1/2). See comment for α =+1/2 signature partner for band crossings and triaxial shape parameter. VMI analysis: parameter Δ =150 keV, 173 keV for both signature partners treated as one band.

^b Band(C): $\pi h_{11/2}$ 3/2[541] (α =-1/2). The first band crossing is observed at 460 keV interpreted as due to alignment of a pair of $h_{11/2}$ protons ('bc' crossing) and the second band crossing is observed at 480 keV due possible to a pair of $h_{11/2}$ neutrons ('AB' crossing). The shape is nearly prolate before the first crossing but the alignment of $h_{11/2}$ protons would result in slightly positive γ . VMI analysis: parameter Δ =357 keV, 270 keV for both signature partners treated as one band.

^{*c*} Band(D): $\pi h_{11/2}$ 3/2[541] (α =+1/2) (?). The identification of this band is questionable. VMI analysis: parameter Δ =28 keV, 270 keV for both signature partners treated as one band.

	Adopted Levels, Gammas (continued)													
							γ ⁽¹³⁵ P	r)						
E_i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	\mathbf{E}_{f}	J_f^{π}	Mult.@	$\delta^{@}$	α &	Comments					
41.43	5/2(+)	41.47 5	100	0.0	3/2 ⁽⁺⁾	M1(+E2)	< 0.15	3.1 6	α (L)=2.5 5; α (M)=0.53 11; α (N+)=0.14 3 α (N)=0.116 24; α (O)=0.018 4; α (P)=0.001086 18					
206.08	7/2 ⁽⁺⁾	164.67 5	100 8	41.43	5/2 ⁽⁺⁾	M1+E2	+0.45 20	0.326 8	$\alpha(K) = 0.270 4; \ \alpha(L) = 0.045 6; \ \alpha(M) = 0.0096 14; \ \alpha(N+) = 0.0025 4$ $\alpha(N) = 0.0021 3; \ \alpha(O) = 0.00033 4; \ \alpha(P) = 1.98 \times 10^{-5} 8$					
		206.05 15	75 6	0.0	3/2 ⁽⁺⁾	E2		0.1717	$\alpha(K) = 0.1295 \ I9; \ \alpha(L) = 0.0331 \ 5; \ \alpha(M) = 0.00729 \ I1; \\ \alpha(N+) = 0.00183 \ 3$					
245.48	7/2 ⁽⁺⁾	204.08 5	100	41.43	5/2 ⁽⁺⁾	M1		0.1762	$\alpha(N)=0.001592 \ 23; \ \alpha(O)=0.000233 \ 4; \ \alpha(P)=7.89\times10^{-6} \ 12 \\ \alpha(K)=0.1503 \ 21; \ \alpha(L)=0.0205 \ 3; \ \alpha(M)=0.00431 \ 6; \\ \alpha(N+)=0.001131 \ 16 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.0001553 \ 22; \ \alpha(P)=1 \ 149\times10^{-5} \ 17 \\ \alpha(N)=0.000064 \ 14; \ \alpha(O)=0.00001553 \ 22; \ \alpha(P)=0.000064 \ 14; \ \alpha(P)=0.00001553 \ 22; \ \alpha(P)=0.000064 \ 14; \ \alpha(P)=0.0000064 \ 14; \ \alpha(P)=0.000064 \ 14; \ \alpha(P)=0.000664 \ 14; \ \alpha(P)=0.000664 \ 14; \ \alpha(P)=0.000664 \ 14; \ \alpha(P)=0.000666 \ 14; \ \alpha(P)=0.006666666666666666666666666666666666$					
