

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Zoltan Elekes and Janos Timar		NDS 129, 191 (2015)	28-Feb-2015

$Q(\beta^-) = -6020$ SY; $S(n) = 9860$ SY; $S(p) = 1640$ 40; $Q(\alpha) = 1500$ 60 [2012Wa38](#)
 $\Delta Q(\beta^-) = 200$, $\Delta S(n) = ^{200}$, $S(2n) = 22150$ syst, $S(2p) = 5940$ 100, $Q(\epsilon p) = 4.28 \times 10^3$ 4 ([2012Wa38](#)).
 Estimated uncertainty for $S(2n) = 200$ ([2012Wa38](#)).

 ^{128}Pr LevelsCross Reference (XREF) Flags

A ^{128}Nd ϵ decay
B (HL,xn γ)

E(level) [‡]	J π [†]	T _{1/2}	XREF	Comments
0.0	4,5,6	2.84 s 9	A	$\% \epsilon + \% \beta^+ = 100$ β -delayed proton activity was observed in coincidence with ce K x ray. $E(p) = 1.8$ - 5.0 MeV (1985Wi07). The activity assigned to ^{128}Nd by 1983Ni05 was revised to ^{128}Pr by 1985Wi07 . J^π : population of the 4^+ and 6^+ members of the g.s. band in ^{128}Ce suggests J lies in the range 4 to 6. $T_{1/2}$: from 2012Au07 . Additional information 1.
0+x [#]	(6 ⁺)		B	
59.0+x [@] 8	(7 ⁺)		B	
152.5+x [#] 8	(8 ⁺)		B	
196.6+x? 10			B	
286.6+x [@] 8	(9 ⁺)		B	
443.5+x [#] 8	(10 ⁺)		B	
529.7+x ^{&} 10	(7 ⁺)		B	
627.3+x ^b 8	(9 ⁺)		B	
654.6+x [@] 8	(11 ⁺)		B	
800.0+x ^{&} 8	(9 ⁺)		B	
838.3+x ^a 8	(10 ⁺)		B	
875.1+x [#] 8	(12 ⁺)		B	
1095.6+x ^b 8	(11 ⁺)		B	
1157.5+x [@] 8	(13 ⁺)		B	
1185.1+x ^{&} 8	(11 ⁺)		B	
1379.1+x ^a 9	(12 ⁺)		B	
1440.6+x [#] 8	(14 ⁺)		B	
1646.3+x 9			B	
1669.5+x ^{&} 8	(13 ⁺)		B	
1723.9+x ^b 11	(13 ⁺)		B	
1779.4+x [@] 8	(15 ⁺)		B	
1917.9+x ^d 9	(13 ⁺)		B	
2048.1+x ^a 14	(14 ⁺)		B	
2121.6+x [#] 8	(16 ⁺)		B	
2182.4+x ^c 8	(14 ⁺)		B	
2288.4+x ^{&} 9	(15 ⁺)		B	
2499.7+x [@] 8	(17 ⁺)		B	

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Adopted Levels, Gammas (continued) ^{128}Pr Levels (continued)

<u>E(level)[‡]</u>	<u>J^π</u>	<u>XREF</u>
2508.9+x ^d 9	(15 ⁺)	B
2833.3+x ^c 9	(16 ⁺)	B
2894.7+x [#] 8	(18 ⁺)	B
3001.6+x ^{&} 9	(17 ⁺)	B
3204.6+x ^d 9	(17 ⁺)	B
3297.3+x [@] 8	(19 ⁺)	B
3583.0+x ^c 9	(18 ⁺)	B
3742.0+x [#] 8	(20 ⁺)	B
3801.3+x ^{&} 9	(19 ⁺)	B
3991.8+x ^d 9	(19 ⁺)	B
4163.8+x [@] 8	(21 ⁺)	B
4412.7+x ^c 9	(20 ⁺)	B
4661.7+x [#] 8	(22 ⁺)	B
4680.2+x ^{&} 9	(21 ⁺)	B
4854.0+x ^d 9	(21 ⁺)	B
5105.7+x [@] 8	(23 ⁺)	B
5312.6+x ^c 9	(22 ⁺)	B
5639.4+x ^{&} 10	(23 ⁺)	B
5665.5+x [#] 8	(24 ⁺)	B
5789.9+x ^d 9	(23 ⁺)	B
6133.7+x [@] 9	(25 ⁺)	B
6290.9+x ^c 9	(24 ⁺)	B
6683.3+x ^{&} 11	(25 ⁺)	B
6766.4+x [#] 9	(26 ⁺)	B
6810.3+x ^d 10	(25 ⁺)	B
7252.8+x [@] 9	(27 ⁺)	B
7358.6+x ^c 10	(26 ⁺)	B
7807.2+x ^{&} 12	(27 ⁺)	B
7924.8+x ^d 11	(27 ⁺)	B
7971.4+x [#] 9	(28 ⁺)	B
8464.7+x [@] 9	(29 ⁺)	B
8523.9+x ^c 11	(28 ⁺)	B
8989.9+x ^{&} 13	(29 ⁺)	B
9137.4+x ^d 12	(29 ⁺)	B
9283.3+x [#] 10	(30 ⁺)	B
9767.6+x [@] 10	(31 ⁺)	B
9786.9+x ^c 15	(30 ⁺)	B
10221.9+x ^{&} 14	(31 ⁺)	B
10444.4+x ^d 16	(31 ⁺)	B
10700.9+x [#] 11	(32 ⁺)	B
11159.2+x [@] 12	(33 ⁺)	B
11516.4+x ^{&} 15	(33 ⁺)	B
12202.9+x ^{?#} 14	(34 ⁺)	B
12644.4+x [@] 13	(35 ⁺)	B
12884.6+x ^{&} 16	(35 ⁺)	B
14216.8+x [@] 14	(37 ⁺)	B

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Adopted Levels, Gammas (continued) ^{128}Pr Levels (continued)

E(level) [‡]	J ^π [†]	XREF	Comments
14332.3+x ^{&} 16	(37 ⁺)	B	
15849.3+x? ^{&} 18	(39 ⁺)	B	
0+y	(5 ⁻)	B	Additional information 2.
39.6+y? ^e 13	(4 ⁻)	B	
97.6+y ^f 10	(5 ⁻)	B	
116.3+y 8	(6 ⁻)	B	
151.6+y ^e 8	(6 ⁻)	B	
240.7+y ^f 8	(7 ⁻)	B	
262.3+y ^h 8	(7 ⁻)	B	
364.5+y ^g 8	(8 ⁻)	B	
387.7+y ^e 8	(8 ⁻)	B	
545.1+y ^f 8	(9 ⁻)	B	
561.5+y ^h 8	(9 ⁻)	B	
751.0+y ^g 8	(10 ⁻)	B	
788.2+y ^e 8	(10 ⁻)	B	
985.2+y ^f 8	(11 ⁻)	B	
1015.2+y ^h 8	(11 ⁻)	B	
1272.4+y ^g 8	(12 ⁻)	B	
1318.0+y ^e 8	(12 ⁻)	B	
1546.8+y ^f 8	(13 ⁻)	B	
1599.0+y ^h 8	(13 ⁻)	B	
1906.4+y ^g 8	(14 ⁻)	B	
1954.8+y ^e 8	(14 ⁻)	B	
2213.0+y ^f 8	(15 ⁻)	B	
2283.0+y ^h 8	(15 ⁻)	B	
2627.7+y ^g 8	(16 ⁻)	B	
2676.8+y ^e 8	(16 ⁻)	B	
2958.1+y ^f 8	(17 ⁻)	B	
3042.6+y ^h 8	(17 ⁻)	B	
3411.1+y ^g 8	(18 ⁻)	B	
3467.3+y ^e 8	(18 ⁻)	B	
3761.9+y ^f 9	(19 ⁻)	B	
3861.5+y ^h 8	(19 ⁻)	B	
4241.1+y ^g 8	(20 ⁻)	B	
4321.2+y ^e 8	(20 ⁻)	B	
4632.7+y ^f 9	(21 ⁻)	B	
4731.6+y ^h 8	(21 ⁻)	B	
4784.5+y 13	(21 ⁻)	B	
5153.9+y ^g 9	(22 ⁻)	B	
5243.4+y ^e 9	(22 ⁻)	B	
5597.3+y ^f 9	(23 ⁻)	B	
5696.4+y ^h 10	(23 ⁻)	B	
5736.5+y 17	(23 ⁻)	B	
6180.4+y ^g 10	(24 ⁻)	B	
6231.2+y ^e 10	(24 ⁻)	B	
6669.2+y ^f 9	(25 ⁻)	B	
6751.5+y 19	(25 ⁻)	B	
6778.3+y ^h 11	(25 ⁻)	B	

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Adopted Levels, Gammas (continued) ^{128}Pr Levels (continued)

