(HI,xnγ) 1996Pe01,2003Ro09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	A. A. Sonzogni	NDS 103, 1 (2004)	31-Jul-2004

1996Pe01: ^{119}Sn(^{19}F,4nγ), E=87 MeV, ^{110}Pd(^{28}Si,3npγ), E=130 MeV; measured Eγ, Iγ, $\gamma\gamma$-coin using GASP array of 31 Ge detectors and 80 BGO inner-ball detectors.

2003Ro09: ^{119}Sn(^{19}F,4nγ), E=76 MeV; measured Eγ, $\gamma\gamma$-coin using 5 Compton-suppressed Ge and one LEP detectors coupled to a 14-element BGO array.

1998Ra21: ^{110}Pd(^{28}Si,3npγ), E=130 MeV; measured Eγ, $T_{1/2}$ using Doppler shift method. GASP array.

1994Ha28: ^{100}Mo(^{37}Cl,3nγ), E=155 MeV; measured Eγ, Iγ, $\gamma\gamma$-coin using Eurogam array of 41 Compton-suppressed Ge detectors.

The level scheme is based on the recent study by 2003Ro09 on the lowest energy states; the use of LEPs allowed to identify a 39 keV transition that had been missed in earlier works. This work assigned a J$^\pi$ value of (7$^+$) to the lowest level of the $\pi h_{11/2}\nu h_{11/2}$ band, which was given a (6$^+$) value in earlier works. The (7$^+$) value is adopted here, while the J values for the remaining were increased by one unit.

^{134}Pr Levels

E(level)[†]	J$^\pi$	$T_{1/2}$	Comments
0.0+y	(6$^-$)	≈11 min	Additional information 1. $T_{1/2}$: from Adopted Levels.
306.50+y[&] *10*	(7$^+$)	3.18 ns *7*	$T_{1/2}$: from 2003Ro09.
345.8+y[&] *10*	(8$^+$)		
440.1+y[&] *15*	(9$^+$)		
611.0+y[&] *16*	(10$^+$)	3.4 ps *8*	$T_{1/2}$: from 1999Kl11.
898.1+y[&] *16*	(11$^+$)		
1204.3+y[&] *17*	(11$^+$)		
1235.3+y[a] *17*	(11$^+$)		
1236.7+y *17*	(11)		
1447.4+y *17*	(12$^+$)		
1482.0+y *17*	(12$^+$)		
1518.3+y[a] *17*	(12$^+$)		
1620.7+y[&] *17*	(13$^+$)		
1841.8+y[a] *17*	(13$^+$)		
2016.1+y[&] *17*	(13$^+$)		
2032.8+y[@] *21*	(11$^-$)		
2092.5+y[#] *18*	(14$^+$)		
2178.8+y[a] *17*	(14$^+$)		
2248.8+y[@] *18*	(12$^-$)		
2479.0+y[@] *18*	(13$^-$)		
2511.1+y[&] *18*	(14$^+$)		
2547.6+y[a] *17*	(15$^+$)		
2679.5+y[@] *18*	(14$^-$)		
2859.9+y[#] *21*	(16$^+$)		
2884.2+y[@] *18*	(15$^-$)		
2947.1+y[a] *18*	(16$^+$)		
2991.7+y[&] *18*	(15$^+$)		
3123.7+y[@] *19*	(16$^-$)		
3413.6+y[@] *19*	(17$^-$)		
3419.1+y[a] *19*	(17$^+$)		

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(HI,xnγ) 1996Pe01,2003Ro09 (continued)

^{134}Pr Levels (continued)

E(level)[†]	Jπ	T1/2	Comments
3537.9+y[&] 19	(16+)		
3709.1+y[#] 23	(18+)		
3756.6+y[@] 20	(18−)		
3885.1+y[a] 19	(18+)		
4058.7+y[&] 20	(17+)		
4142.1+y[@] 20	(19−)		
4553.4+y[#] 25	(20+)		
4580.1+y[@] 21	(20−)		
4597.8+y[&] 20	(18+)		
4969.9+y[a]	(20+)		
5056.1+y[@] 21	(21−)		
5097.0+y[&] 21	(19+)		
5376+y[#] 3	(22+)	296[‡] fs 16	
5537.3+y[&] 21	(20+)		
5573.2+y[@] 22	(22−)		
6010.6+y[&] 23	(21+)		
6123.2+y[@] 22	(23−)		
6258+y[#] 3	(24+)	205[‡] fs 11	
6485.3+y[&] 24	(22+)		
6715.2+y[@] 23	(24−)		
7015.0+y[&]	(23+)		
7236+y[#] 3	(26+)	87[‡] fs 10	
7327.2+y[@] 23	(25−)		
7973.2+y[@] 24	(26−)		
8311+y[#] 4	(28+)	71[‡] fs 8	
8649.7+y[@]	(27−)		
9478+y[#] 4	(30+)	53[‡] fs 6	
10730+y[#] 4	(32+)	40[‡] fs 6	
12056+y[#] 4	(34+)		
0.0+z[b]			Additional information 2. E(level),Jπ: linking transitions were not clearly obtained, the Y and 871.5+z seem to feed the 2249+Y (12−), 2479+Y (13−), 2680+Y (14−) and 2884+Y (15−) levels (1994Ha28). Parity of the band expected to be negative.
871.51+z[b] 20			
1819.7+z[b] 3		166[‡] fs 21	
2829.2+z[b] 4		116[‡] fs 15	
3893.5+z[b] 4		85[‡] fs 11	
5020.0+z[b] 5		60[‡] fs 8	
6220.8+z[b] 5		44[‡] fs 6	
7508.5+z[b] 6		33[‡] fs 4	
8894.3+z[b] 6		24[‡] fs 3	
10376.3+z[b] 6		16.6[‡] fs 21	
11964.3+z[b] 7			
13656.3+z[b] 12			