		245.4 1	6.3 7	0.0	3/2 ⁽⁺⁾	(E2)		0.0963	$\alpha(N) = 0.000904 \ 14, \ \alpha(O) = 0.0001333 \ 22, \ \alpha(\Gamma) = 1.149 \times 10^{-17} \ \alpha(K) = 0.0748 \ 11; \ \alpha(L) = 0.01686 \ 24; \ \alpha(M) = 0.00369 \ 6; \ \alpha(N+) = 0.000932 \ 14 \ \alpha(N) = 0.000932 \ 14 \ \alpha(N) = 0.000807 \ 12; \ \alpha(O) = 0.0001108 \ 17; \ \alpha(D) = 4.71 \times 10^{-6} \ 7.51 \times 10^{-$					
358.06	(11/2 ⁻)	112.60 5	100 6	245.48	7/2 ⁽⁺⁾	M2		8.27	a(N)=0.00080772; a(O)=0.000119877; a(P)=4.71×1077B(M2)(W.u.)=0.0659a(K)=6.4610; a(L)=1.40920; a(M)=0.3125; a(N+)=0.081712a(N)=0.070010; a(O)=0.0110116; a(P)=0.00070810					
		316.6 1	23 4	41.43	5/2 ⁽⁺⁾	E3		0.1603	$\begin{array}{l} B(E3)(W.u.)=0.81 \ 17 \\ \alpha(K)=0.1082 \ 16; \ \alpha(L)=0.0406 \ 6; \ \alpha(M)=0.00916 \ 13; \\ \alpha(N+)=0.00229 \ 4 \end{array}$					
402 40	7/2(+)	040.0.1	47.00	0.45 40	$\pi (\mathbf{a}(\pm))$				α (N)=0.00200 3; α (O)=0.000288 4; α (P)=7.32×10 ⁻⁶ 11					
493.48	$1/2^{(+)}$	248.0 I	4.7 20	245.48	$7/2^{(+)}$									
		287.4+ <i>1</i> 452.1 <i>1</i>	8.2 20 100 6	41.43	$5/2^{(+)}$	M1+E2	+0.4 1	0.0208 6	α (K)=0.0177 5; α (L)=0.00241 5; α (M)=0.000508 9; α (N+)=0.0001330 24					
		493.4 1	34 4	0.0	3/2 ⁽⁺⁾	E2		0.01169	$\alpha(N)=0.0001134\ 20;\ \alpha(O)=1.82\times10^{-5}\ 4;\ \alpha(P)=1.33\times10^{-6}\ 4$ $\alpha(K)=0.00971\ 14;\ \alpha(L)=0.001561\ 22;\ \alpha(M)=0.000333\ 5;$ $\alpha(N+)=8.60\times10^{-5}\ 12$					
517.41	9/2 ⁽⁺⁾	271.9 <i>1</i>	28 9	245.48	7/2 ⁽⁺⁾	M1+E2	+0.25 5	0.0807	$ \begin{aligned} \alpha(N) &= 7.38 \times 10^{-5} \ 11; \ \alpha(O) &= 1.147 \times 10^{-5} \ 16; \ \alpha(P) &= 6.74 \times 10^{-7} \ 10 \\ \alpha(K) &= 0.0686 \ 11; \ \alpha(L) &= 0.00951 \ 15; \ \alpha(M) &= 0.00201 \ 3; \\ \alpha(N+) &= 0.000525 \ 8 \end{aligned} $					
		476.0 1	100 6	41.43	5/2 ⁽⁺⁾	E2		0.01289	$ \begin{aligned} &\alpha(\mathrm{N}) = 0.000448 \ 7; \ \alpha(\mathrm{O}) = 7.19 \times 10^{-5} \ 11; \ \alpha(\mathrm{P}) = 5.19 \times 10^{-6} \ 9 \\ &\alpha(\mathrm{K}) = 0.01069 \ 15; \ \alpha(\mathrm{L}) = 0.001740 \ 25; \ \alpha(\mathrm{M}) = 0.000372 \ 6; \\ &\alpha(\mathrm{N} +) = 9.59 \times 10^{-5} \ 14 \end{aligned} $					
543.17	7/2 ⁽⁻⁾	185.06 8	31 8	358.06	(11/2 ⁻)	(E2)		0.247	$\begin{aligned} \alpha(N) &= 8.23 \times 10^{-3} \ 12; \ \alpha(O) &= 1.277 \times 10^{-3} \ 18; \ \alpha(P) &= 7.40 \times 10^{-7} \ 11 \\ \alpha(K) &= 0.182 \ 3; \ \alpha(L) &= 0.0509 \ 8; \ \alpha(M) &= 0.01124 \ 16; \\ \alpha(N+) &= 0.00282 \ 4 \end{aligned}$					
		501.7 <i>1</i>	100	41.43	5/2 ⁽⁺⁾	E1		0.00373	α (N)=0.00245 4; α (O)=0.000356 5; α (P)=1.084×10 ⁻⁵ 16 α (K)=0.00321 5; α (L)=0.000414 6; α (M)=8.65×10 ⁻⁵ 13;					