E(level) [‡]	J ^π [†]	XREF	Comments
7278.6+y ^e 11	(26 ⁻)	B	
7316.7+y ^g 11	(26 ⁻)	B	
7821.2+y 14	(27 ⁻)	B	
7861.3+y ^f 11	(27 ⁻)	B	
7948.7+y ^h 12	(27 ⁻)	B	
8391.5+y ^e 12	(28 ⁻)	B	
8546.8+y ^g 12	(28 ⁻)	B	
8977.2+y 17	(29 ⁻)	B	
9123.0+y ^f 12	(29 ⁻)	B	
9577.7+y ^e 13	(30 ⁻)	B	
9815.6+y ^g 13	(30 ⁻)	B	
10208.2+y 20	(31 ⁻)	B	
10419.9+y ^f 13	(31 ⁻)	B	
10839.7+y ^e 14	(32 ⁻)	B	
11114.2+y ^g 18	(32 ⁻)	B	
11773.4+y ^f 18	(33 ⁻)	B	
12174.1+y ^e 15	(34 ⁻)	B	
13583.6+y ^e 20	(36 ⁻)	B	
0+z ⁱ	(8 ⁻)	B	Additional information 3. Possibly an isomer with T _{1/2} >80 ns.
242.47+z ^j 16	(9 ⁻)	B	
507.43+z ⁱ 16	(10 ⁻)	B	
792.37+z ^j 19	(11 ⁻)	B	
1095.69+z ⁱ 21	(12 ⁻)	B	
1416.51+z ^j 25	(13 ⁻)	B	
1754.2+z ⁱ 3	(14 ⁻)	B	
2109.1+z ^j 3	(15 ⁻)	B	
2480.7+z ⁱ 4	(16 ⁻)	B	
2868.8+z ^j 4	(17 ⁻)	B	
3275.4+z ⁱ 4	(18 ⁻)	B	
3694.9+z ^j 4	(19 ⁻)	B	
4133.4+z ⁱ 5	(20 ⁻)	B	
4587.6+z ^j 5	(21 ⁻)	B	
5061.9+z ⁱ 7	(22 ⁻)	B	
5552.8+z ^j 7	(23 ⁻)	B	
6065.4+z ⁱ 9	(24 ⁻)	B	
6596.3+z ^j 9	(25 ⁻)	B	
7150.1+z ⁱ 10	(26 ⁻)	B	
7720.4+z ^j 10	(27 ⁻)	B	
8316.0+z ⁱ 11	(28 ⁻)	B	
8924.0+z ^j 11	(29 ⁻)	B	
9558.3+z ⁱ 12	(30 ⁻)	B	
10205.7+z ^j 12	(31 ⁻)	B	
10876.6+z ⁱ 13	(32 ⁻)	B	
11560.1+z ^j 13	(33 ⁻)	B	
12263.3+z ⁱ 14	(34 ⁻)	B	
12977.1+z ^j 16	(35 ⁻)	B	
13722.3+z ⁱ 17	(36 ⁻)	B	

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Adopted Levels, Gammas (continued) ^{128}Pr Levels (continued)

[†] From band structure obtained in (HI,xny), unless otherwise noted. Bandhead spin and parity values are taken from systematics or determined from DCO ratios of linking transitions to band members with known spins.

[‡] From a least-squares fit to the adopted $E\gamma$'s by the evaluators. Uncertainty of 1 keV is assumed when no uncertainty is given.

Band(A): $\pi h_{11/2} \nu h_{11/2}$, $\alpha=0$ yrast. At high spins, alignment gain is attributed to second $h_{11/2}$ proton crossing.

@ Band(a): $\pi h_{11/2} \nu h_{11/2}$, $\alpha=1$ yrast. See comment for its signature partner.

& Band(B): $\pi h_{11/2} \nu (h_{9/2}/f_{7/2})$, $\alpha=1$. Decoupled-band with $K^\pi=(2^+, 1^+)$.

^a Band(C): $\pi h_{11/2} \nu h_{11/2}$, $\alpha=0$ side.

^b Band(c): $\pi h_{11/2} \nu h_{11/2}$, $\alpha=1$ side.

^c Band(D): band based on 14^+ , $\alpha=0$. Possible 4-quasiparticle structure involving $\nu h_{11/2}$.

^d Band(d): band based on 13^+ , $\alpha=1$. Possible 4-quasiparticle structure involving $\nu h_{11/2}$.

^e Band(E): $\pi h_{11/2} \nu (d_{3/2}/s_{1/2})$, $\alpha=0$. $K^\pi=(1^-, 2^-)$. $\pi(d_{5/2}/g_{7/2}) \otimes \nu h_{11/2}$ in 2002Pe05.

^f Band(e): $\pi h_{11/2} \nu (d_{3/2}/s_{1/2})$, $\alpha=1$. $K^\pi=(1^-, 2^-)$. $\pi(d_{5/2}/g_{7/2}) \otimes \nu h_{11/2}$ in 2002Pe05.

^g Band(F): $\pi h_{11/2} \nu d_{5/2}$ $K^\pi=(4^-)$, $\alpha=0$. $\pi(d_{5/2}/g_{7/2}) \otimes \nu h_{11/2}$ in 2002Pe05.

^h Band(f): $\pi h_{11/2} \nu d_{5/2}$ $K^\pi=(4^-)$, $\alpha=1$. $\pi(d_{5/2}/g_{7/2}) \otimes \nu h_{11/2}$ in 2002Pe05.

ⁱ Band(G): $\pi g_{9/2} \nu h_{11/2}$ $K^\pi=(8^-)$, $\alpha=0$.

^j Band(g): $\pi g_{9/2} \nu h_{11/2}$ $K^\pi=(8^-)$, $\alpha=1$.

$\gamma(^{128}\text{Pr})$							Comments
$E_i(\text{level})$	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult. [‡]	
59.0+x	(7 ⁺)	59	100	0+x	(6 ⁺)		
152.5+x	(8 ⁺)	93.5 2		59.0+x	(7 ⁺)	(M1+E2)	DCO=0.60 8.
		152.5		0+x	(6 ⁺)		
286.6+x	(9 ⁺)	134.1 2	100	152.5+x	(8 ⁺)	(M1+E2)	DCO=0.49 2.
		227.6 2	14.4 7	59.0+x	(7 ⁺)	(E2)	
443.5+x	(10 ⁺)	156.8 2	100 4	286.6+x	(9 ⁺)	(M1+E2)	DCO=0.47 2.
		291.0 2	26.8 10	152.5+x	(8 ⁺)	(E2)	DCO=1.03 6.
529.7+x	(7 ⁺)	333.1 2	100	196.6+x?			
627.3+x	(9 ⁺)	183.5 5	100	443.5+x	(10 ⁺)	(M1+E2)	
654.6+x	(11 ⁺)	211.1 2	100 5	443.5+x	(10 ⁺)	(M1+E2)	DCO=0.47 2.
		368.1 2	38.6 24	286.6+x	(9 ⁺)	(E2)	DCO=0.99 5.
800.0+x	(9 ⁺)	270.3 5		529.7+x	(7 ⁺)	(E2)	
		356.8 5		443.5+x	(10 ⁺)	(M1+E2)	DCO=0.6 1.
838.3+x	(10 ⁺)	210.9 2	100	627.3+x	(9 ⁺)	(M1+E2)	
875.1+x	(12 ⁺)	220.4 2	100 5	654.6+x	(11 ⁺)	(M1+E2)	DCO=0.47 2.
		431.6 2	80 3	443.5+x	(10 ⁺)	(E2)	DCO=0.96 3.
1095.6+x	(11 ⁺)	220.6 5	76 12	875.1+x	(12 ⁺)	(M1+E2)	
		257.2 2	100 6	838.3+x	(10 ⁺)	(M1+E2)	
		468.4 5	<59	627.3+x	(9 ⁺)	(E2)	
1157.5+x	(13 ⁺)	282.4 2	100 7	875.1+x	(12 ⁺)	(M1+E2)	DCO=0.38 2 for 282.4+283.1.
		502.9 2	87 4	654.6+x	(11 ⁺)	(E2)	DCO=1.04 7.
1185.1+x	(11 ⁺)	346.9 5	51 5	838.3+x	(10 ⁺)	(M1+E2)	DCO=0.7 1.
		385.2 2	100 7	800.0+x	(9 ⁺)	(E2)	DCO=1.07 8.
1379.1+x	(12 ⁺)	283 1	<100	1095.6+x	(11 ⁺)	(M1+E2)	
		541 [#] 1	<100	838.3+x	(10 ⁺)	(E2)	
1440.6+x	(14 ⁺)	283.1 2	66 5	1157.5+x	(13 ⁺)	(M1+E2)	DCO=0.38 2 for 282.4+283.1.
		565.6 2	100 5	875.1+x	(12 ⁺)	(E2)	DCO=1.00 4.
1646.3+x		772 1		875.1+x	(12 ⁺)		
		992 1		654.6+x	(11 ⁺)		
1669.5+x	(13 ⁺)	290.2 5	<47	1379.1+x	(12 ⁺)	(M1+E2)	
		484.4 2	98 7	1185.1+x	(11 ⁺)	(E2)	DCO=0.92 7.
		573.8 2	100 7	1095.6+x	(11 ⁺)	(E2)	DCO=0.9 1.