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(HI,xnγ) 1996Pe01,2003Ro09 (continued)

^{134}Pr Levels (continued)

† From least-squares to Eγ assuming an uncertainty of 1 keV when unknown.
‡ From 1998Ra21.
# Band(A): $\pi h^3_{11/2}\nu 1/2[530]$, average transition quadrupole moment= 3.9 eb *3* (1998Ra21).
@ Band(B): $\pi 5/2[413]\nu 9/2[514]$.
& Band(C): $\pi h_{11/2}\nu h_{11/2}$.
a Band(D): $\pi 3/2[541]\nu h_{11/2}$.
b Band(E): Band based on z level, possibly of negative parity, transition quadrupole moment= 6.3 eb *4*.

γ(^{134}Pr)

R(DCO) values are from 1996PE01, they are stretched dipole gated, unless otherwise stated.

E_γ[‡]	I(γ+ce)[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	Comments
39.3[#]		345.8+y	(8$^+$)	306.50+y	(7$^+$)	M1	Mult.: from α(exp)=3.6 *4* (2003Ro09).
94.3	183.7	440.1+y	(9$^+$)	345.8+y	(8$^+$)	M1	Mult.: from α(exp)=1.4 *3* (2003Ro09).
171.0	155.0	611.0+y	(10$^+$)	440.1+y	(9$^+$)		R(DCO)= 0.97 *3*.
200.4	9.4	2679.5+y	(14$^-$)	2479.0+y	(13$^-$)		R(DCO)= 0.99 *3*.
204.4	25.8 *5*	2884.2+y	(15$^-$)	2679.5+y	(14$^-$)		R(DCO)= 1.00 *4*.
210.3	3.0 *1*	1447.4+y	(12$^+$)	1236.7+y	(11)		
216.0	2.5	2248.8+y	(12$^-$)	2032.8+y	(11$^-$)		
230.2	2.0	2479.0+y	(13$^-$)	2248.8+y	(12$^-$)		
239.8	23.5	3123.7+y	(16$^-$)	2884.2+y	(15$^-$)		R(DCO)= 0.94 *3*.
244	0.5 *3*	1447.4+y	(12$^+$)	1204.3+y	(11$^+$)		
245.0	4.0	1482.0+y	(12$^+$)	1236.7+y	(11)		
278	1.5	1482.0+y	(12$^+$)	1204.3+y	(11$^+$)		
282.9	12.1	1518.3+y	(12$^+$)	1236.7+y	(11)		R(DCO)= 1.02 *4*.
287.4	100.0	898.1+y	(11$^+$)	611.0+y	(10$^+$)		R(DCO)= 0.53 *3* (stretched quadrupole gated).
289.7	24.6	3413.6+y	(17$^-$)	3123.7+y	(16$^-$)		R(DCO)= 1.02 *2*.
306.3 *1*	58.0	1204.3+y	(11$^+$)	898.1+y	(11$^+$)		E_γ: from 2003Ro09.
306.5[#] *1*		306.50+y	(7$^+$)	0.0+y	(6$^-$)	(E1)	Mult.: Proposed by 2003Ro09; the transition is dipole based on γ(θ), while the level $T_{1/2}$ value points at change of parity between the connecting levels.
323.6	24.0	1841.8+y	(13$^+$)	1518.3+y	(12$^+$)		R(DCO)= 0.98 *4*.
337.0	9.0	2178.8+y	(14$^+$)	1841.8+y	(13$^+$)		R(DCO)= 1.00 *4*.
339.0	6.0	1236.7+y	(11)	898.1+y	(11$^+$)		R(DCO)= 0.80 *2*.
342.8	17.0	3756.6+y	(18$^-$)	3413.6+y	(17$^-$)		R(DCO)= 0.97 *3*.
368.8	4.5	2547.6+y	(15$^+$)	2178.8+y	(14$^+$)		R(DCO)= 1.02 *6*.
385.6	11.9	4142.1+y	(19$^-$)	3756.6+y	(18$^-$)		
395.3	25.5	2016.1+y	(13$^+$)	1620.7+y	(13$^+$)		R(DCO)= 1.00 *5*.
399.6	2.2	2947.1+y	(16$^+$)	2547.6+y	(15$^+$)		R(DCO)= 0.96 *6*.
404.5[a]	<0.5	2884.2+y	(15$^-$)	2479.0+y	(13$^-$)		
416.2	43.0	1620.7+y	(13$^+$)	1204.3+y	(11$^+$)		R(DCO)= 0.50 *4* (stretched quadrupole gated).
428[a]	<0.5	3419.1+y	(17$^+$)	2991.7+y	(15$^+$)		
436.2	2.2 *1*	2947.1+y	(16$^+$)	2511.1+y	(14$^+$)		
437.9	9.1	4580.1+y	(20$^-$)	4142.1+y	(19$^-$)		R(DCO)= 1.17 *9*.
440.4	1.6	5537.3+y	(20$^+$)	5097.0+y	(19$^+$)		
444.0	9.0	3123.7+y	(16$^-$)	2679.5+y	(14$^-$)		R(DCO)= 2.80 *6*.
446.0[a]	<0.5	2479.0+y	(13$^-$)	2032.8+y	(11$^-$)		
458.1	9.0	898.1+y	(11$^+$)	440.1+y	(9$^+$)		
466.0	1.0 *5*	3885.1+y	(18$^+$)	3419.1+y	(17$^+$)		
472	1.3	3419.1+y	(17$^+$)	2947.1+y	(16$^+$)		
473[a]	<1.0	6010.6+y	(21$^+$)	5537.3+y	(20$^+$)		

