

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, ¹ and Jun Chen ²		NDS 169, 1 (2020)	15-Oct-2020

$Q(\beta^-) = -9817$ 26; $S(n) = 10644$ 19; $S(p) = 3090$ 15; $Q(\alpha) = 5698$ 5 [2017Wa10](#)

$S(2n) = 18744$ 16, $S(2p) = 4793$ 18, $Q(\epsilon p) = 1920$ 30 ([2017Wa10](#)).

Other measurements:

Mass measurement: [2000Ra23](#).

Isomer-shift and hyperfine measurements: [1991Du07](#).

Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for about 150 primary references for nuclear structure and other calculations.

[Additional information 1](#).

 ^{190}Pb LevelsCross Reference (XREF) Flags

- A** ^{190}Bi ϵ decay (6.3 s+6.2 s)
B ^{194}Po α decay (0.392 s)
C $^{154}\text{Gd}(^{40}\text{Ar}, 4n\gamma)$
D $^{166}\text{Er}(^{28}\text{Si}, 4n\gamma)$

E(level) [†]	J^π [‡]	$T_{1/2}$	XREF	Comments
0.0 [#]	0 ⁺	71 s 1	ABCD	$\% \alpha = 0.40$ 4 (1992Wa14); $\% \epsilon + \% \beta^+ = 99.60$ 4 $T_{1/2}$: from α decay (1996Ri12). Others: 1.2 min 1 (1981El03), 1.2 min 2 (1974Le02), 1.1 min (1967Es05), 1993An19 . $\% \alpha$: from 1992Wa14 . Others: 0.5 2 (1996Bi17), 0.9 2 (1981El03), 0.21 7 (1974Ho26). Additional information 2 . Evaluated nuclear rms charge radius: $\langle r^2 \rangle^{1/2} = 5.4222$ fm 23 (2013An02). Evaluated $\delta \langle r^2 \rangle (^{190}\text{Pb}, ^{208}\text{Pb}) = -0.851$ fm ² 2 (2013An02). $\delta \langle r^2 \rangle (^{190}\text{Pb}, ^{208}\text{Pb}) = -0.839$ fm ² 10 (2007De09 , 2009Se13 , 2006Se18 , 2004DeZV); uncertainty from isotope shift is 0.005 fm ² . $\Delta \langle r^2 \rangle (^{190}\text{Pb} - ^{208}\text{Pb}) = -0.840$ fm ² 10 (1991Du07), -0.839 fm ² 10 (2007De09 , 2009Se13).
658 4	0 ⁺	≤ 0.22 ns	B	E(level): from ^{194}Po α decay. J^π : E0 transition to g.s. Interpreted as an intruder state (1989De18). $T_{1/2}$: from $(\alpha)(\text{ce})(t)$ (1989De18).
773.9 [#] 4	2 ⁺		ABCD	J^π : E2 774.0 γ to 0 ⁺ .
1163.0 [@] 4	(2 ⁺)		D	
1229.1 [#] 6	(4 ⁺)		A CD	J^π : E2 455.4 γ to 2 ⁺ .
1521.3 [@] 6	(4 ⁺)		D	
1735.9 [#] 7	(6 ⁺)		A CD	J^π : E2 506.8 γ to (4 ⁺).
1905.6 ^b 7	(5 ⁻)		D	
1937.2 [@] 7	(6 ⁺)		D	
2251.8 8	(8 ⁺)		D	J^π : E2 515.9 γ to (6 ⁺).
2276.2 8	(8 ⁺)		A CD	J^π : E2 γ to (6 ⁺).
2406.4 ^b 8	(7 ⁻)		D	
2463.2 [@] 7	(8 ⁺)		D	
2606 ^d 1	(7 ⁻)		D	
2614.8 8	(10 ⁺)	150 ns	CD	J^π : E2 γ to (8 ⁺). $T_{1/2}$: from $^{166}\text{Er}(^{28}\text{Si}, 4n\gamma)$ (1998Dr06). Configuration= $\nu i_{13/2}^{-2}$ (1998Dr06).