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Adopted Levels, Gammas (continued) $\gamma(^{128}\text{Pr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. ‡	Comments
1723.9+x	(13 ⁺)	345 1	<80	1379.1+x	(12 ⁺)	(M1+E2)	
		628 1	100 12	1095.6+x	(11 ⁺)	(E2)	
1779.4+x	(15 ⁺)	338.7 2	72 3	1440.6+x	(14 ⁺)	(M1+E2)	DCO=0.40 5.
		621.8 2	100 5	1157.5+x	(13 ⁺)	(E2)	DCO=1.00 5.
1917.9+x	(13 ⁺)	1044 [#] 1	100	875.1+x	(12 ⁺)	(M1+E2)	
2048.1+x	(14 ⁺)	669 1	100	1379.1+x	(12 ⁺)	(E2)	
2121.6+x	(16 ⁺)	342.1 2	47.5 20	1779.4+x	(15 ⁺)	(M1+E2)	DCO=0.47 6.
		681.1 2	100 5	1440.6+x	(14 ⁺)	(E2)	DCO=0.99 4.
2182.4+x	(14 ⁺)	264.3 2	100 5	1917.9+x	(13 ⁺)	(M1+E2)	
		536.2 2	89 8	1646.3+x			
		741.6 5	<54	1440.6+x	(14 ⁺)	(E2)	
		1024.7 5	<54	1157.5+x	(13 ⁺)	(M1+E2)	
2288.4+x	(15 ⁺)	618.9 2	100	1669.5+x	(13 ⁺)	(E2)	DCO=0.99 5.
2499.7+x	(17 ⁺)	377.9 2	51.9 25	2121.6+x	(16 ⁺)	(M1+E2)	DCO=0.37 5.
		720.3 2	100 6	1779.4+x	(15 ⁺)	(E2)	DCO=1.01 5.
2508.9+x	(15 ⁺)	326.5 2	100 16	2182.4+x	(14 ⁺)	(M1+E2)	
		591.2 2	71 8	1917.9+x	(13 ⁺)	(E2)	
2833.3+x	(16 ⁺)	324.5 2	91 14	2508.9+x	(15 ⁺)	(M1+E2)	
		650.6 2	100 9	2182.4+x	(14 ⁺)	(E2)	
2894.7+x	(18 ⁺)	395.0 2	39.7 20	2499.7+x	(17 ⁺)	(M1+E2)	DCO=0.37 6.
		773.1 2	100 3	2121.6+x	(16 ⁺)	(E2)	DCO=0.98 4.
3001.6+x	(17 ⁺)	713.2 2	100	2288.4+x	(15 ⁺)	(E2)	DCO=1.07 6.
3204.6+x	(17 ⁺)	371.4 2	100 8	2833.3+x	(16 ⁺)	(M1+E2)	
		696.0 2	100 8	2508.9+x	(15 ⁺)	(E2)	
3297.3+x	(19 ⁺)	402.7 2	38.5 19	2894.7+x	(18 ⁺)	(M1+E2)	DCO=0.41 6.
		797.5 2	100 4	2499.7+x	(17 ⁺)	(E2)	DCO=0.97 9.
3583.0+x	(18 ⁺)	378.6 2	100 7	3204.6+x	(17 ⁺)	(M1+E2)	
		749.5 2	88 9	2833.3+x	(16 ⁺)	(E2)	
3742.0+x	(20 ⁺)	444.6 2	27.3 18	3297.3+x	(19 ⁺)	(M1+E2)	DCO=0.51 6.
		847.4 2	100 5	2894.7+x	(18 ⁺)	(E2)	DCO=0.94 5.
3801.3+x	(19 ⁺)	799.7 2	100	3001.6+x	(17 ⁺)	(E2)	DCO=1.04 5.
3991.8+x	(19 ⁺)	408.3 5	66 5	3583.0+x	(18 ⁺)	(M1+E2)	
		787.2 2	100 8	3204.6+x	(17 ⁺)	(E2)	
4163.8+x	(21 ⁺)	421.8 2	31.0 14	3742.0+x	(20 ⁺)	(M1+E2)	DCO=0.43 8.
		866.6 2	100 5	3297.3+x	(19 ⁺)	(E2)	DCO=0.84 9.
4412.7+x	(20 ⁺)	420.8 2	75 5	3991.8+x	(19 ⁺)	(M1+E2)	
		829.7 2	100 10	3583.0+x	(18 ⁺)	(E2)	
4661.7+x	(22 ⁺)	498.1 2	38.6 21	4163.8+x	(21 ⁺)	(M1+E2)	
		919.6 2	100 5	3742.0+x	(20 ⁺)	(E2)	DCO=0.96 7.
4680.2+x	(21 ⁺)	878.9 2	100	3801.3+x	(19 ⁺)	(E2)	DCO=0.95 6.
4854.0+x	(21 ⁺)	441.2 5	81 6	4412.7+x	(20 ⁺)	(M1+E2)	
		862.3 2	100 8	3991.8+x	(19 ⁺)	(E2)	
5105.7+x	(23 ⁺)	444.0 2	27.3 22	4661.7+x	(22 ⁺)	(M1+E2)	DCO=0.51 6.
		941.8 2	100 5	4163.8+x	(21 ⁺)	(E2)	DCO=1.0 1.
5312.6+x	(22 ⁺)	458.4 5	58 4	4854.0+x	(21 ⁺)	(M1+E2)	
		899.8 2	100 6	4412.7+x	(20 ⁺)	(E2)	
5639.4+x	(23 ⁺)	959.2 2	100	4680.2+x	(21 ⁺)	(E2)	DCO=1.2 1.
5665.5+x	(24 ⁺)	559.9 5	23 5	5105.7+x	(23 ⁺)	(M1+E2)	
		1003.7 2	100 5	4661.7+x	(22 ⁺)	(E2)	DCO=1.1 1.
5789.9+x	(23 ⁺)	477.5 5	<53	5312.6+x	(22 ⁺)	(M1+E2)	
		935.9 2	100 8	4854.0+x	(21 ⁺)	(E2)	
6133.7+x	(25 ⁺)	468.2 5	<20.2	5665.5+x	(24 ⁺)	(M1+E2)	
		1028.0 2	100 5	5105.7+x	(23 ⁺)	(E2)	DCO=1.0 1.
6290.9+x	(24 ⁺)	501.5 5	<63	5789.9+x	(23 ⁺)	(M1+E2)	
		978.2 2	100 9	5312.6+x	(22 ⁺)	(E2)	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{128}\text{Pr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	Comments
6683.3+x	(25 ⁺)	1043.9 5	100	5639.4+x	(23 ⁺)	(E2)	DCO=0.9 1.
6766.4+x	(26 ⁺)	1100.9 2	100	5665.5+x	(24 ⁺)	(E2)	DCO=1.0 1.
6810.3+x	(25 ⁺)	519.1 5	<100	6290.9+x	(24 ⁺)	(M1+E2)	
		1020.5 5	100 10	5789.9+x	(23 ⁺)	(E2)	
7252.8+x	(27 ⁺)	1119.1 2	100	6133.7+x	(25 ⁺)	(E2)	
7358.6+x	(26 ⁺)	548.2 5	<100	6810.3+x	(25 ⁺)	(M1+E2)	
		1067.9 5	<100	6290.9+x	(24 ⁺)	(E2)	
7807.2+x	(27 ⁺)	1123.9 5	100	6683.3+x	(25 ⁺)	(E2)	
7924.8+x	(27 ⁺)	1114.5 5	100	6810.3+x	(25 ⁺)	(E2)	
7971.4+x	(28 ⁺)	1205.0 2	100	6766.4+x	(26 ⁺)	(E2)	
8464.7+x	(29 ⁺)	1211.9 2	100	7252.8+x	(27 ⁺)	(E2)	
8523.9+x	(28 ⁺)	1165.3 5	100	7358.6+x	(26 ⁺)	(E2)	
8989.9+x	(29 ⁺)	1182.7 5	100	7807.2+x	(27 ⁺)	(E2)	
9137.4+x	(29 ⁺)	1212.6 5	100	7924.8+x	(27 ⁺)	(E2)	
9283.3+x	(30 ⁺)	1311.9 5	100	7971.4+x	(28 ⁺)	(E2)	
9767.6+x	(31 ⁺)	1302.9 5	100	8464.7+x	(29 ⁺)	(E2)	
9786.9+x	(30 ⁺)	1263 1	100	8523.9+x	(28 ⁺)	(E2)	
10221.9+x	(31 ⁺)	1232.0 5	100	8989.9+x	(29 ⁺)	(E2)	
10444.4+x	(31 ⁺)	1307 1	100	9137.4+x	(29 ⁺)	(E2)	
10700.9+x	(32 ⁺)	1417.6 5	100	9283.3+x	(30 ⁺)	(E2)	
11159.2+x	(33 ⁺)	1391.6 5	100	9767.6+x	(31 ⁺)	(E2)	
11516.4+x	(33 ⁺)	1294.5 5	100	10221.9+x	(31 ⁺)	(E2)	
12202.9+x?	(34 ⁺)	1502 [#] 1	100	10700.9+x	(32 ⁺)	(E2)	
12644.4+x	(35 ⁺)	1485.2 5	100	11159.2+x	(33 ⁺)	(E2)	
12884.6+x	(35 ⁺)	1368.2 5	100	11516.4+x	(33 ⁺)	(E2)	
14216.8+x	(37 ⁺)	1572.4 5	100	12644.4+x	(35 ⁺)	(E2)	
14332.3+x	(37 ⁺)	1447.7 5	100	12884.6+x	(35 ⁺)	(E2)	
15849.3+x?	(39 ⁺)	1517 [#] 1	100	14332.3+x	(37 ⁺)	(E2)	
116.3+y	(6 ⁻)	116	100	0+y	(5 ⁻)		E_γ : from Fig. 3 of 2002Ha20.
151.6+y	(6 ⁻)	54		97.6+y	(5 ⁻)		
		112		39.6+y?	(4 ⁻)		
240.7+y	(7 ⁻)	89.0 2		151.6+y	(6 ⁻)	(M1+E2)	
		125		116.3+y	(6 ⁻)		
		143		97.6+y	(5 ⁻)		
		241		0+y	(5 ⁻)		
262.3+y	(7 ⁻)	110.9 2	100	151.6+y	(6 ⁻)	(M1+E2)	DCO=0.53 7.
364.5+y	(8 ⁻)	102.2 2	31.6 16	262.3+y	(7 ⁻)	(M1+E2)	
		123.8 2	100 5	240.7+y	(7 ⁻)	(M1+E2)	DCO=0.52 5.
		248.1 2	52 3	116.3+y	(6 ⁻)		DCO=0.57 8.
387.7+y	(8 ⁻)	126		262.3+y	(7 ⁻)		
		147.0 2	100 5	240.7+y	(7 ⁻)	(M1+E2)	DCO=0.6 1.
		236.1 2	18.4 21	151.6+y	(6 ⁻)	(E2)	
		271.5 2	37 3	116.3+y	(6 ⁻)		DCO=0.6 1.
545.1+y	(9 ⁻)	157.5 2	78 5	387.7+y	(8 ⁻)	(M1+E2)	DCO=0.7 1.
		180.6 2	100 5	364.5+y	(8 ⁻)	(M1+E2)	DCO=0.8 1.
		283.2 2	30 3	262.3+y	(7 ⁻)	(E2)	
		304.4 2	78 5	240.7+y	(7 ⁻)	(E2)	DCO=1.0 1.
561.5+y	(9 ⁻)	173.7 2	55 3	387.7+y	(8 ⁻)	(M1+E2)	DCO=0.72 8.
		197.0 2	100 5	364.5+y	(8 ⁻)	(M1+E2)	DCO=0.49 4.
		299.1 2	88 5	262.3+y	(7 ⁻)	(E2)	DCO=0.91 9.
		320.8 5	<15.9	240.7+y	(7 ⁻)	(E2)	
751.0+y	(10 ⁻)	189.5 2	55 3	561.5+y	(9 ⁻)	(M1+E2)	DCO=0.51 5.
		206.3 2	45 3	545.1+y	(9 ⁻)	(M1+E2)	
		386.4 2	100 5	364.5+y	(8 ⁻)	(E2)	DCO=1.00 7.