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(HI,xnγ) 1996Pe01,2003Ro09 (continued)

γ(^{134}Pr) (continued)

E_γ[‡]	I(γ+ce)[†]	E_i(level)	J^π_i	E_f	J^π_f	Comments
475[a]	<0.5	6485.3+y	(22$^+$)	6010.6+y	(21$^+$)	
476.0	6.3	5056.1+y	(21$^-$)	4580.1+y	(20$^-$)	R(DCO)= 0.99 *4*.
480.6	7.4	2991.7+y	(15$^+$)	2511.1+y	(14$^+$)	R(DCO)= 0.91 *7*.
495.3	13.0	2511.1+y	(14$^+$)	2016.1+y	(13$^+$)	R(DCO)= 1.15 *11*.
499.3	2.9	5097.0+y	(19$^+$)	4597.8+y	(18$^+$)	
517.3	4.1	5573.2+y	(22$^-$)	5056.1+y	(21$^-$)	
520.8	2.9	4058.7+y	(17$^+$)	3537.9+y	(16$^+$)	
529[a]	<0.5	7015.0+y	(23$^+$)	6485.3+y	(22$^+$)	
529.5	2.4 *1*	3413.6+y	(17$^-$)	2884.2+y	(15$^-$)	
531.3	1.6 *5*	2547.6+y	(15$^+$)	2016.1+y	(13$^+$)	
539	2.8	4597.8+y	(18$^+$)	4058.7+y	(17$^+$)	
546.1	4.7	3537.9+y	(16$^+$)	2991.7+y	(15$^+$)	
550	3.2	6123.2+y	(23$^-$)	5573.2+y	(22$^-$)	
558.1	2.4	2178.8+y	(14$^+$)	1620.7+y	(13$^+$)	
592	2.5	6715.2+y	(24$^-$)	6123.2+y	(23$^-$)	
593.6	21.0	1204.3+y	(11$^+$)	611.0+y	(10$^+$)	R(DCO)= 2.27 *15*.
610.5	5.0	2092.5+y	(14$^+$)	1482.0+y	(12$^+$)	R(DCO)= 1.17 *12* (stretched quadrupole gated).
612	1.4 *5*	7327.2+y	(25$^-$)	6715.2+y	(24$^-$)	
620.0	14.0	1518.3+y	(12$^+$)	898.1+y	(11$^+$)	R(DCO)= 0.84 *4*.
624.4	9.0	1235.3+y	(11$^+$)	611.0+y	(10$^+$)	R(DCO)= 0.76 *5*.
633.0	4.0	3756.6+y	(18$^-$)	3123.7+y	(16$^-$)	R(DCO)= 2.40 *3*.
637.5	6.4	1841.8+y	(13$^+$)	1204.3+y	(11$^+$)	R(DCO)= 0.59 *8*.
645.0	2.8	2092.5+y	(14$^+$)	1447.4+y	(12$^+$)	R(DCO)= 0.83 *11* (stretched quadrupole gated).
646	0.9 *5*	7973.2+y	(26$^-$)	7327.2+y	(25$^-$)	
661.0	1.0 *5*	2178.8+y	(14$^+$)	1518.3+y	(12$^+$)	
663	2.5	2679.5+y	(14$^-$)	2016.1+y	(13$^+$)	
676[a]	<0.5	8649.7+y	(27$^-$)	7973.2+y	(26$^-$)	
705.8	1.8 *1*	2547.6+y	(15$^+$)	1841.8+y	(13$^+$)	
706	1.9 *1*	2884.2+y	(15$^-$)	2178.8+y	(14$^+$)	
722.4	17.7	1620.7+y	(13$^+$)	898.1+y	(11$^+$)	R(DCO)= 1.78 *18*.
728.4	4.8	4142.1+y	(19$^-$)	3413.6+y	(17$^-$)	R(DCO)= 2.40 *2*.
767.5	9.5	2859.9+y	(16$^+$)	2092.5+y	(14$^+$)	
768.4	1.1 *5*	2947.1+y	(16$^+$)	2178.8+y	(14$^+$)	
795	<0.5	1235.3+y	(11$^+$)	440.1+y	(9$^+$)	
811.5	27.8	2016.1+y	(13$^+$)	1204.3+y	(11$^+$)	R(DCO)= 1.80 *15*.
822.5	9.5	5376+y	(22$^+$)	4553.4+y	(20$^+$)	
823.5	4.5	4580.1+y	(20$^-$)	3756.6+y	(18$^-$)	
836.0	1.0	1447.4+y	(12$^+$)	611.0+y	(10$^+$)	
837.5	2.2	2679.5+y	(14$^-$)	1841.8+y	(13$^+$)	
844.3	9.5	4553.4+y	(20$^+$)	3709.1+y	(18$^+$)	
849.1	10.0	3709.1+y	(18$^+$)	2859.9+y	(16$^+$)	
858.2	3.6	2479.0+y	(13$^-$)	1620.7+y	(13$^+$)	R(DCO)= 2.00 *2*.
871	1.0 *5*	1482.0+y	(12$^+$)	611.0+y	(10$^+$)	
871.5[@] *2*	0.87[&] *6*	871.51+z		0.0+z		
872[a]	<0.4	3419.1+y	(17$^+$)	2547.6+y	(15$^+$)	
882.5	5.0	6258+y	(24$^+$)	5376+y	(22$^+$)	
890.3	15.3	2511.1+y	(14$^+$)	1620.7+y	(13$^+$)	
907.0	2.7 *1*	1518.3+y	(12$^+$)	611.0+y	(10$^+$)	
907.8	2.0 *1*	3419.1+y	(17$^+$)	2511.1+y	(14$^+$)	
913.5	4.9	6010.6+y	(21$^+$)	5097.0+y	(19$^+$)	
914.2	2.7	5056.1+y	(21$^-$)	4142.1+y	(19$^-$)	R(DCO)= 3.20 *9*.
927	1.5	2547.6+y	(15$^+$)	1620.7+y	(13$^+$)	
931	1.0	2947.1+y	(16$^+$)	2016.1+y	(13$^+$)	
938	1.0	3885.1+y	(18$^+$)	2947.1+y	(16$^+$)	
939.4	2.2	5537.3+y	(20$^+$)	4597.8+y	(18$^+$)	