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						Adopted L	evels, Gam	mas (continu	ied)
						<u> </u>	(¹³⁵ Pr) (cor	tinued)	
E _i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	\mathbf{E}_{f}	\mathbf{J}_{f}^{π}	Mult.@	$\delta^{@}$	α &	Comments
									α (N+)=2.26×10 ⁻⁵ 4
			10.0		= (a(+)				$\alpha(N)=1.93\times10^{-5} 3; \alpha(O)=3.08\times10^{-6} 5; \alpha(P)=2.21\times10^{-7} 4$
591.05		345.6 <i>I</i>	49 9 100 <i>11</i>	245.48	$\frac{7}{2^{(+)}}$				
688-10	$(9/2^+)$	170.65^{\ddagger} 10	28 5	517.41	$9/2^{(+)}$	D±O			
000.10	()[2])	442.7 2	100 25	245.48	$7/2^{(+)}$	D(+O)			
		482.2 [#] 3	48 [#] 10	206.08	7/2 ⁽⁺⁾	M1(+E2)	<1.5	0.0164 21	α (K)=0.0139 20; α (L)=0.00195 15; α (M)=0.00041 3; α (N+)=0.000107 9
		4			(1)				$\alpha(N)=9.2\times10^{-5}$ 7; $\alpha(O)=1.47\times10^{-5}$ 13; $\alpha(P)=1.03\times10^{-6}$ 17
730.83	$(15/2^{-})$	646.7 + 3	48 8	41.43	$5/2^{(+)}$	F2		0.0260	$B(E2)(W_{H}) - 81.5$
750.85	(13/2)	572.8 1	100	558.00	(11/2)	E2		0.0200	$\alpha(K)=0.0212 \ 3; \ \alpha(L)=0.00380 \ 6; \ \alpha(M)=0.000818 \ 12; \ \alpha(N+)=0.000209 \ 3$
									$\alpha(N)=0.000180 \ 3; \ \alpha(O)=2.76\times10^{-5} \ 4; \ \alpha(P)=1.426\times10^{-6} \ 20$
777.48	$(11/2^+)$	260.1 <i>I</i>	7.5 18	517.41	9/2 ⁽⁺⁾				I _{γ} : from weighted average of (p,2n γ) and (¹⁹ F,4n γ). I γ =38 15 in ¹³⁵ Nd ε decay.
		532.0 1	100 9	245.48	7/2 ⁽⁺⁾	(E2)		0.00954	α (K)=0.00796 <i>12</i> ; α (L)=0.001249 <i>18</i> ; α (M)=0.000266 <i>4</i> ; α (N+)=6.88×10 ⁻⁵ <i>10</i>
									α (N)=5.90×10 ⁻⁵ 9; α (O)=9.20×10 ⁻⁶ 13; α (P)=5.57×10 ⁻⁷ 8
799.25	$9/2^{(-)}$	256.0 1	18 2	543.17	7/2 ⁽⁻⁾	M1(+E2)	< 0.35	0.0950 15	$\begin{array}{l} \alpha(\mathrm{K}) = 0.0807 \ 15; \ \alpha(\mathrm{L}) = 0.01122 \ 25; \ \alpha(\mathrm{M}) = 0.00237 \ 6; \\ \alpha(\mathrm{N} +) = 0.000620 \ 14 \end{array}$
		441.2 2	100 7	358.06	(11/2-)	M1,E2		0.020 4	$ \alpha(N)=0.000529 \ 12; \ \alpha(O)=8.48\times10^{-5} \ 16; \ \alpha(P)=6.11\times10^{-6} \ 15 \\ \alpha(K)=0.016 \ 4; \ \alpha(L)=0.00242 \ 22; \ \alpha(M)=0.00051 \ 5; $
									α (N+)=0.000133 <i>12</i>
951.68	(13/2 ⁻)	220.89 10	10 <i>3</i>	730.83	(15/2 ⁻)	(M1)		0.1421	$\alpha(N)=0.000114 \ 10; \ \alpha(O)=1.80\times10^{-5} \ 20; \ \alpha(P)=1.2\times10^{-6} \ 3 \\ \alpha(K)=0.1213 \ 17; \ \alpha(L)=0.01647 \ 24; \ \alpha(M)=0.00347 \ 5; \\ \alpha(N+)=0.000910 \ 13 $
									$\alpha(N)=0.000776 \ 11; \ \alpha(O)=0.0001250 \ 18; \ \alpha(P)=9.26\times10^{-6} \ 13$
		593.9 2	100 13	358.06	(11/2 ⁻)	M1+E2	-1.5 10	0.0083 19	$\alpha(K)=0.0071$ 17; $\alpha(L)=0.00101$ 17; $\alpha(M)=0.00021$ 4; $\alpha(N+)=5.6\times10^{-5}$ 9
									α (N)=4.8×10 ⁻⁵ 8; α (O)=7.6×10 ⁻⁶ 14; α (P)=5.1×10 ⁻⁷ 14
985.38	$(9/2^+)$	468.0 [‡] 2	7.5 18	517.41	$9/2^{(+)}$				
		739.9# 5	100 # 15	245.48	7/2 ⁽⁺⁾	M1+E2	-2.0 15	0.0046 14	α (K)=0.0039 <i>12</i> ; α (L)=0.00055 <i>13</i> ; α (M)=0.00012 <i>3</i> ; α (N+)=3.0×10 ⁻⁵ 7
		щ	.#						$\alpha(N)=2.6\times10^{-5} 6; \alpha(O)=4.1\times10^{-6} 11; \alpha(P)=2.8\times10^{-7} 10$
1016.96		779.2# 5	70 # 15	206.08	$7/2^{(+)}$				
1010.86		499.0 2 523.3 2	21 8 100 8	517.41 493.48	$\frac{9/2^{(+)}}{7/2^{(+)}}$				