788.2+y	(10 ⁻)	226.3 2	20.7 20	561.5+y	(9 ⁻)	(M1+E2)	DCO=0.8 1.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{128}\text{Pr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. ‡	Comments
788.2+y	(10 ⁻)	243.0 2	55 4	545.1+y	(9 ⁻)	(M1+E2)	DCO=0.8 1.
		400.4 2	100 7	387.7+y	(8 ⁻)	(E2)	DCO=1.00 9.
985.2+y	(11 ⁻)	196.9 2	14.0 12	788.2+y	(10 ⁻)	(M1+E2)	
		235		751.0+y	(10 ⁻)		
		424.0 2	45.6 24	561.5+y	(9 ⁻)	(E2)	DCO=0.9 1.
		439.8 2	100 4	545.1+y	(9 ⁻)	(E2)	DCO=1.03 9.
1015.2+y	(11 ⁻)	226.7 2	40 3	788.2+y	(10 ⁻)	(M1+E2)	
		264.2 2	100 5	751.0+y	(10 ⁻)	(M1+E2)	DCO=0.44 4.
		453.8 2	76 4	561.5+y	(9 ⁻)	(E2)	DCO=1.0 1.
		470.4 2	28.1 25	545.1+y	(9 ⁻)	(E2)	
1272.4+y	(12 ⁻)	257.1 2	48 3	1015.2+y	(11 ⁻)	(M1+E2)	DCO=0.48 5.
		521.6 2	100 4	751.0+y	(10 ⁻)	(E2)	DCO=1.06 9.
1318.0+y	(12 ⁻)	303.0 2	23.2 17	1015.2+y	(11 ⁻)	(M1+E2)	
		332.5 5	11.9 11	985.2+y	(11 ⁻)	(M1+E2)	
		529.5 2	100 5	788.2+y	(10 ⁻)	(E2)	DCO=1.00 9.
1546.8+y	(13 ⁻)	275		1272.4+y	(12 ⁻)		
		561.5 2	100 4	985.2+y	(11 ⁻)	(E2)	DCO=1.0 1.
1599.0+y	(13 ⁻)	280.8 2	19.0 13	1318.0+y	(12 ⁻)	(M1+E2)	
		326.6 2	43 3	1272.4+y	(12 ⁻)	(M1+E2)	DCO=0.41 4.
		583.8 2	100 5	1015.2+y	(11 ⁻)	(E2)	DCO=0.92 9.
1906.4+y	(14 ⁻)	307.4 2	26.4 18	1599.0+y	(13 ⁻)	(M1+E2)	DCO=0.4 1.
		634.2 2	100 5	1272.4+y	(12 ⁻)	(E2)	DCO=0.99 7.
1954.8+y	(14 ⁻)	355.6 2	22.4 18	1599.0+y	(13 ⁻)	(M1+E2)	
		636.9 2	100 5	1318.0+y	(12 ⁻)	(E2)	DCO=1.0 1.
2213.0+y	(15 ⁻)	307		1906.4+y	(14 ⁻)		
		666.2 2	100 4	1546.8+y	(13 ⁻)	(E2)	DCO=1.1 1.
2283.0+y	(15 ⁻)	327		1954.8+y	(14 ⁻)		
		376.7 2	29.9 17	1906.4+y	(14 ⁻)	(M1+E2)	DCO=0.37 8.
		684.0 2	100 5	1599.0+y	(13 ⁻)	(E2)	DCO=1.06 7.
2627.7+y	(16 ⁻)	344.7 5	17.7 13	2283.0+y	(15 ⁻)	(M1+E2)	
		721.2 2	100 5	1906.4+y	(14 ⁻)	(E2)	DCO=1.00 6.
2676.8+y	(16 ⁻)	393.9 2	28 3	2283.0+y	(15 ⁻)	(M1+E2)	
		721.9 2	100 6	1954.8+y	(14 ⁻)	(E2)	DCO=1.1 1.
2958.1+y	(17 ⁻)	745.1 2	100	2213.0+y	(15 ⁻)	(E2)	DCO=1.1 1.
3042.6+y	(17 ⁻)	415.0 5	22 4	2627.7+y	(16 ⁻)	(M1+E2)	
		759.6 2	100 5	2283.0+y	(15 ⁻)	(E2)	DCO=1.1 1.
3411.1+y	(18 ⁻)	368.1 5	<18.7	3042.6+y	(17 ⁻)	(M1+E2)	
		783.4 2	100 6	2627.7+y	(16 ⁻)	(E2)	DCO=0.94 9.
3467.3+y	(18 ⁻)	790.5 2	100	2676.8+y	(16 ⁻)	(E2)	DCO=1.2 1.
3761.9+y	(19 ⁻)	803.8 2	100	2958.1+y	(17 ⁻)	(E2)	DCO=1.2 1.
3861.5+y	(19 ⁻)	449.9 5	<31	3411.1+y	(18 ⁻)	(M1+E2)	
		819.0 2	100 6	3042.6+y	(17 ⁻)	(E2)	
4241.1+y	(20 ⁻)	830.0 2	100	3411.1+y	(18 ⁻)	(E2)	DCO=1.0 1.
4321.2+y	(20 ⁻)	853.9 2	100	3467.3+y	(18 ⁻)	(E2)	
4632.7+y	(21 ⁻)	870.8 2	100	3761.9+y	(19 ⁻)	(E2)	DCO=1.1 1.
4731.6+y	(21 ⁻)	490 1	<57	4241.1+y	(20 ⁻)	(M1+E2)	
		870.1 2	100 9	3861.5+y	(19 ⁻)	(E2)	
4784.5+y	(21 ⁻)	923 1	100	3861.5+y	(19 ⁻)		
5153.9+y	(22 ⁻)	912.8 2	100	4241.1+y	(20 ⁻)	(E2)	
5243.4+y	(22 ⁻)	922.2 2	100	4321.2+y	(20 ⁻)	(E2)	
5597.3+y	(23 ⁻)	964.6 2	100	4632.7+y	(21 ⁻)	(E2)	
5696.4+y	(23 ⁻)	964.8 5	100	4731.6+y	(21 ⁻)	(E2)	
5736.5+y	(23 ⁻)	952 1	100	4784.5+y	(21 ⁻)		
6180.4+y	(24 ⁻)	1026.5 5	100	5153.9+y	(22 ⁻)	(E2)	
6231.2+y	(24 ⁻)	987.8 5	100	5243.4+y	(22 ⁻)	(E2)	
6669.2+y	(25 ⁻)	1071.9 2	100	5597.3+y	(23 ⁻)	(E2)	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{128}\text{Pr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]
6751.5+y	(25 ⁻)	1015 1	100	5736.5+y	(23 ⁻)	
6778.3+y	(25 ⁻)	1081.9 5	100	5696.4+y	(23 ⁻)	(E2)
7278.6+y	(26 ⁻)	1047.4 5	100	6231.2+y	(24 ⁻)	(E2)
7316.7+y	(26 ⁻)	1136.3 5	100	6180.4+y	(24 ⁻)	(E2)
7821.2+y	(27 ⁻)	1152 1	100	6669.2+y	(25 ⁻)	
7861.3+y	(27 ⁻)	1192.1 5	100	6669.2+y	(25 ⁻)	(E2)
7948.7+y	(27 ⁻)	1170.4 5	100	6778.3+y	(25 ⁻)	(E2)
8391.5+y	(28 ⁻)	1112.9 5	100	7278.6+y	(26 ⁻)	(E2)
8546.8+y	(28 ⁻)	1230.1 5	100	7316.7+y	(26 ⁻)	(E2)
8977.2+y	(29 ⁻)	1156 1	100	7821.2+y	(27 ⁻)	
9123.0+y	(29 ⁻)	1261.7 5	100	7861.3+y	(27 ⁻)	(E2)
9577.7+y	(30 ⁻)	1186.2 5	100	8391.5+y	(28 ⁻)	(E2)
9815.6+y	(30 ⁻)	1268.8 5	100	8546.8+y	(28 ⁻)	(E2)
10208.2+y	(31 ⁻)	1231 1	100	8977.2+y	(29 ⁻)	
10419.9+y	(31 ⁻)	1296.9 5	100	9123.0+y	(29 ⁻)	(E2)
10839.7+y	(32 ⁻)	1261.9 5	100	9577.7+y	(30 ⁻)	(E2)
11114.2+y?	(32 ⁻)	1299 [#] 1	100	9815.6+y	(30 ⁻)	(E2)
11773.4+y?	(33 ⁻)	1354 [#] 1	100	10419.9+y	(31 ⁻)	(E2)
12174.1+y	(34 ⁻)	1334.4 5	100	10839.7+y	(32 ⁻)	(E2)
13583.6+y?	(36 ⁻)	1410 [#] 1	100	12174.1+y	(34 ⁻)	(E2)
242.47+z	(9 ⁻)	242.4 2	100	0+z	(8 ⁻)	(M1+E2)
507.43+z	(10 ⁻)	264.9 2	86 5	242.47+z	(9 ⁻)	(M1+E2)
		507.5 2	100 10	0+z	(8 ⁻)	(E2)
792.37+z	(11 ⁻)	285.0 2	58 4	507.43+z	(10 ⁻)	(M1+E2)
		549.9 2	100 7	242.47+z	(9 ⁻)	(E2)
1095.69+z	(12 ⁻)	303.3 2	38 3	792.37+z	(11 ⁻)	(M1+E2)
		588.2 2	100 6	507.43+z	(10 ⁻)	(E2)
1416.51+z	(13 ⁻)	320.6 5	26.9 22	1095.69+z	(12 ⁻)	(M1+E2)
		624.2 2	100 6	792.37+z	(11 ⁻)	(E2)
1754.2+z	(14 ⁻)	337.7 5	23.8 20	1416.51+z	(13 ⁻)	(M1+E2)
		658.5 2	100 6	1095.69+z	(12 ⁻)	(E2)
2109.1+z	(15 ⁻)	354.9 5	<20.2	1754.2+z	(14 ⁻)	(M1+E2)
		692.6 2	100 6	1416.51+z	(13 ⁻)	(E2)
2480.7+z	(16 ⁻)	371.8 5	<19.0	2109.1+z	(15 ⁻)	(M1+E2)
		726.4 2	100 6	1754.2+z	(14 ⁻)	(E2)
2868.8+z	(17 ⁻)	388 1	<30	2480.7+z	(16 ⁻)	(M1+E2)
		759.7 2	100 6	2109.1+z	(15 ⁻)	(E2)
3275.4+z	(18 ⁻)	794.7 2	100	2480.7+z	(16 ⁻)	(E2)
3694.9+z	(19 ⁻)	826.1 2	100	2868.8+z	(17 ⁻)	(E2)
4133.4+z	(20 ⁻)	858.0 2	100	3275.4+z	(18 ⁻)	(E2)
4587.6+z	(21 ⁻)	892.7 2	100	3694.9+z	(19 ⁻)	(E2)
5061.9+z	(22 ⁻)	928.5 5	100	4133.4+z	(20 ⁻)	(E2)
5552.8+z	(23 ⁻)	965.2 5	100	4587.6+z	(21 ⁻)	(E2)
6065.4+z	(24 ⁻)	1003.5 5	100	5061.9+z	(22 ⁻)	(E2)
6596.3+z	(25 ⁻)	1043.5 5	100	5552.8+z	(23 ⁻)	(E2)
7150.1+z	(26 ⁻)	1084.7 5	100	6065.4+z	(24 ⁻)	(E2)
7720.4+z	(27 ⁻)	1124.1 5	100	6596.3+z	(25 ⁻)	(E2)
8316.0+z	(28 ⁻)	1165.9 5	100	7150.1+z	(26 ⁻)	(E2)
8924.0+z	(29 ⁻)	1203.6 5	100	7720.4+z	(27 ⁻)	(E2)
9558.3+z	(30 ⁻)	1242.3 5	100	8316.0+z	(28 ⁻)	(E2)
10205.7+z	(31 ⁻)	1281.7 5	100	8924.0+z	(29 ⁻)	(E2)
10876.6+z	(32 ⁻)	1318.3 5	100	9558.3+z	(30 ⁻)	(E2)
11560.1+z	(33 ⁻)	1354.4 5	100	10205.7+z	(31 ⁻)	(E2)
12263.3+z	(34 ⁻)	1386.7 5	100	10876.6+z	(32 ⁻)	(E2)