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(HI,xnγ) 1996Pe01,2003Ro09 (continued)

γ(^{134}Pr) (continued)

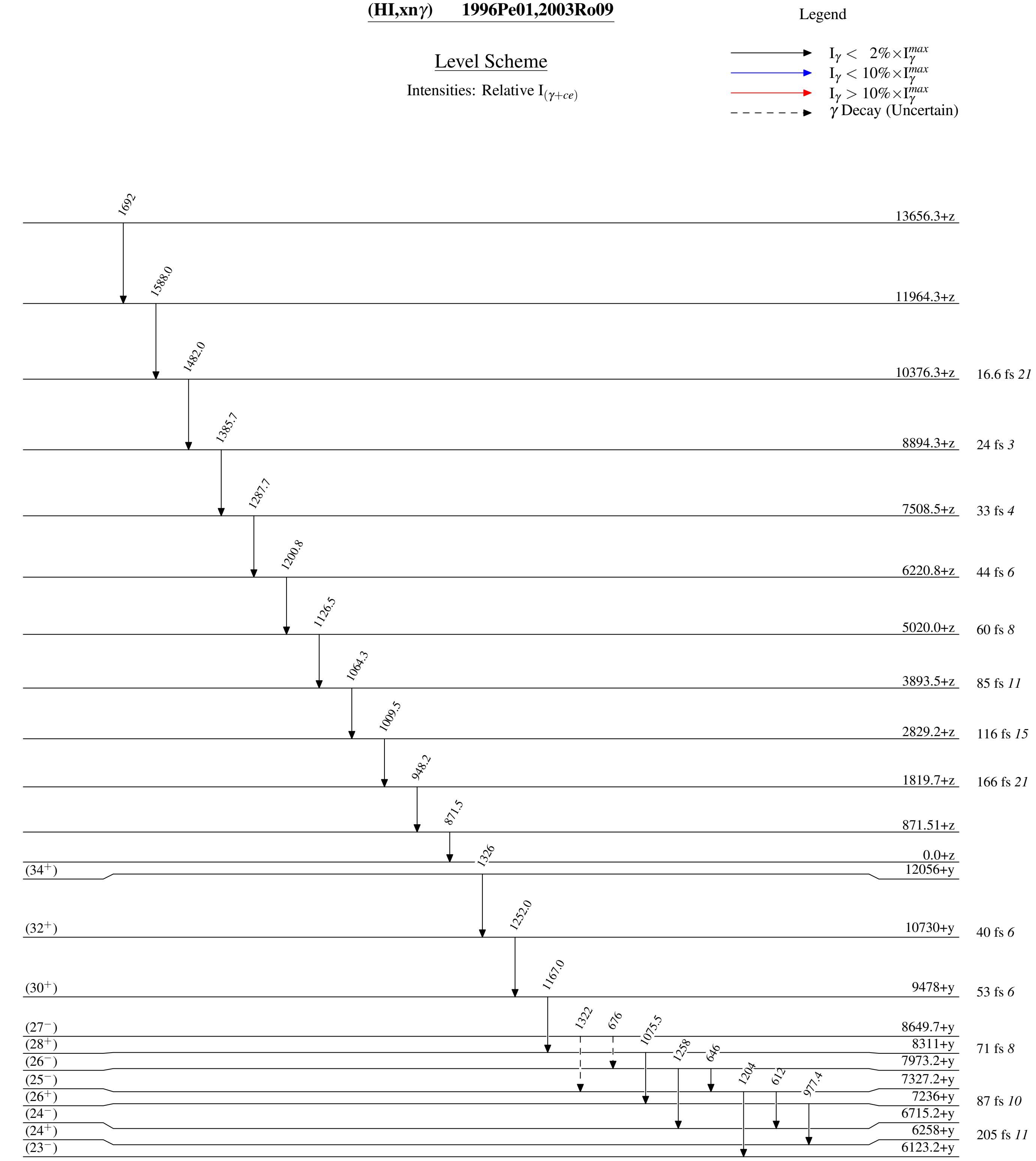
E_γ[‡]	I(γ+ce)[†]	E_i(level)	J_i^π	E_f	J_f^π	Comments
944[a]	<0.5	1841.8+y	(13+)	898.1+y	(11+)	
948	1.0	6485.3+y	(22+)	5537.3+y	(20+)	
948.2[@] 2	1.00[&] 7	1819.7+z		871.51+z		
975[a]	<0.5	2178.8+y	(14+)	1204.3+y	(11+)	
975.6	20.4	2991.7+y	(15+)	2016.1+y	(13+)	
977.4	4.5	7236+y	(26+)	6258+y	(24+)	
993	2.9	5573.2+y	(22−)	4580.1+y	(20−)	R(DCO)= 1.80 4.
1004[a]	<0.5	7015.0+y	(23+)	6010.6+y	(21+)	
1009.5[@] 2	0.87[&] 7	2829.2+z		1819.7+z		
1026.8	9.5	3537.9+y	(16+)	2511.1+y	(14+)	
1038.5	6.7	5097.0+y	(19+)	4058.7+y	(17+)	
1044.5	5.0	2248.8+y	(12−)	1204.3+y	(11+)	R(DCO)= 1.70 2.
1059.8	4.7	4597.8+y	(18+)	3537.9+y	(16+)	
1064.3[@] 2	0.77[&] 7	3893.5+z		2829.2+z		
1067.0	11.7	4058.7+y	(17+)	2991.7+y	(15+)	
1067	1.9 1	6123.2+y	(23−)	5056.1+y	(21−)	
1075.5	3.4	8311+y	(28+)	7236+y	(26+)	