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Adopted Levels, Gammas (continued) ^{190}Pb Levels (continued)

E(level) [†]	J ^{π‡}	T _{1/2}	XREF	Comments
2615+x ^c	(12 ⁺)	25 μs	CD	E(level): x≈120 (1998Dr06). This level probably decays to 2615, (10 ⁺) level, through a transition of energy x. T _{1/2} : from $^{166}\text{Er}(^{28}\text{Si}, 4n\gamma)$ (1998Dr06). Configuration= $\nu i_{13/2}^{-2}$ (1998Dr06).
2622.8 ^b 8	(9 ⁻)		D	
2658.2 ^{&} 8	(11 ⁻)	7.2 μs 6	CD	J ^π : E3 γ to (8) ⁺ . T _{1/2} : from $^{166}\text{Er}(^{28}\text{Si}, 4n\gamma)$ (2001Dr05). Other: 7.9 μs 4 (1985St16). Configuration= $\pi i_{13/2} h_{9/2}$ (1998Dr06).
2825.3 9	(10 ⁺)		D	
2973 ^d 1	(9 ⁻)		D	
3055.3 ^b 10	(11 ⁻)		D	
3180.2 ^{&} 9	(12 ⁻)		D	
3196.7 10	(12 ⁺)		D	
3238.3 ^b 11	(12 ⁻)		D	
3350 ^d 1	(11 ⁻)		D	
3435.3 14	(12 ⁺)		D	
3512.0+x ^c 10	(14 ⁺)		D	
3601.3 ^{&} 9	(13 ⁻)		D	
4030.0+x ^c 15	(15 ⁺)		D	
4093.2 ^{&} 10	(14 ⁻)		D	
4328.1 ^{&} 10	(15 ⁻)		D	
4507.0+x ^c 18	(16 ⁺)		D	
4516.8 ^a 11	(16 ⁺)	≈14 ns	D	T _{1/2} : from $^{166}\text{Er}(^{28}\text{Si}, 4n\gamma)$ (1998Dr06).
4865.2 ^a 12	(17 ⁺)		D	
5111.3 ^a 13	(18 ⁺)		D	
5330.3 ^a 14	(19 ⁺)		D	
y ^e	J≈(10 ⁺)		D	J ^π : the interband SD band transitions of 310, 350, 389 and 428 seen in coincidence with a large number of low-lying transitions from (9 ⁻) to (12 ⁺) levels. Most of the decay out of the band is from the two lowest states in the SD band.
309.7+y ^e 8	J+2		D	
660.0+y ^e 11	J+4		D	
1048.8+y ^e 13	J+6		D	
1476.7+y ^e 16	J+8		D	
1942.7+y ^e 18	J+10		D	
2446.7+y ^e 20	J+12		D	
2985.7+y ^e 23	J+14		D	

[†] From a least-squares fit to γ-ray energies, assuming Δ(Eγ)=0.5 keV for each γ ray, except when stated.[‡] As proposed in $^{166}\text{Er}(^{28}\text{Si}, 4n\gamma)$ (1998Dr06, 2001Dr05), which are based on systematics, band structures and multipolarity assignments from ce data.

Band(A): g.s. band.

@ Band(B): $K^{\pi}=2^{+}$ band.& Seq.(D): γ cascade based on (11⁻).^a Seq.(E): γ cascade based on (16⁺).^b Seq.(F): γ cascade based on (5⁻).^c Seq.(G): γ cascade based on (12⁺).

Adopted Levels, Gammas (continued) ^{190}Pb Levels (continued)^d Seq.(H): γ cascade based on (7⁻).^e Band(C): SD band (2005Wi10). Band assignment from 2005Wi10. Population intensity=0.5% of the reaction channel.