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Adopted Levels, Gammas (continued) $\gamma(^{128}\text{Pr})$ (continued)

<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>$E_\gamma^\dagger$</u>	<u>$I_\gamma^\dagger$</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.‡</u>
12977.1+z?	(35 ⁻)	1417 [#]	1	100	11560.1+z (33 ⁻)	(E2)
13722.3+z?	(36 ⁻)	1459 [#]	1	100	12263.3+z (34 ⁻)	(E2)

[†] From (HI,xn γ).

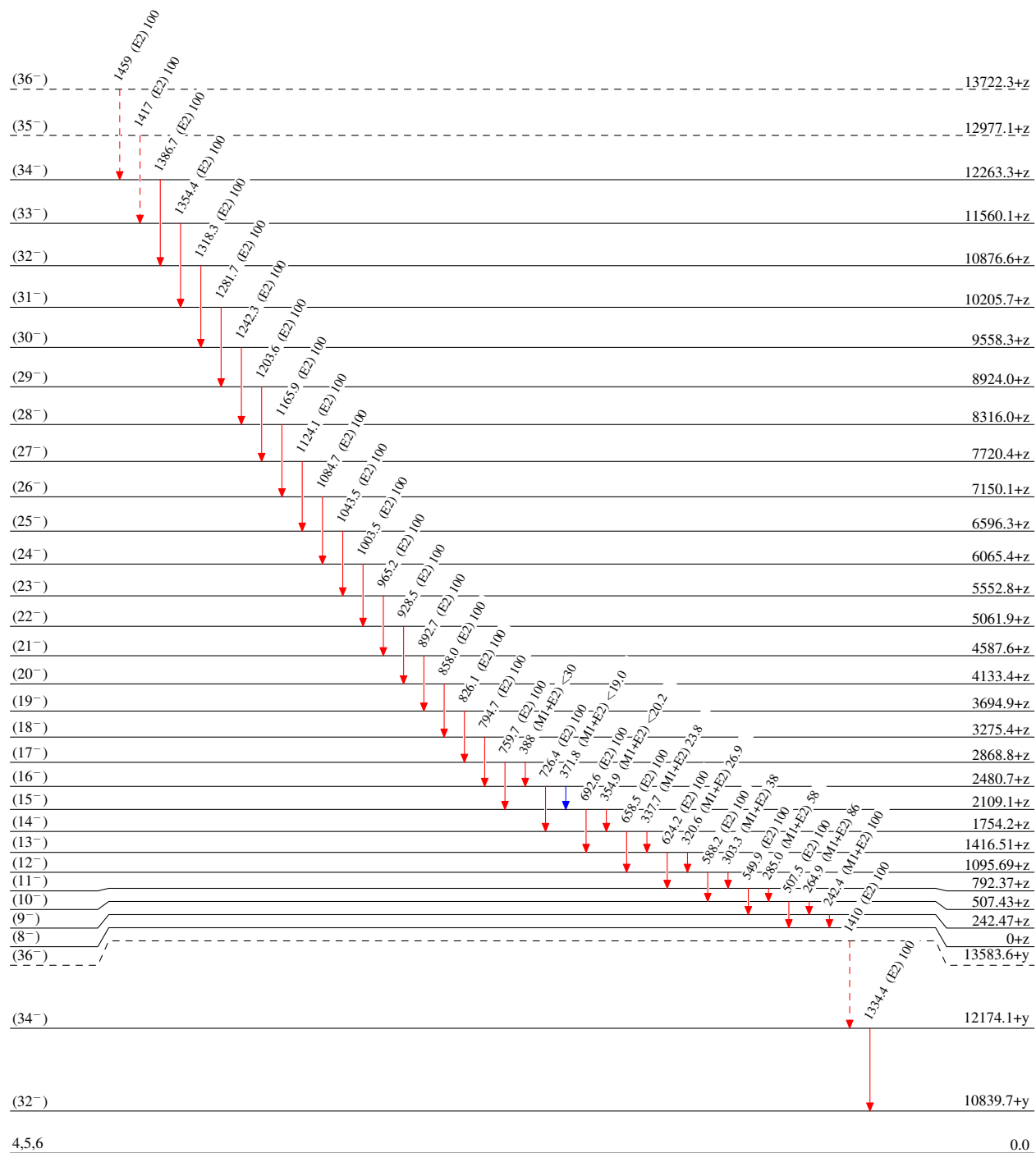
[‡] From suggested multipolarities in (HI,xn γ). Probable values, based mostly on weak arguments. Dipole or quadrupole character is based on DCO values where DCO values are given in comment. DCO values of 0.5 and 1 are expected for stretched dipole and stretched quadrupole transitions, respectively. The multipole order of the other transitions, as well as their electric or magnetic character is based on band structures and assigned configurations.

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

Adopted Levels, Gammas**Legend****Level Scheme**

Intensities: Type not specified

- $I_\gamma < 2\% \times I_\gamma^{\max}$
 —→ $I_\gamma < 10\% \times I_\gamma^{\max}$
 —→ $I_\gamma > 10\% \times I_\gamma^{\max}$
 - - - - -→ γ Decay (Uncertain)