1084[a]	<1.0	4969.9+y	(20+)	3885.1+y	(18+)	
1126.5[@] 2	0.61[&] 5	5020.0+z		3893.5+z		
1142	1.4	6715.2+y	(24−)	5573.2+y	(22−)	
1167.0	2.9	9478+y	(30+)	8311+y	(28+)	
1200.8[@] 2	0.43[&] 4	6220.8+z		5020.0+z		
1204	1.4	7327.2+y	(25−)	6123.2+y	(23−)	
1252.0	2.5	10730+y	(32+)	9478+y	(30+)	
1258	0.6 3	7973.2+y	(26−)	6715.2+y	(24−)	
1287.7[@] 2	0.38[&] 4	7508.5+z		6220.8+z		
1322[a]	<0.5	8649.7+y	(27−)	7327.2+y	(25−)	
1326	0.7 5	12056+y	(34+)	10730+y	(32+)	
1385.7[@] 2	0.34[&] 3	8894.3+z		7508.5+z		
1482.0[@] 2	0.17[&] 2	10376.3+z		8894.3+z		
1588.0[@] 2	0.09[&] 2	11964.3+z		10376.3+z		
1692[@] 1		13656.3+z		11964.3+z		

† From 1996Pe01, unless stated otherwise. Transition (total) intensities deduced from total projection and gated spectra. Uncertainties, when not given, are <10%.
‡ From 1996Pe01, unless stated otherwise.
# From 2003Ro09.
@ From 1994Ha28.
& From 1994Ha28, relative to 948.2 G.
a Placement of transition in the level scheme is uncertain.