S

 $^{135}_{59}\mathrm{Pr}_{76}$ -5

 $^{135}_{59}\mathrm{Pr}_{76}$ -5

L

$\gamma(^{135}\text{Pr})$ (continued)

E_i (level)	\mathbf{J}^{π}_{i}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	$\mathbf{E}_f = \mathbf{J}_f^{\pi}$	Mult.@	$\delta^{@}$	α &	Comments
1016.86		771.0 5	75 20	245.48 7/2(+)				
1089.91	$(5/2^+, 7/2, 9/2^+)$	572.3 2	26 5	517.41 9/2(+)				
		596.6 2	53 16	493.48 7/2 ⁽⁺⁾				
		1048.6 5	100 25	41.43 5/2 ⁽⁺⁾				
1104.90		587.6 2	58 17	517.41 9/2 ⁽⁺⁾				
		611.0 <i>3</i>	100 25	493.48 7/2 ⁽⁺⁾				
		899.3 5	83 <i>30</i>	206.08 7/2 ⁽⁺⁾				
1160.2	(9/2 ⁻)	617.0 <i>3</i>	100	543.17 7/2 ⁽⁻⁾	D+Q	-2.0 15		E_{γ} : from (p,n γ).
1181.49	$(7/2^+, 9/2)$	404.0 1	42 11	777.48 (11/2 ⁺)				
		664.4 <i>4</i>	53 20	517.41 9/2(+)				
		687.8 4	47 16	493.48 7/2 ⁽⁺⁾				
		975.3 5	100 20	206.08 7/2 ⁽⁺⁾				
1185.15	(9/2 ⁻ ,11/2 ⁻)	233.56 10	91 10	951.68 (13/2 ⁻)	M1,E2		0.118 5	$\alpha(K)=0.096\ 9;\ \alpha(L)=0.017\ 4;\ \alpha(M)=0.0037\ 8;$ $\alpha(N+)=0.00095\ 18$
								α (N)=0.00082 <i>16</i> ; α (O)=0.000126 <i>19</i> ; α (P)=6.7×10 ⁻⁶ <i>13</i>
		385.8 1	100 14	799.25 9/2 ⁽⁻⁾	(E2)		0.0235	α (K)=0.0192 3; α (L)=0.00339 5; α (M)=0.000729 11; α (N+)=0.000187 3
								α (N)=0.0001609 23; α (O)=2.46×10 ⁻⁵ 4; α (P)=1.298×10 ⁻⁶ 19
1214.24	(7/2 ⁻ ,9/2 ⁻ ,11/2 ⁻)	415.0 <i>I</i>	100 14	799.25 9/2 ⁽⁻⁾	M1,E2		0.023 4	$\alpha(K)=0.019$ 4; $\alpha(L)=0.00288$ 21; $\alpha(M)=0.00061$ 4; $\alpha(N+)=0.000159$ 12
								$\alpha(N)=0.000136 \ 10: \ \alpha(O)=2.14\times10^{-5} \ 20: \ \alpha(P)=1.4\times10^{-6} \ 4$
		670.6 7	46 18	543.17 7/2 ⁽⁻⁾				$E_{\alpha}I_{\alpha}$; from ¹³⁵ Nd ε decay. Other $I_{\alpha}=127$ 43 in (p.ny).
		1172.1 ^{<i>a</i>} 7	100 32	41.43 5/2 ⁽⁺⁾				From ¹³⁵ Nd ε decay only.
1221.5	$(11/2^+)$	704.1 5	77 25	517.41 9/2 ⁽⁺⁾	D+Q	+3.3 27		
		728.0 5	100 40	493.48 7/2 ⁽⁺⁾				
1232.2	$(13/2^+)$	455 1	31 15	777.48 (11/2 ⁺)				From $({}^{19}F,4n\gamma)$ only.
		714.8 4	100 31	517.41 9/2(+)	E2		0.00454	$\alpha(K)=0.00383\ 6;\ \alpha(L)=0.000555\ 8;\ \alpha(M)=0.0001175\ 17;$
								α (N+)=3.05×10 ⁻⁵ 5
								$\alpha(N)=2.61\times10^{-5} 4$; $\alpha(O)=4.13\times10^{-6} 6$; $\alpha(P)=2.73\times10^{-7} 4$
1289.60	(11/2 ⁻)	490.4 2	100 18	799.25 9/2 ⁽⁻⁾	M1+E2	-1.5 10	0.014 3	$\alpha(K)=0.011 \ 3; \ \alpha(L)=0.00172 \ 21; \ \alpha(M)=0.00036 \ 4; \ \alpha(N+)=9.5\times10^{-5} \ 12$
								$\alpha(N) = 8.1 \times 10^{-5} \ 10; \ \alpha(O) = 1.28 \times 10^{-5} \ 18; \ \alpha(P) = 8.3 \times 10^{-7} \ 23$
		746.1 5	88 30	543.17 7/2 ⁽⁻⁾				I_{γ} : from ¹³⁵ Nd ε decay. Other: 143 75 in (p.2n γ).
1303.1	$(11/2^{-})$	351.6 5	100 20	951.68 (13/2-)				
		572.0 5	55 20	730.83 (15/2 ⁻)				
1306.63	(_)	575.8 2	100	730.83 (15/2 ⁻)	(E2)		0.00776	$\alpha(K)=0.00650 \ 10; \ \alpha(L)=0.000995 \ 14; \ \alpha(M)=0.000212 \ 3; \ \alpha(N+)=5.48 \times 10^{-5} \ 8$
								$\alpha(N)=4.70\times10^{-5}$ 7; $\alpha(O)=7.35\times10^{-6}$ 11; $\alpha(P)=4.57\times10^{-7}$ 7