4,5,6

0.0

2.84 s 9

 $^{128}_{59}\text{Pr}_{69}$

Legend

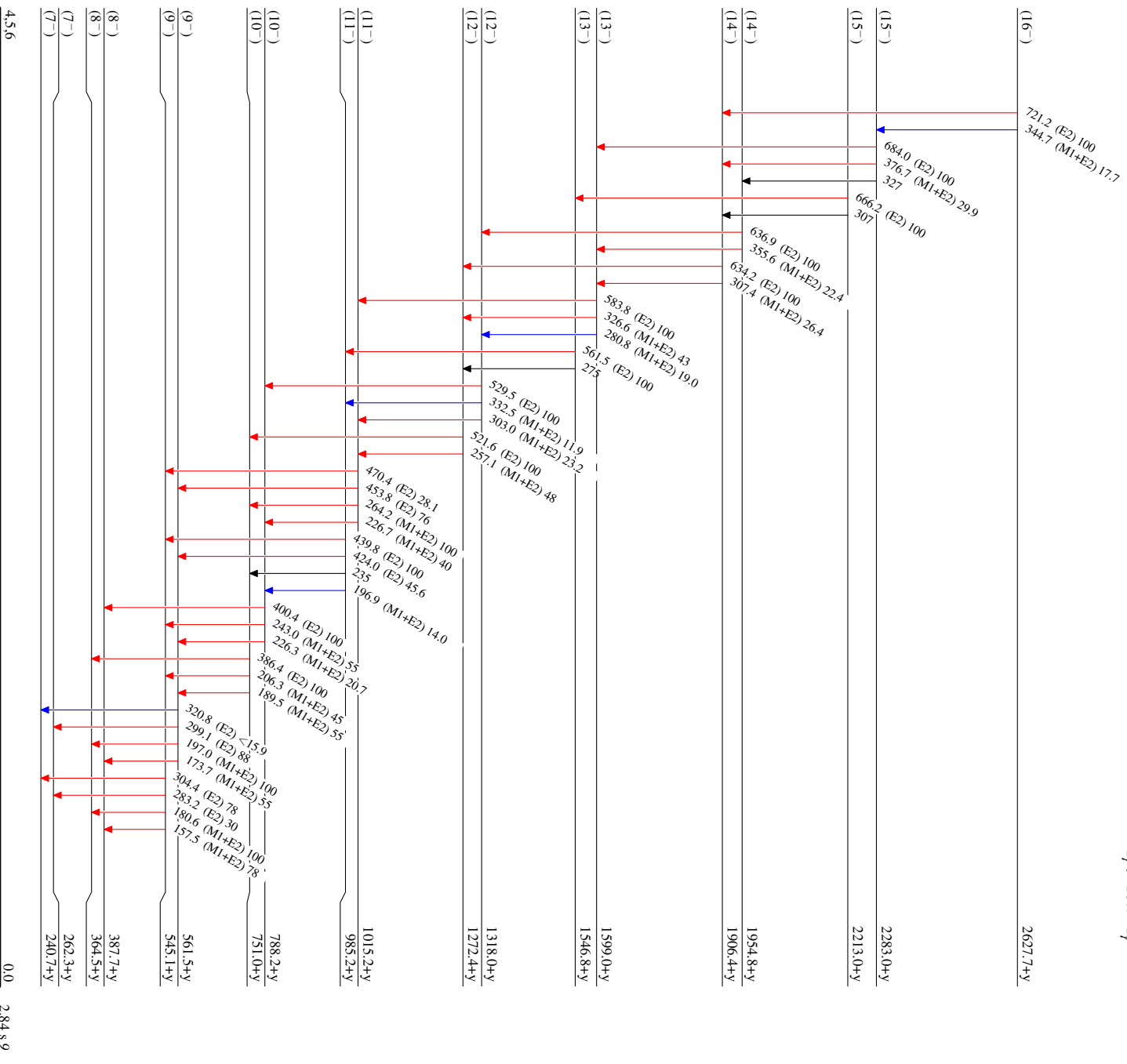
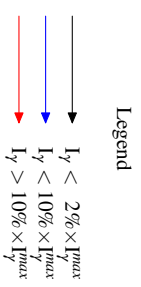
- $I_\gamma < 2\% \times I_\gamma^{\max}$
- $I_\gamma < 10\% \times I_\gamma^{\max}$
- $I_\gamma > 10\% \times I_\gamma^{\max}$
- - - → γ Decay (Uncertain)

2.84 s 9

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



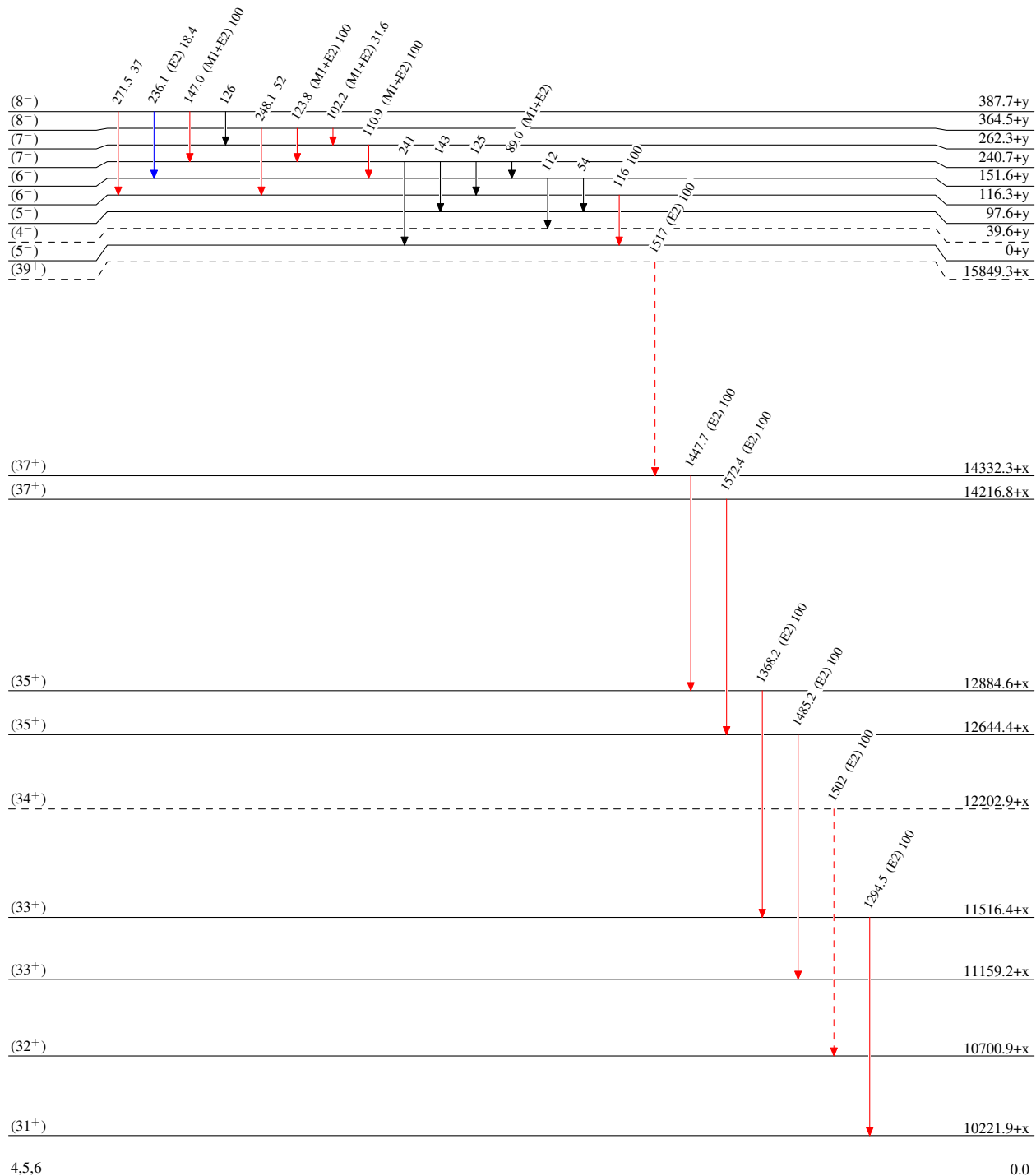
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

- $I_\gamma < 2\% \times I_\gamma^{\max}$
- $I_\gamma < 10\% \times I_\gamma^{\max}$
- $I_\gamma > 10\% \times I_\gamma^{\max}$
- - - - -→ γ Decay (Uncertain)



2.84 s 9

$^{128}_{59}\text{Pr}_{69}$

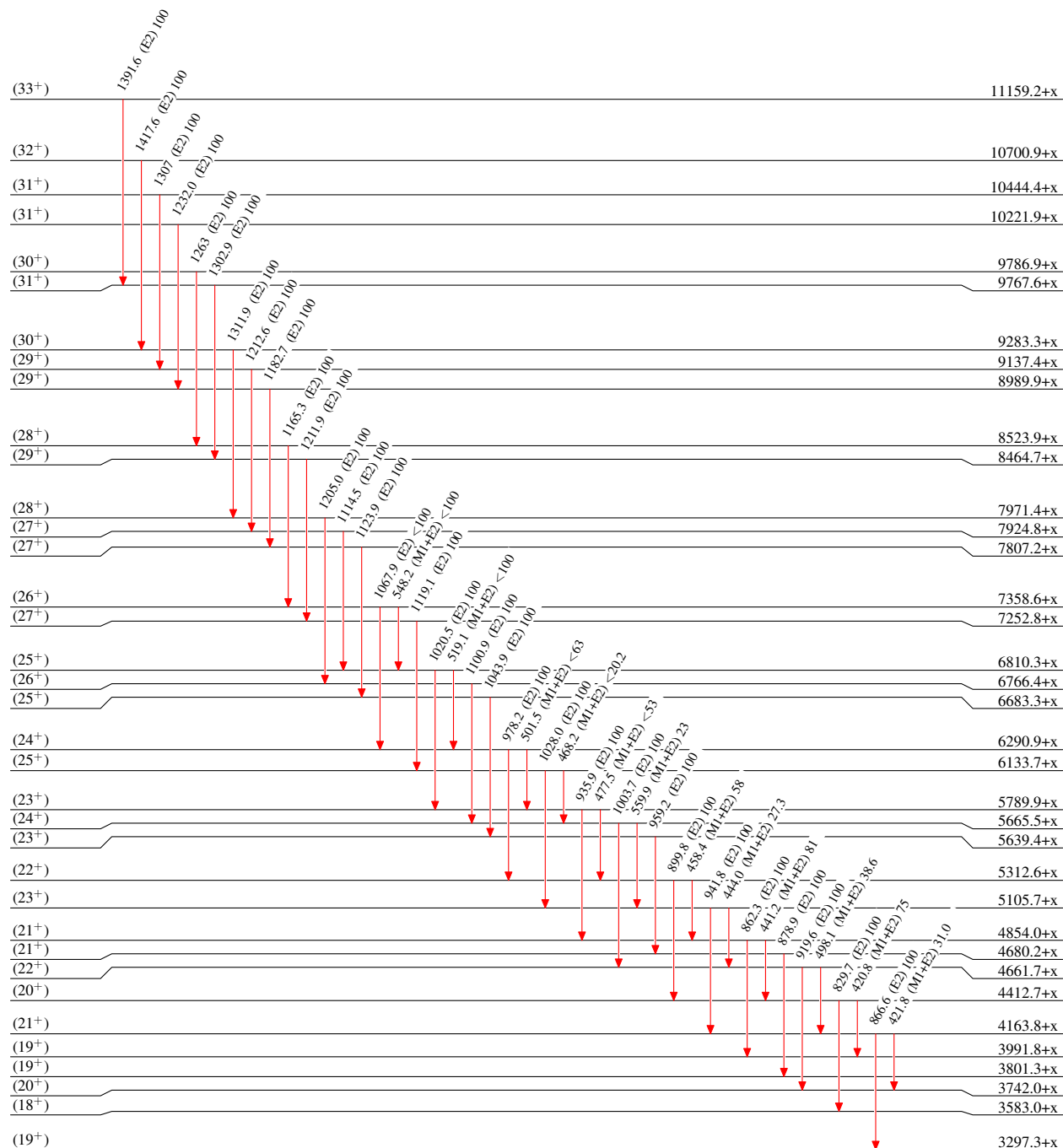
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