$\gamma(^{190}\text{Pb})$								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	$\alpha^\#$	Comments
658	0 ⁺	658		0.0	0 ⁺	E0		Mult.: from ¹⁹⁴ Po α decay.
773.9	2 ⁺	774.0	100	0.0	0 ⁺	E2	0.01113	E_γ : other: 883.8 from ¹⁹⁰ Bi ε decay.
1163.0	(2 ⁺)	389.1		773.9	2 ⁺			
		1162.9		0.0	0 ⁺			
1229.1	(4 ⁺)	455.3	100	773.9	2 ⁺	E2	0.0369	E_γ : other: 455.0 from ¹⁹⁰ Bi ε decay.
1521.3	(4 ⁺)	292		1229.1	(4 ⁺)			
		358.2	100	1163.0	(2 ⁺)			
		748		773.9	2 ⁺			
1735.9	(6 ⁺)	506.8	100	1229.1	(4 ⁺)	E2	0.0284	E_γ : other: 506.2 from ¹⁹⁰ Bi ε decay.
1905.6	(5 ⁻)	676.5	100	1229.1	(4 ⁺)			
1937.2	(6 ⁺)	415.8	100	1521.3	(4 ⁺)			
		708		1229.1	(4 ⁺)			
2251.8	(8 ⁺)	515.9	100	1735.9	(6 ⁺)	E2	0.0273	
2276.2	(8 ⁺)	338.8		1937.2	(6 ⁺)			
		540.4		1735.9	(6 ⁺)	E2	0.0244	E_γ : other: 539.4 from ¹⁹⁰ Bi ε decay.
2406.4	(7 ⁻)	500.9		1905.6	(5 ⁻)			
		670.6		1735.9	(6 ⁺)			
2463.2	(8 ⁺)	525.9		1937.2	(6 ⁺)			
		727.4		1735.9	(6 ⁺)			
2606	(7 ⁻)	700		1905.6	(5 ⁻)			
		870		1735.9	(6 ⁺)			
2614.8	(10 ⁺)	338.6	100	2276.2	(8 ⁺)	E2	0.0813	B(E2)(W.u.)=0.012
		362.9		2251.8	(8 ⁺)	[E2]	0.0670	
2622.8	(9 ⁻)	216.4		2406.4	(7 ⁻)	[E2]	0.327	
		370.9		2251.8	(8 ⁺)	[E1]		
2658.2	(11 ⁻)	43.2	38 10	2614.8	(10 ⁺)	[E1]	0.88 3	B(E1)(W.u.)=5.7×10 ⁻⁸ 18
		382.0	34 4	2276.2	(8 ⁺)	(E3)	0.245	B(E3)(W.u.)=9.6 17
		406.5	100 7	2251.8	(8 ⁺)	E3	0.195	B(E3)(W.u.)=18 3
2825.3	(10 ⁺)	167@		2658.2	(11 ⁻)			
		211@		2614.8	(10 ⁺)			
		549		2276.2	(8 ⁺)			
		573		2251.8	(8 ⁺)			
2973	(9 ⁻)	367		2606	(7 ⁻)			
		566		2406.4	(7 ⁻)			
3055.3	(11 ⁻)	432.5		2622.8	(9 ⁻)			
3180.2	(12 ⁻)	522.0		2658.2	(11 ⁻)			
3196.7	(12 ⁺)	581.9		2614.8	(10 ⁺)			
3238.3	(12 ⁻)	183.0		3055.3	(11 ⁻)			
3350	(11 ⁻)	377		2973	(9 ⁻)			
		728		2622.8	(9 ⁻)			
3435.3	(12 ⁺)	610		2825.3	(10 ⁺)			
3512.0+x	(14 ⁺)	897		2615+x	(12 ⁺)			
3601.3	(13 ⁻)	421.2		3180.2	(12 ⁻)			
		943.1		2658.2	(11 ⁻)			
4030.0+x	(15 ⁺)	518		3512.0+x	(14 ⁺)			
4093.2	(14 ⁻)	491.8		3601.3	(13 ⁻)			
		913.0@		3180.2	(12 ⁻)			
4328.1	(15 ⁻)	234.7		4093.2	(14 ⁻)			
		726.9		3601.3	(13 ⁻)			