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$\gamma(^{135}\text{Pr})$ (continued)

E_i (level)	\mathbf{J}_i^π	E_{γ}^{\dagger}	I_{γ}^{\dagger}	\mathbf{E}_{f}	\mathbf{J}_{f}^{π}	Mult.@	$\delta^{@}$	α &	Comments
1325.3	$(11/2^+)$	637.4 <i>3</i>	32 7	688.10	$(9/2^+)$	D+Q	-73		
		807.4 5	100 20	517.41	$9/2^{(+)}$	D+Q			δ : +0.2 1 or >30.
		1079.6 8	39 10	245.48	$7/2^{(+)}$				
1351.8		1145.7 8	100	206.08	$7/2^{(+)}$				
1390.9	(19/2 ⁻)	660.1 <i>3</i>	100	730.83	$(15/2^{-})$	(E2)			B(E2)(W.u.)=46 12
1409.9		632.5 <i>3</i>	11 4	777.48	$(11/2^+)$				
1422.2	(17/0-)	721.6 5	100 20	688.10	$(9/2^+)$				
1433.3	(1/2)	481.6 3	100 19	951.68	(13/2)				L_{1} from (n m) Othern (4.18 in 120 C_{1} (19 E_{1} (19)
1460.8	$(11/2^{+})$	102.5 5	11 4	130.83	(15/2)				I_{γ} : from (p,n γ). Other: 64 18 in 120 Sn(17 F,4n γ).
1400.8	(11/2)	043.0.5	19.0	777.40	(11/2) $0/2^{(+)}$	$D \downarrow O$	15111		
1478.2	$(17/2^{-})$	527 1	63	051.68	$(13/2^{-})$	D∓Q	⊤J.1 77		From $(^{19}\text{E}/\text{ne})$ only
1470.2	(17/2)	747 1 5	100.75	730.83	$(15/2^{-})$	D			
1506.0	$(15/2^+)$	274 1	93	1232.2	$(13/2^+)$	D			From $({}^{19}\mathrm{F}4\mathrm{n}\gamma)$ only
1200.0	(13/2)	728.5 5	100 15	777.48	$(13/2^+)$ $(11/2^+)$	(0)			
1507.8	$(11/2^+)$	708.4 5	12 4	799.25	9/2(-)				
		990.1 5	100 19	517.41	$9/2^{(+)}$	D+Q	+6 4		
		1014.6 5	84	493.48	$7/2^{(+)}$				
		1302.0 8	42 12	206.08	$7/2^{(+)}$				
1531.9		843.7 5	100 30	688.10	$(9/2^+)$				
		1038.6 5	100 30	493.48	$7/2^{(+)}$				
1571.1		1077.6 8	91 <i>30</i>	493.48	$7/2^{(+)}$				
		1325.6 8	100 30	245.48	$7/2^{(+)}$				
1636.4	$(13/2^+)$	651.0 <i>3</i>	100 19	985.38	$(9/2^+)$	(Q)			
1742.0		858.8 5	19 7	777.48	$(11/2^{+})$				
1742.2		1224.8 8	100	517.41	$9/2^{(+)}$				
1766.0	$(1/2^{-}, 9/2^{-}, 11/2^{-})$	966.7 5	100	799.25	$9/2^{(-)}$	D+Q			
1/94.2	(-)	1063.4 5	100	/30.83	(15/2) $(10/2^{-})$	M1 E2		0 022 4	$\alpha(K) = 0.018 4; \alpha(L) = 0.00268 22; \alpha(M) = 0.00057 4;$
1810.0	()	423.1 1	100	1390.9	(19/2)	1011,122		0.022 4	$\alpha(N) = 0.00184, \alpha(L) = 0.0020822, \alpha(M) = 0.000574, \alpha(N+) = 0.00014812$
									$\alpha(N)=0.000127 \ 10: \alpha(O)=2.00\times10^{-5} \ 20: \alpha(P)=1.3\times10^{-6} \ 4$
1904.9		1127.4 8	100	777.48	$(11/2^+)$				
1928.6	$(19/2^{-})$	450 1	87 26	1478.2	$(17/2^{-})$	D			
		495 1	22 7	1433.3	$(17/2^{-})$				
		1198 <i>1</i>	100 30	730.83	$(15/2^{-})$	(Q)			
1959.2		568.3 2	100	1390.9	$(19/2^{-})$				
1998.0	$(1/2, 9/2, 11/2^+)$	1480.7 7	58 18	517.41	$9/2^{(+)}$				
2002.8		1752.0 15	100 50	245.48	$1/2^{(+)}$				
2002.8		12/2.0 ð 1283 2 8	100	/30.83	(15/2)				
2014.0		1203.2 0	100	/30.83	(13/2)				

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 $^{135}_{59}\mathrm{Pr}_{76}$ -7

$\gamma(^{135}\text{Pr})$ (continued)

