

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Ashok Jain, Sukhjeet Singh, Suresh Kumar, Jagdish Tuli		NDS 108,883 (2007)	15-Jan-2007

Q(β^-)= -2.41×10^3 6; S(n)= 7.29×10^3 5; S(p)= 3.04×10^3 6; Q(α)= 7.78×10^3 5 [2012Wa38](#)

Note: Current evaluation has used the following Q record -2410 50 7300 50 3040 50 7780 50 [2003Au03](#).

Assignment: parent ²¹⁷Fr ([1951Ke53](#) and [1968Ha14](#)); excitation functions and cross bombardments ([1970Bo13](#)).

Theory, Calculations:

[1980Ji02](#): Deduced fission barrier from ²⁰⁹Bi(¹²C,F) reaction.

[2006Ho03](#): Angular distribution and correlation of two alphas emitted in ¹⁸O on ^{207,208}Pb targets gated on the 143,398,463 gammas of ²²¹Ac.

[1994Sh46](#): Interpretation of data in terms of reflection symmetry breaking.

[1991Cw01](#): Calculated levels and reviewed data.

²²¹Ac Levels

Cross Reference (XREF) Flags

- A ²²⁵Pa α decay
- B ²⁰⁹Bi(¹⁴C,2n γ)

E(level)	J π &	T _{1/2}	XREF	Comments
0.0 [‡]	(3/2 ⁻)	52 ms 2	AB	% α =100 J π : from calculated level systematics. T _{1/2} : from 1970Bo13 .
9.0 [#] 5	(5/2 ⁻)		B	E(level): Deduced from the level scheme.
52? 15			A	XREF: A(?).
148.4 [‡] 3	(7/2 ⁻)		B	
201.2 [#] 4	(9/2 ⁻)		B	
321.1 [†] 4	(9/2 ⁺)		B	
380.7 [‡] 4	(11/2 ⁻)		B	
413.8 [@] 5	(11/2 ⁺)		B	
459.5 [#] 5	(13/2 ⁻)		B	
523.2 [†] 4	(13/2 ⁺)		B	
639.1 [@] 5	(15/2 ⁺)		B	
663.1 [‡] 4	(15/2 ⁻)		B	
762.8 [#] 5	(17/2 ⁻)		B	
789.9 [†] 4	(17/2 ⁺)		B	
926.4 [@] 5	(19/2 ⁺)		B	
980.0 [‡] 5	(19/2 ⁻)		B	
1097.0 [#] 5	(21/2 ⁻)		B	
1106.0 [†] 5	(21/2 ⁺)		B	
1261.4 [@] 5	(23/2 ⁺)		B	
1324.8 [‡] 5	(23/2 ⁻)		B	
1457.2 [#] 5	(25/2 ⁻)		B	
1459.7 [†] 5	(25/2 ⁺)		B	
1631.4 [@] 5	(27/2 ⁺)		B	
1697.1 [‡] 5	(27/2 ⁻)		B	
1843.6 [†] 5	(29/2 ⁺)		B	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

²²¹Ac Levels (continued)

E(level)	J ^π &	XREF	E(level)	J ^π &	XREF
1843.8 [#] 5	(29/2 ⁻)	B	2255.3 [#] 6	(33/2 ⁻)	B
2029.8 [@] 5	(31/2 ⁺)	B	2255.4 [†] 5	(33/2 ⁺)	B
2095.3 [‡] 5	(31/2 ⁻)	B	2454.2 [@] 6	(35/2 ⁺)	B
			2514.4 [‡] 6	(35/2 ⁻)	B

[†] Band(A): 9/2⁺ band.

[‡] Band(B): 3/2⁻ band.

[#] Band(C): 5/2⁻ band, s=-i.

[@] Band(D): 11/2⁺ band, s=-i.