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Adopted Levels, Gammas (continued) $\gamma(^{190}\text{Pb})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	E_f	J_f^π	Mult. [‡]	Comments
4507.0+x	(16 ⁺)	477	4030.0+x	(15 ⁺)		
4516.8	(16 ⁺)	188.7	4328.1	(15 ⁻)		
4865.2	(17 ⁺)	348.4	4516.8	(16 ⁺)		
5111.3	(18 ⁺)	246.1	4865.2	(17 ⁺)		
5330.3	(19 ⁺)	219.0	5111.3	(18 ⁺)		
309.7+y	J+2	309.7 8	y	J $\approx$ (10 ⁺)	(E2)	
660.0+y	J+4	350.3 7	309.7+y	J+2	(E2)	
1048.8+y	J+6	388.8 8	660.0+y	J+4	(E2)	
1476.7+y	J+8	427.9 8	1048.8+y	J+6	(E2)	
1942.7+y	J+10	466.0 9	1476.7+y	J+8		
2446.7+y	J+12	504 1	1942.7+y	J+10		E_γ : strongly contaminated by a low-lying 504 γ in ^{190}Pb .
2985.7+y?	J+14	539 [@] 1	2446.7+y	J+12		

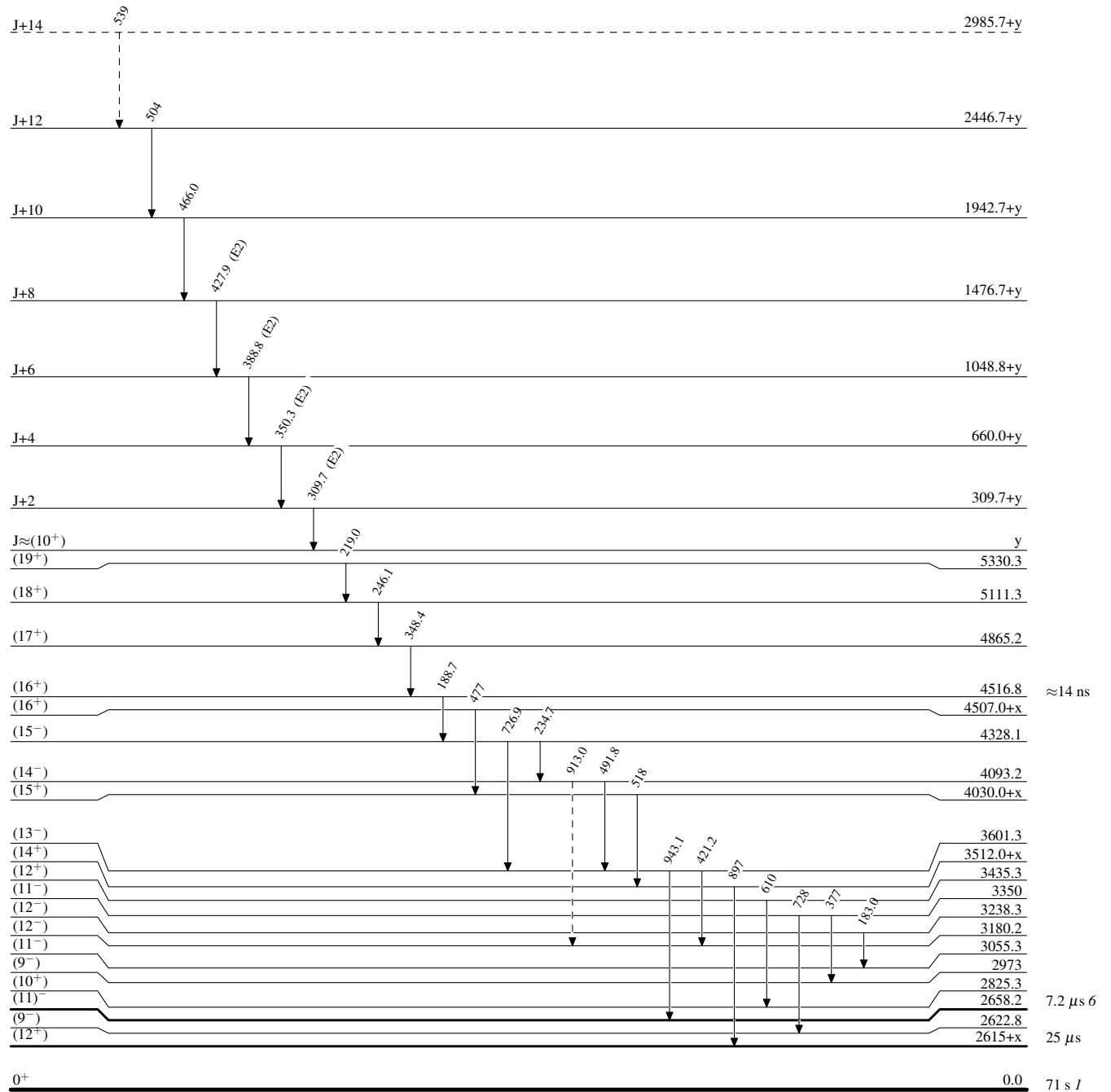
[†] From $^{166}\text{Er}(^{28}\text{Si},4n\gamma)$.[‡] From ce data and DCO values (for SD band transitions) in $^{166}\text{Er}(^{28}\text{Si},4n\gamma)$.[#] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.[@] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