E _i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	\mathbf{E}_{f}	${ m J}_f^\pi$	Mult.@	Comments
2104.4		1373 6 8	100	730.83	$(15/2^{-})$		
2116.5	$(17/2^+)$	884.3.5	100	1232.2	$(13/2^+)$		
2129.22	$(7/2 9/2 11/2^{-})$	1586.0.7	100	543 17	(10/2)		
2125.2.	(7/2,7/2,11/2)	722.6.5	100	1433 3	$(17/2^{-})$		
2158.5	$(21/2^{-})$	725 1	32.9	1433.3	$(17/2^{-})$		
2100.0	(21/2)	768 1	100 29	1390.9	$(19/2^{-})$		
2204.7	$(21/2^{-})$	726 1	72.22	1478.2	$(17/2^{-})$		
	(814 <i>I</i>	100 31	1390.9	$(19/2^{-})$	D	
2244.9	$(23/2^{-})$	854 1	100	1390.9	$(19/2^{-})$	(E2)	B(E2)(W.u.)=33 2
2346.9	$(23/2^{-})$	956 1	100	1390.9	$(19/2^{-})$	Ò	
2355.9		965 1	100	1390.9	$(19/2^{-})$		
2373.0	$(19/2^+)$	867 1	100	1506.0	$(15/2^+)$	(Q)	
2395.9	$(19/2^+)$	890 <i>1</i>	100	1506.0	$(15/2^+)$	(Q)	
2589.9	$(21/2^+)$	194 <i>1</i>	100 20	2395.9	$(19/2^+)$	D	
		217 <i>I</i>	33 10	2373.0	$(19/2^+)$	D	
		1199 <i>1</i>	76 15	1390.9	$(19/2^{-})$	D	
2617.8	$(21/2^+)$	689 <i>1</i>	100 20	1928.6	$(19/2^{-})$		
		1227 <i>I</i>	39 12	1390.9	$(19/2^{-})$		
2754.7		596 <i>1</i>	63 19	2158.5	$(21/2^{-})$		
		826 1	42 12	1928.6	$(19/2^{-})$		
		1364 <i>I</i>	100 19	1390.9	$(19/2^{-})$		
2846.9	$(23/2^+)$	257 1	100 15	2589.9	$(21/2^+)$	D	
		451 <i>I</i>	3.5 18	2395.9	$(19/2^+)$		
2900.9	$(23/2^+)$	554 1	61 18	2346.9	$(23/2^{-})$	(D)	
2001.0	(25/2-)	656 1	100 20	2244.9	$(23/2^{-})$	(D)	
3001.0	$(25/2^{-})$	756 1	42 13	2244.9	$(23/2^{-})$	D	
		796 1	100 20	2204.7	(21/2)	(Q)	
2122.0	(25/0+)	843 1	18.5	2158.5	(21/2)	D	
3123.9	$(23/2^{+})$	2// 1	100 21	2840.9	$(23/2^{+})$	D (D)	
		200 I 870 I	42 15	2017.8	$(21/2^{+})$ $(22/2^{-})$	(Q) D	
3204.0	(25/2)	0191	99 19 100	2244.9 2846.0	(23/2)	D	
3204.9	(23/2) $(27/2^{-})$	1000 1	100	2040.9 2244 0	(23/2)	0	
3421.0	$(27/2^+)$	521 1	100 20	2000.0	$(23/2^{+})$	Q	
5721.7	(21/2)	575 1	52 16	2900.9	$(23/2^+)$	ζ ())	
3488 8		871 1	100	2617.8	$(23/2^{+})$ $(21/2^{+})$		
3517.7		763 1	100	2754 7	(21/2)		
3530.8		776 1	100 37	2754.7			
2220.0		1286 /	89 28	2244.9	$(23/2^{-})$		
3642.9	(27/2)	438 /	100	3204.9	(25/2)	D	
3658.9	$(29/2^+)$	535 1	100	3123.9	$(25/2^+)$	(0)	
3862.8	· / /	332 1	69 20	3530.8	/		

 $^{135}_{59}\mathrm{Pr}_{76}$ -8

From ENSDF

γ ⁽¹³⁵Pr) (continued)