- $\longrightarrow$ $I_\gamma < 2\% \times I_\gamma^{\max}$
 $\longrightarrow$ $I_\gamma < 10\% \times I_\gamma^{\max}$
 $\longrightarrow$ $I_\gamma > 10\% \times I_\gamma^{\max}$



4,5,6

0.0

2.84 s 9

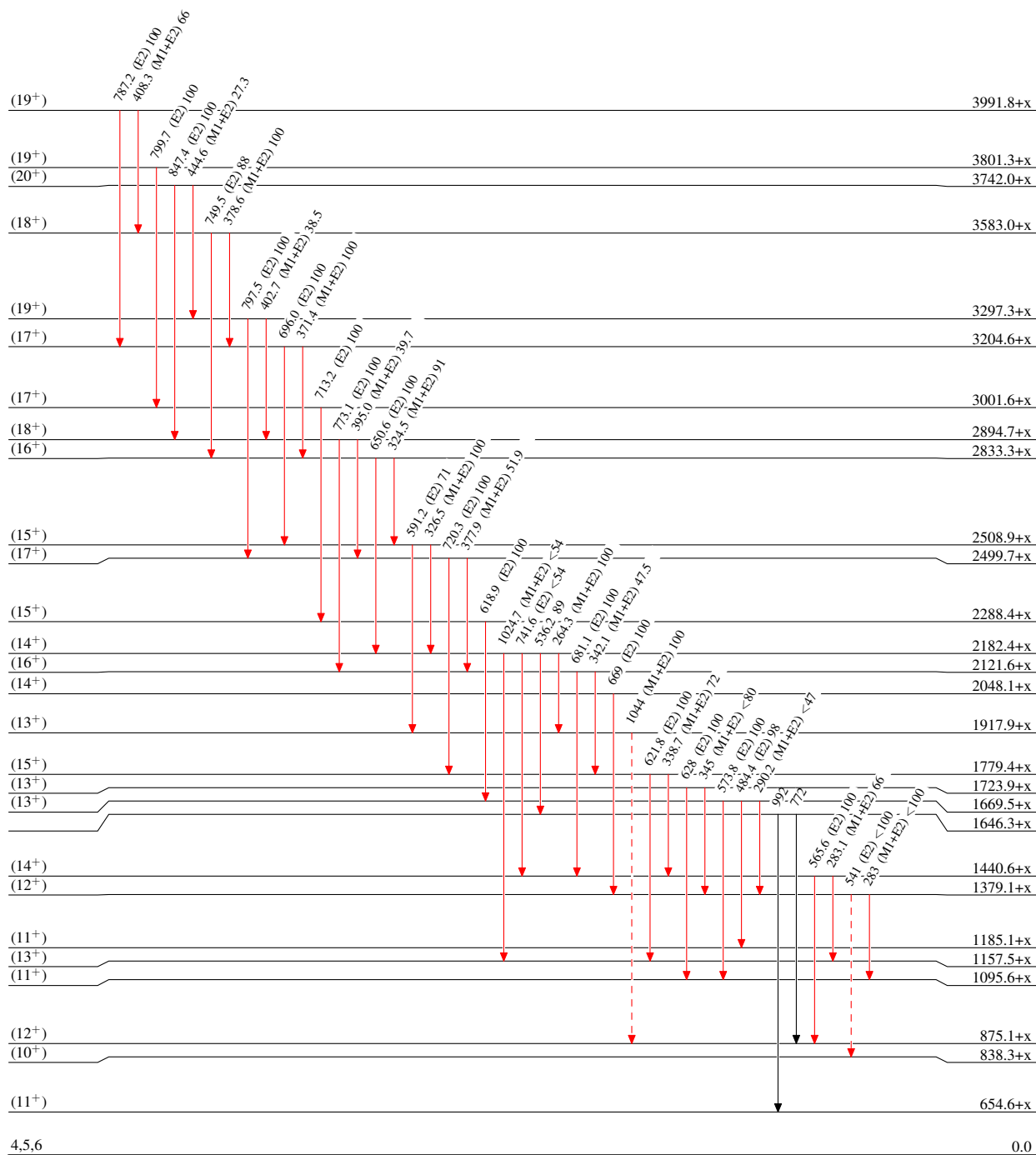
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

-  $I_\gamma < 2\% \times I_\gamma^{\max}$
 $I_\gamma < 10\% \times I_\gamma^{\max}$
 $I_\gamma > 10\% \times I_\gamma^{\max}$
 γ Decay (Uncertain)



2.84 s 9

 $^{128}_{59}\text{Pr}_{69}$

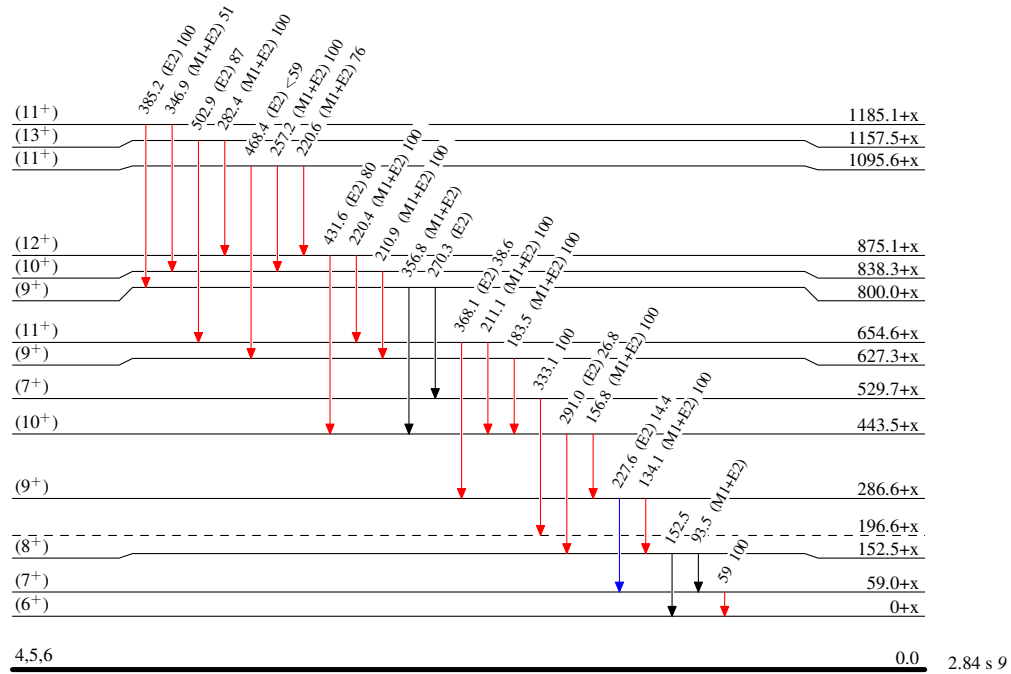
Adopted Levels, Gammas

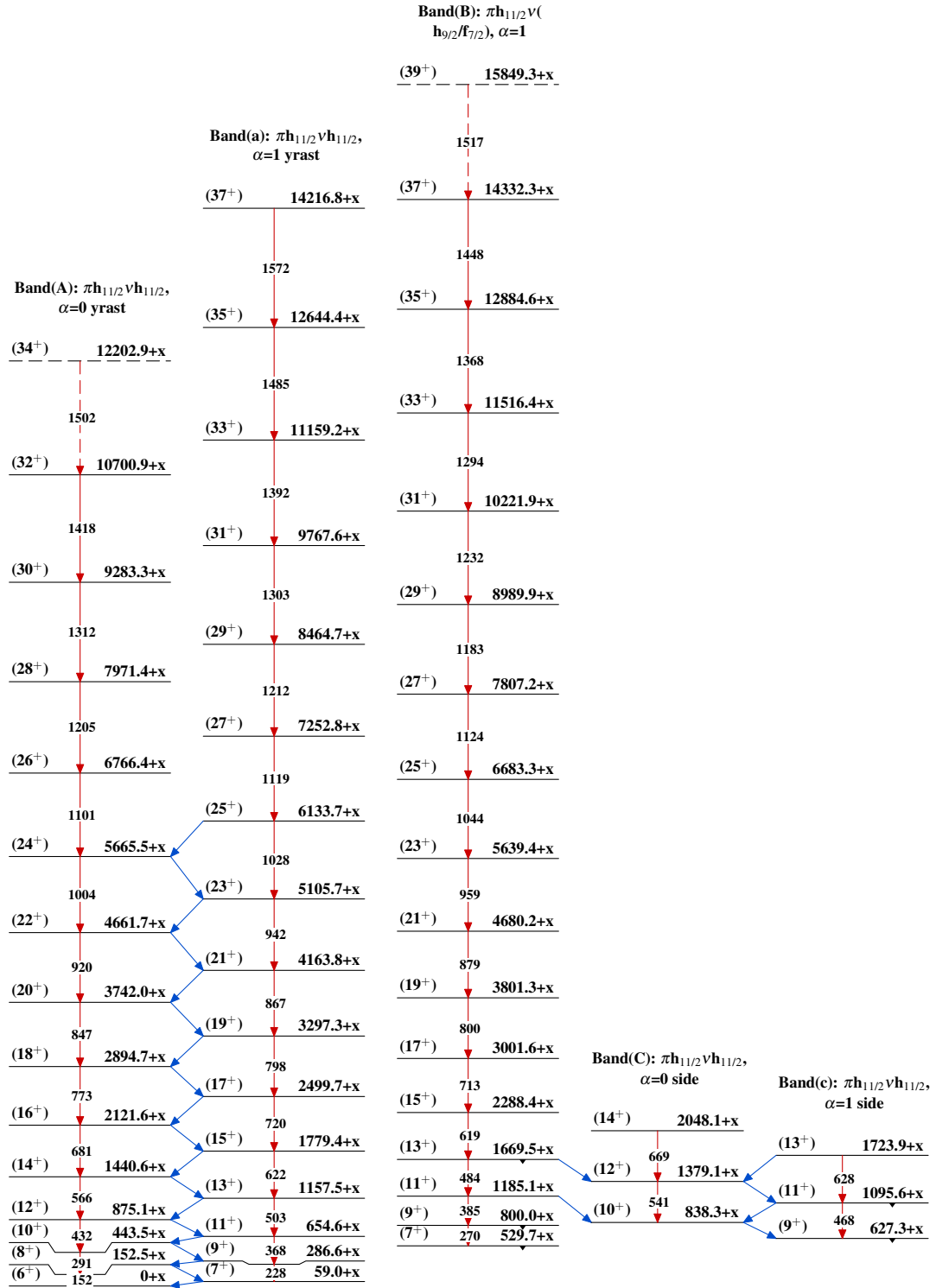
Level Scheme (continued)