(HI,xnγ) 1996Pe01,2003Ro09

Level Scheme

Intensities: Relative $I_{(\gamma+ce)}$



$^{134}_{59}Pr_{75}$

(HI,xnγ) 1996Pe01,2003Ro09

Level Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$

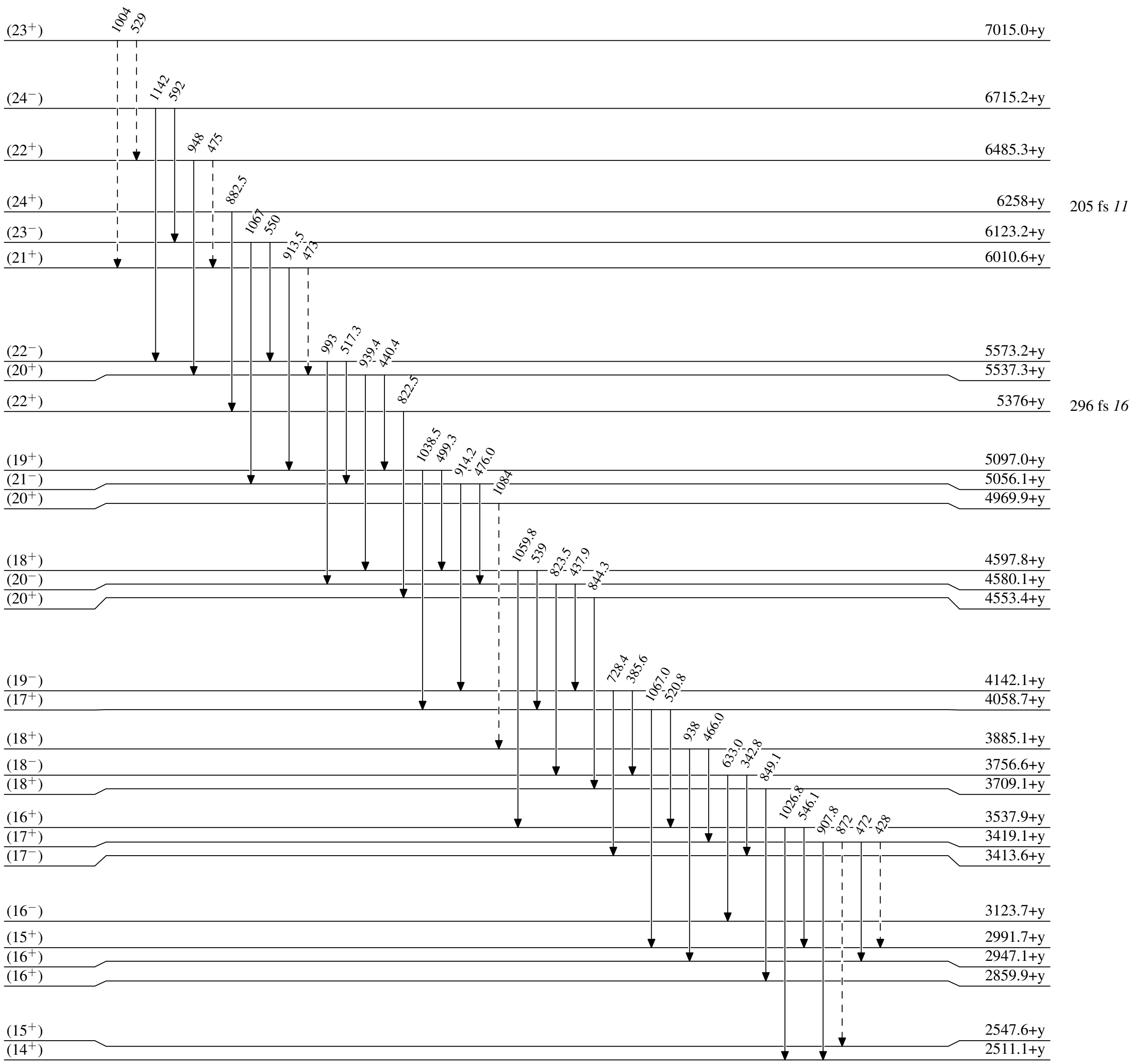
Legend

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

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

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

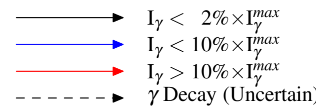
γ Decay (Uncertain)