E_i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	$\mathbf{E}_f \qquad \mathbf{J}_f^{\pi}$	Mult. [@]	E _i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	\mathbf{E}_{f}	\mathbf{J}_f^{π}	Mult. [@]
3862.8		345 1	28 9	3517.7		5336.8		1044 <i>1</i>	100	4292.8		
		374 <i>1</i>	100 20	3488.8		5420.9	$(37/2^+)$	956 <i>1</i>	100	4464.9	$(33/2^+)$	(Q)
3957.0	$(29/2^{-})$	956 <i>1</i>	100	3001.0 (25/2 ⁻)		5454.8		424 1	100	5030.8		
4107.9	$(31/2^+)$	686 <i>1</i>	100	3421.9 (27/2+)	(Q)	5953.8		499 <i>1</i>	100	5454.8		
4219.9	(31/2)	263 1	14 4	3957.0 (29/2 ⁻)		5973.9	$(39/2^+)$	1009 <i>1</i>	100	4964.9	$(35/2^+)$	(Q)
		561 <i>I</i>	100 20	3658.9 (29/2 ⁺)	D	5997.8	$(39/2^{-})$	834 <i>1</i>	100	5163.8	$(35/2^{-})$	(Q)
4292.8		430 <i>1</i>	100 20	3862.8		6500.9	$(41/2^+)$	1080 <i>1</i>	100	5420.9	$(37/2^+)$	(Q)
		1048 <i>1</i>	46 14	3244.8 (27/2 ⁻)		6510.8		557 <i>1</i>	100	5953.8		
4319.8	$(31/2^{-})$	1075 <i>1</i>	100	3244.8 (27/2 ⁻)	(Q)	6879.8	$(43/2^{-})$	882 <i>1</i>	100	5997.8	$(39/2^{-})$	(Q)
4393.8		1149 <i>1</i>	100	3244.8 (27/2 ⁻)		6978.9	$(43/2^+)$	1005 <i>1</i>	100	5973.9	$(39/2^+)$	(Q)
4464.9	$(33/2^+)$	806 1	100	3658.9 (29/2 ⁺)	(Q)	7515?	$(45/2^+)$	1014 ^a 1	100	6500.9	$(41/2^+)$	
4704.8		385 1	32 10	4319.8 (31/2 ⁻)		7802.8	$(47/2^{-})$	923 1	100	6879.8	$(43/2^{-})$	
		412 <i>1</i>	100 20	4292.8		7899?	$(47/2^+)$	920 ^a 1	100	6978.9	$(43/2^+)$	
4964.9	$(35/2^+)$	857 <i>1</i>	100	4107.9 (31/2 ⁺)	(Q)	8716?	$(51/2^{-})$	913 ^a 1	100	7802.8	$(47/2^{-})$	
5030.8		326 <i>1</i>	100	4704.8		9004?	$(51/2^+)$	1105 ^a 1	100	7899?	$(47/2^+)$	(Q)
5069.0	$(33/2^{-})$	1112 <i>I</i>	100	3957.0 (29/2-)	(Q)	9678?	$(55/2^{-})$	962 ^a 1	100	8716?	$(51/2^{-})$	(Q)
5163.8	$(35/2^{-})$	844 <i>1</i>	100 20	4319.8 (31/2 ⁻)	(Q)	10745?	$(59/2^{-})$	1067 ^a 1	100	9678?	$(55/2^{-})$	(Q)
		871 <i>1</i>	14 5	4292.8								