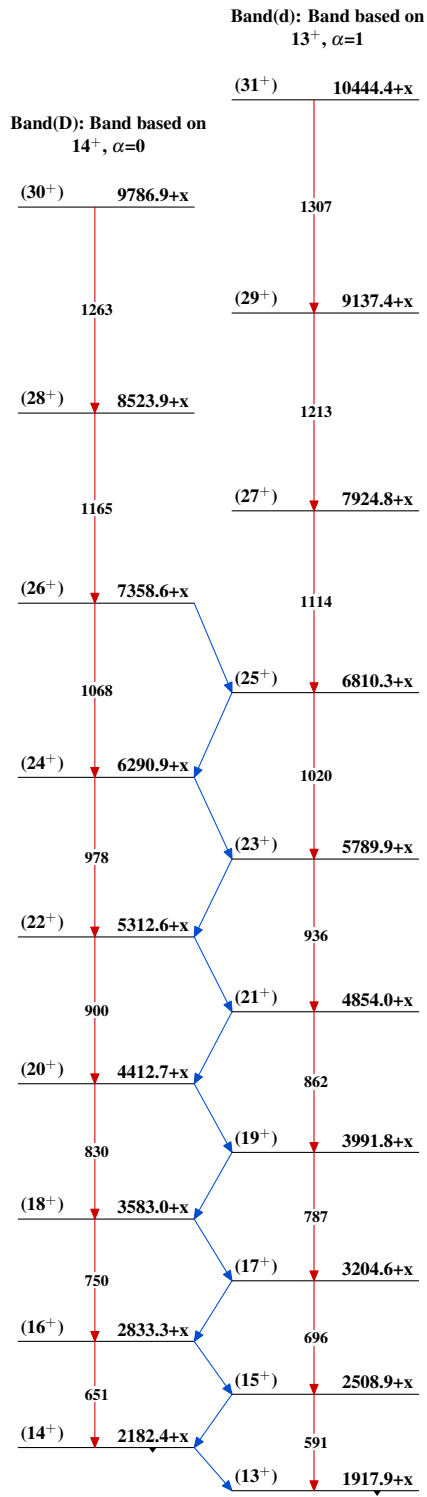
Intensities: Type not specified

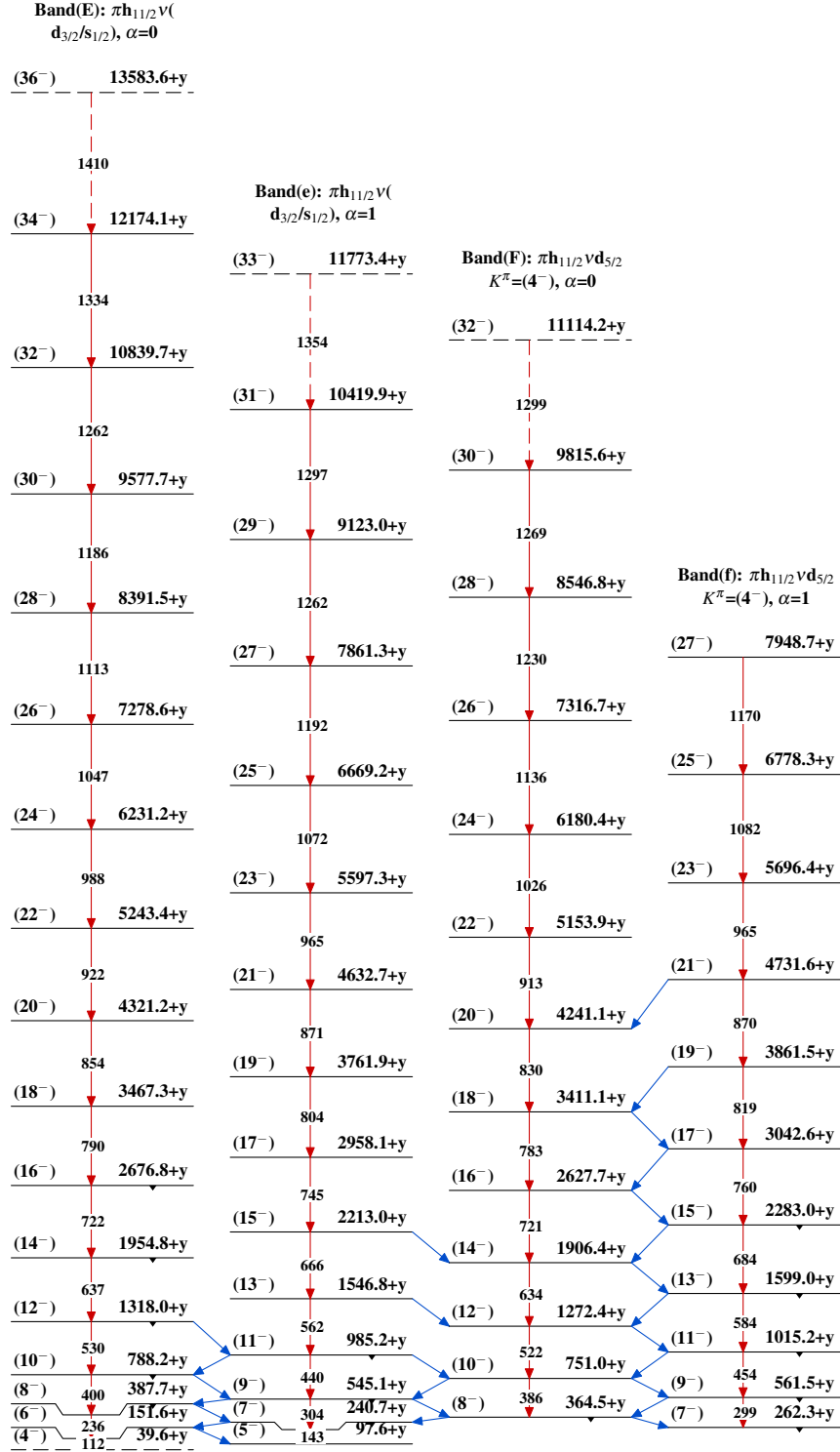
Legend

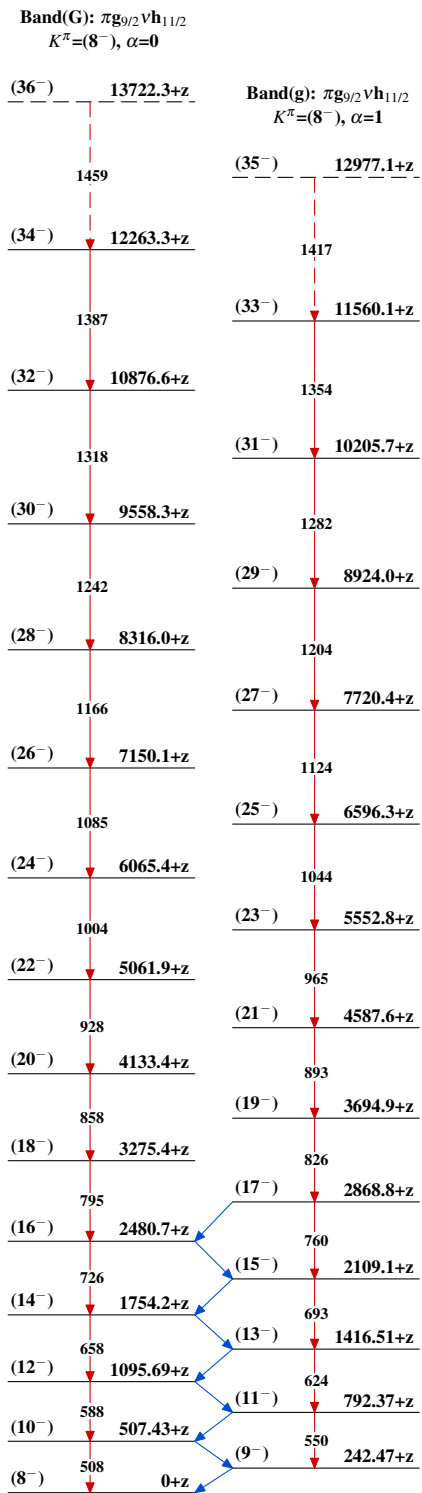
- $I_\gamma < 2\% \times I_\gamma^{\max}$
- $I_\gamma < 10\% \times I_\gamma^{\max}$
- $I_\gamma > 10\% \times I_\gamma^{\max}$


 $^{128}_{59}\text{Pr}_{69}$

Adopted Levels, Gammas

Adopted Levels, Gammas (continued) $^{128}_{59}\text{Pr}_{69}$

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued) $^{128}_{59}\text{Pr}_{69}$