$^{134}_{59}Pr_{75}$

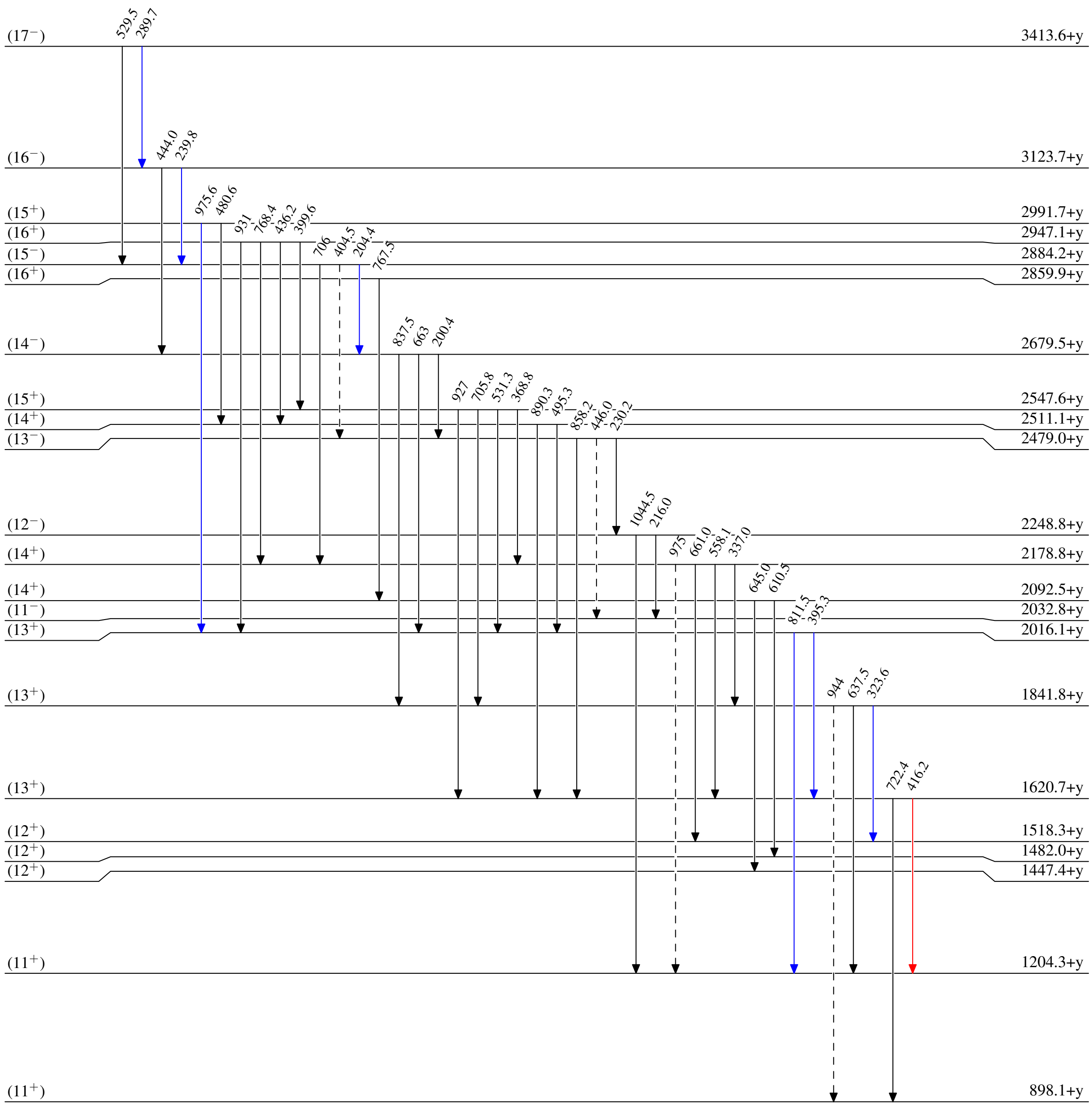
(HI,xnγ) 1996Pe01,2003Ro09

Legend



Level Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$

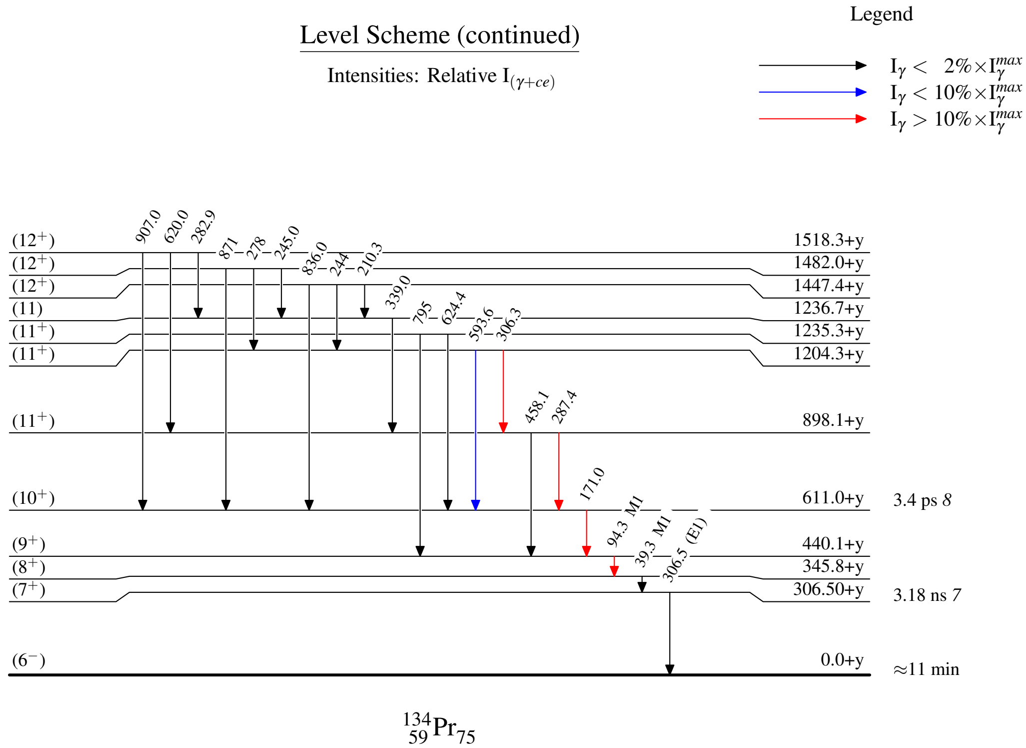