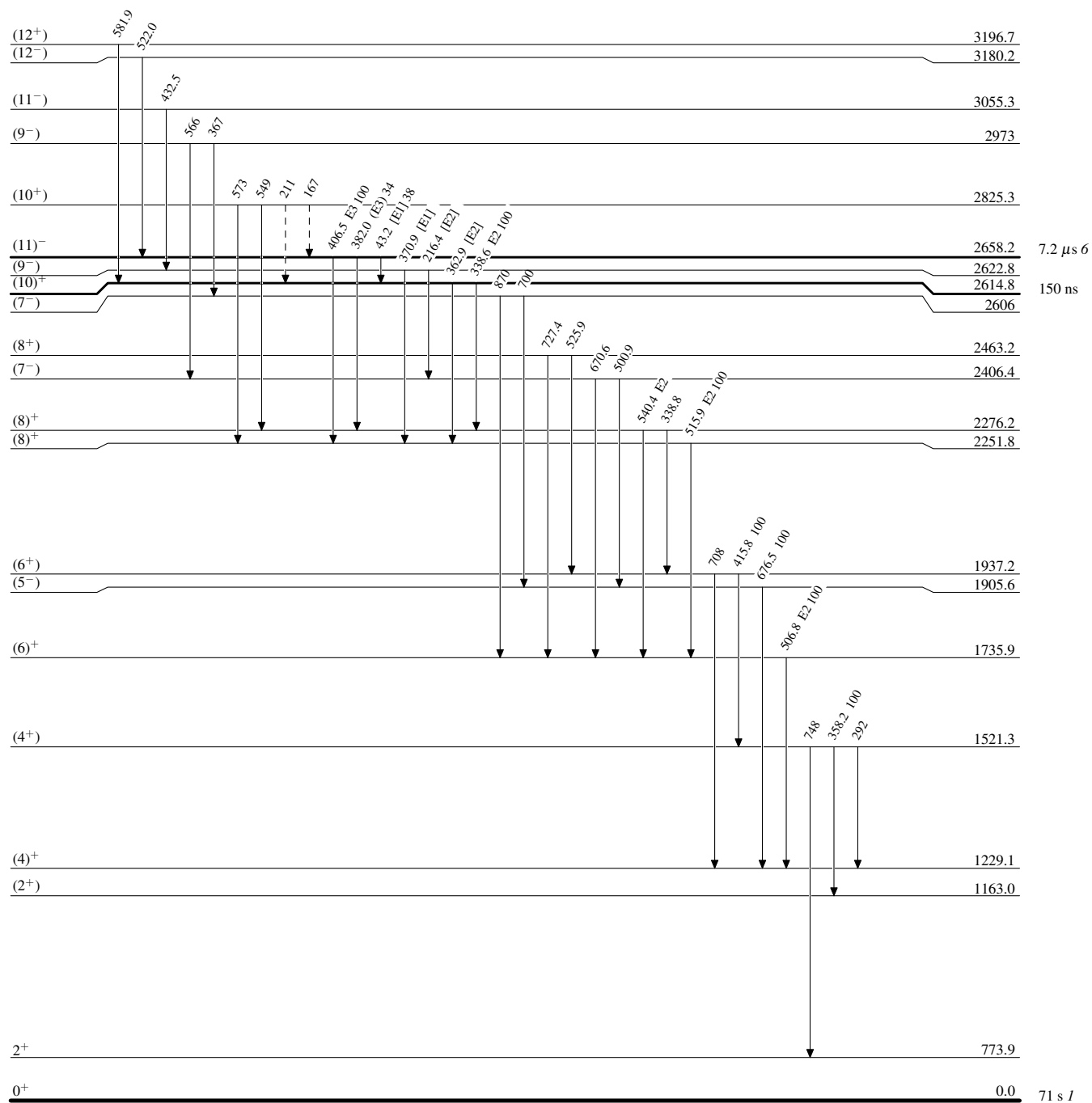
-----► γ Decay (Uncertain)