[†] For levels populated in more than one dataset, values represent weighted averages of available data, unless otherwise stated.

[‡] From $(p,n\gamma)$ only.

[#] From (p,n γ). The γ ray is poorly defined in ¹³⁵Nd ε decay.

^(a) For γ rays from low-spin (J \leq 9/2), the assignments are generally from ce data in ¹³⁵Nd ε decay. For high-spin states the assignments are from $\gamma(\theta)$ and ce data in ¹³⁶Ce(p,2n γ) and from $\gamma\gamma(\theta)$ (DCO) data in ¹²⁰Sn(¹⁹F,4n γ) reaction. The mult=Q most likely corresponds to E2 transition.

[&] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

^{*a*} Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas Legend Level Scheme Intensities: Relative photon branching from each level γ Decay (Uncertain) ----+ 1067 (59/2-) ____10745 _____ - 362 (D 100 (55/2-) 9678 1 1,05 (D,100 $(51/2^+)$ _ __9004 -8 6/6 (51/2-) _ __8716 4 20 100 1 23 100 $(47/2^+)$ <u>_7899</u> 7802.8 S *101 (45/2+) 1 1005 (D 100) _ <u>75</u>15 -** ** 0.0 $(43/2^+)$ 6978.9 1080 (0 100 (43/2-) 6879.8 -6 53 + 834 (0 |0| 6510.8 100 1010 $(41/2^+)$ 6500.9 *_*8 (39/2-) 5997.8 (39/2+) S. 5973.9 1 / 36 (0 / 00 | 5953.8 + 224 100 -*6* Ş g 5454.8 5420.9 $(37/2^+)$ 0 .6 ð 5336.8 0 (35/2⁻) (33/2⁻) 5163.8 ŝ 5069.0 -\$--? 5030.8 4964.9 (35/2+) 27 385 4704.8 $\frac{(33/2^+)}{(31/2^-)}$ 4464.9 4319.8 ¥ 4292.8 $(31/2^+)$ 4107.9 (29/2-) 3957.0 3/2(+) 0.0 24 min 1

¹³⁵₅₉Pr₇₆

Level Scheme (continued)

Intensities: Relative photon branching from each level





Level Scheme (continued)

Intensities: Relative photon branching from each level



Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

 $--- \rightarrow \gamma$ Decay (Uncertain)







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Adopted Levels, Gammas

 $^{135}_{59} \mathrm{Pr}_{76}$ -14

From ENSDF



¹³⁵₅₉Pr₇₆