$^{134}_{59}Pr_{75}$

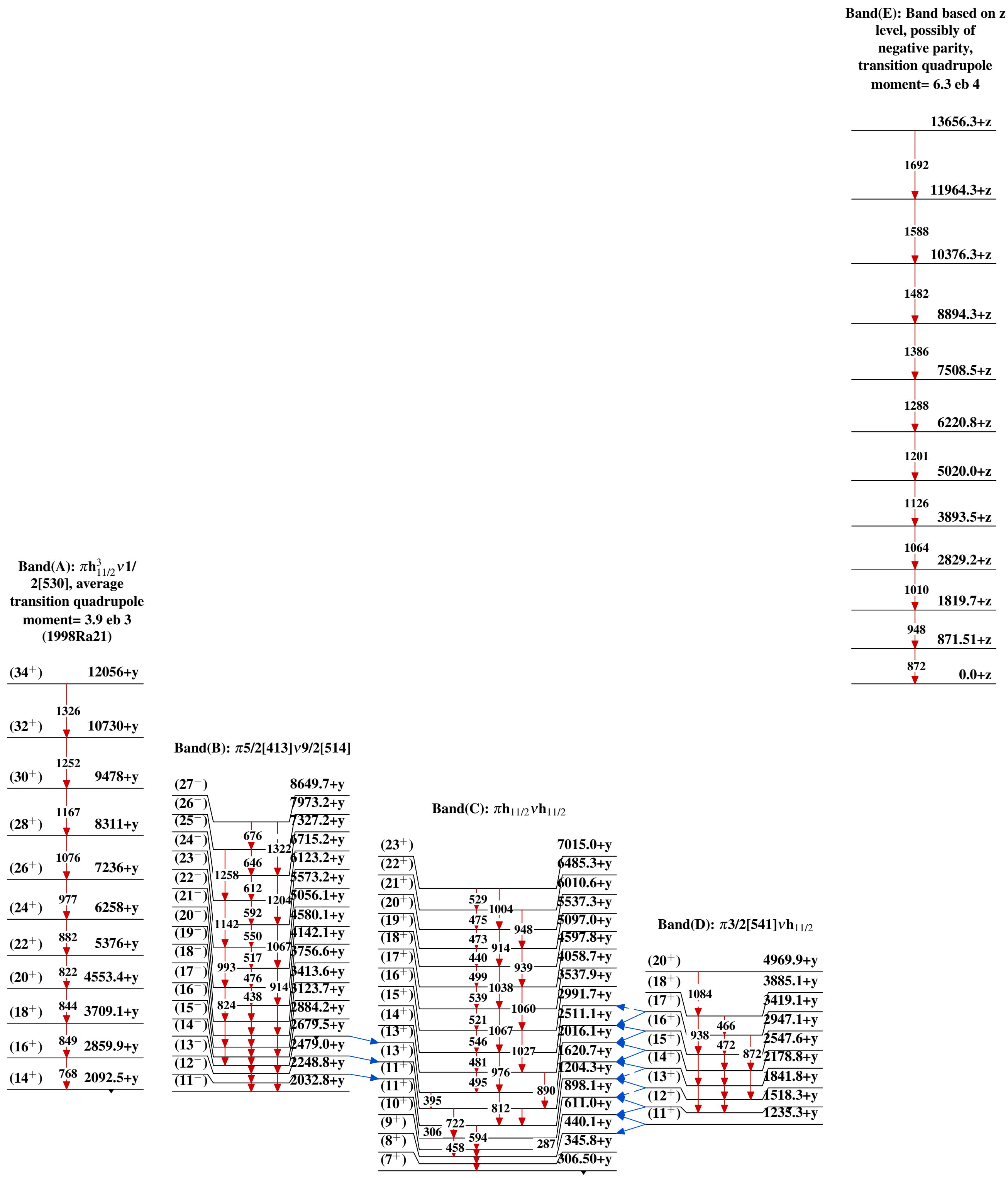
(HI,xnγ) 1996Pe01,2003Ro09

Level Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$



(HI,xnγ) 1996Pe01,2003Ro09



$^{134}_{59}Pr_{75}$