Adopted Levels, Gammas

Legend

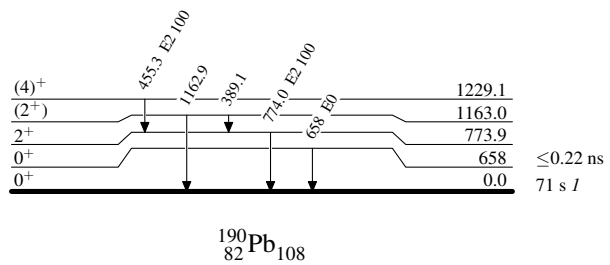
Level Scheme (continued)

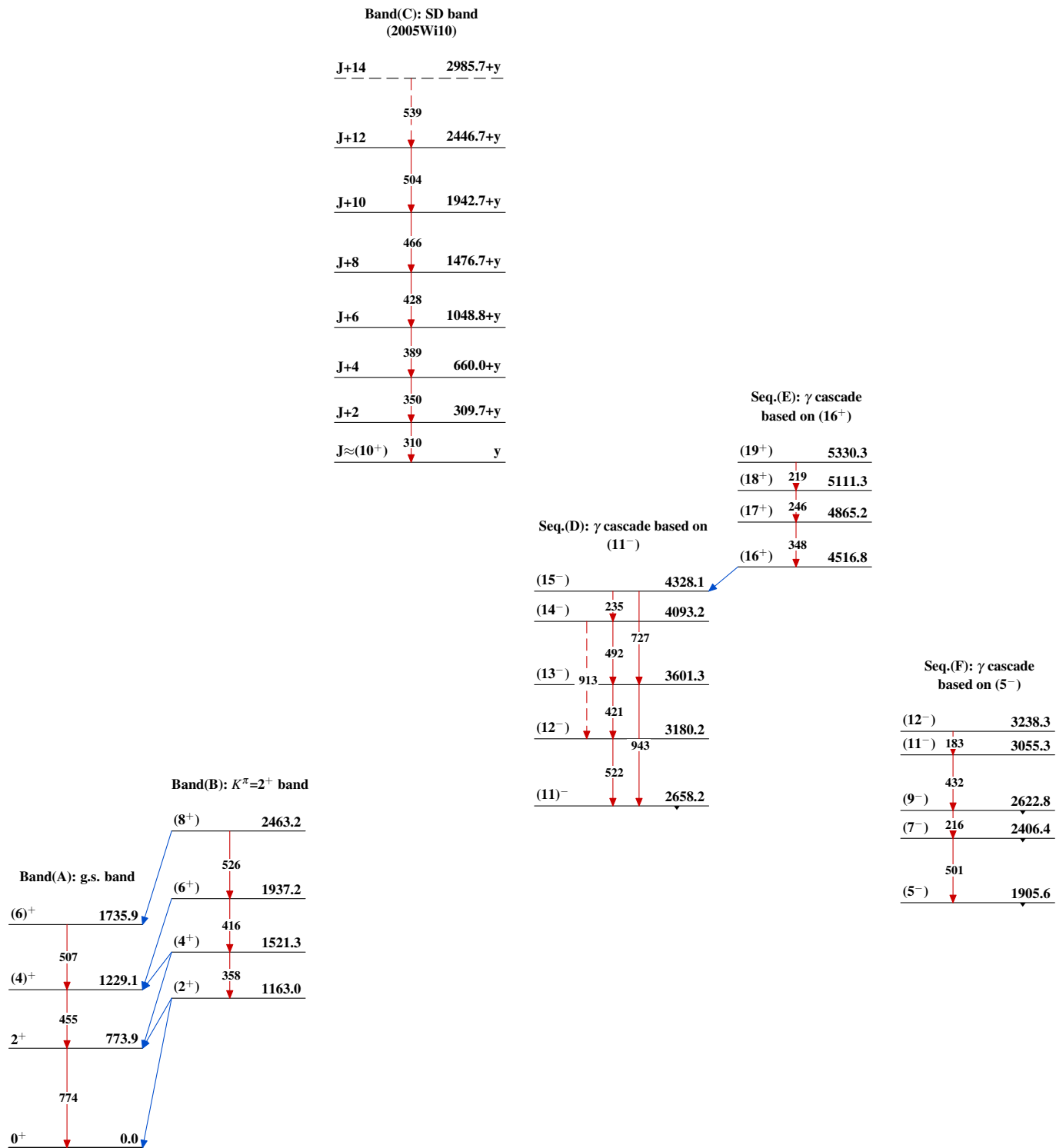
Intensities: Relative photon branching from each level

-----► γ Decay (Uncertain)


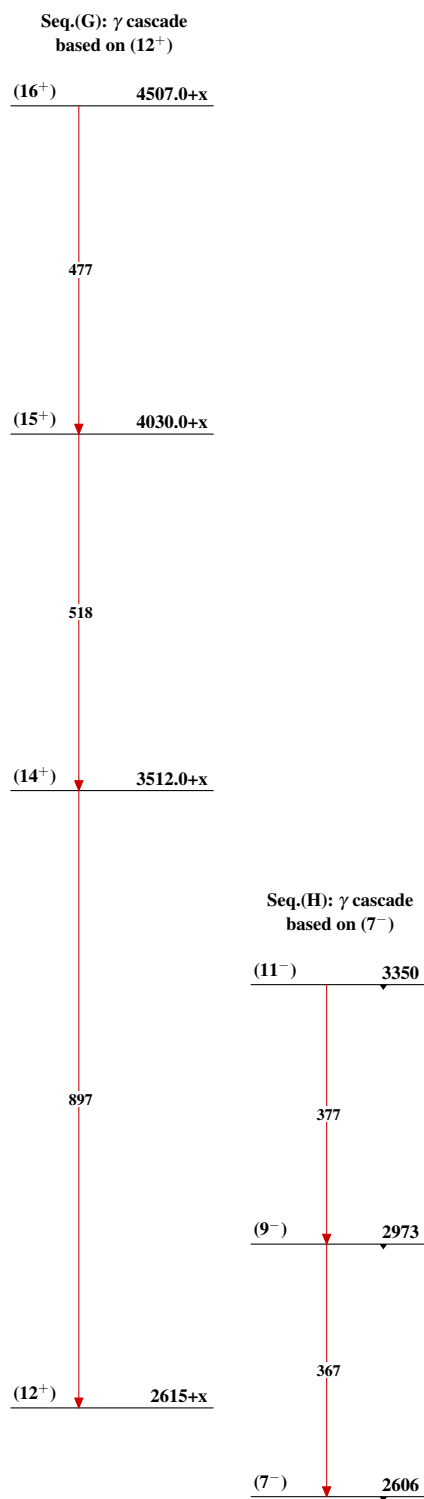
Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level

 $^{190}_{82}\text{Pb}_{108}$

Adopted Levels, Gammas

Adopted Levels, Gammas (continued)


 $^{190}_{82}\text{Pb}_{108}$