& From 1994Ai01 in ²⁰⁹Bi(¹⁴C,2n γ). J^π derived by the authors from theory for odd-A actinides using reflection asymmetric mean-field approach. Excited-state assignments are based on assumption of 3/2⁻ and 5/2⁻ for the g.s. and the 9.0-keV level, respectively.

γ (²²¹Ac)

E _i (level)	J _i ^π	E _{γ}	I _{γ} [‡]	E _f	J _f ^π	Mult. [†]	Comments
9.0	(5/2 ⁻)	(9.0 5)		0.0	(3/2 ⁻)		
148.4	(7/2 ⁻)	139.4		9.0	(5/2 ⁻)	M1	
		148.4 3		0.0	(3/2 ⁻)	(E2)	
201.2	(9/2 ⁻)	52.8 5		148.4	(7/2 ⁻)	M1	E _{γ} : Deduced from the level scheme.
		192.2 3		9.0	(5/2 ⁻)	E2	
321.1	(9/2 ⁺)	172.7 3		148.4	(7/2 ⁻)	E1	
380.7	(11/2 ⁻)	59.6 3	30 8	321.1	(9/2 ⁺)	E1	
		179.5 3	<57	201.2	(9/2 ⁻)	M1	
		232.3 3	100 8	148.4	(7/2 ⁻)	E2	
413.8	(11/2 ⁺)	212.5 3	100	201.2	(9/2 ⁻)		
459.5	(13/2 ⁻)	45.8 3		413.8	(11/2 ⁺)		
		78.8		380.7	(11/2 ⁻)	M1	
		258.3 3		201.2	(9/2 ⁻)	E2	
523.2	(13/2 ⁺)	142.5 3	100 2	380.7	(11/2 ⁻)	E1	
		202.2 3	11 2	321.1	(9/2 ⁺)		
639.1	(15/2 ⁺)	179.6 3		459.5	(13/2 ⁻)		
		225.2 3		413.8	(11/2 ⁺)		
663.1	(15/2 ⁻)	139.9 3	<100	523.2	(13/2 ⁺)	E1	
		203.7 3	29 7	459.5	(13/2 ⁻)	M1	α (exp)>2.0.
		282.4 3	97 7	380.7	(11/2 ⁻)	E2	
762.8	(17/2 ⁻)	123.7 3	100 5	639.1	(15/2 ⁺)		
		303.3 3	59 5	459.5	(13/2 ⁻)		
789.9	(17/2 ⁺)	126.7 3	100 4	663.1	(15/2 ⁻)		
		150.8 3	8 3	639.1	(15/2 ⁺)		
		266.7 3	24 3	523.2	(13/2 ⁺)		
926.4	(19/2 ⁺)	163.6 3	100 2	762.8	(17/2 ⁻)		
		287.2 3	15 2	639.1	(15/2 ⁺)		
980.0	(19/2 ⁻)	190.1 3	100 6	789.9	(17/2 ⁺)		
		317.0 3	18 6	663.1	(15/2 ⁻)		
1097.0	(21/2 ⁻)	170.7 3	100 6	926.4	(19/2 ⁺)		
		334.1 3	39 6	762.8	(17/2 ⁻)		
1106.0	(21/2 ⁺)	126.0 3	100 6	980.0	(19/2 ⁻)		
		316.2 3	52 6	789.9	(17/2 ⁺)		
1261.4	(23/2 ⁺)	164.3 3	100 5	1097.0	(21/2 ⁻)		
		334.9 3	37 5	926.4	(19/2 ⁺)		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{221}\text{Ac})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ	I_γ^\ddagger	E_f	J_f^π	$E_i(\text{level})$	J_i^π	E_γ	I_γ^\ddagger	E_f	J_f^π
1324.8	(23/2 ⁻)	218.8 3	100 5	1106.0	(21/2 ⁺)	1843.8	(29/2 ⁻)	386.6 3	49 6	1457.2	(25/2 ⁻)
		344.9 3	18 5	980.0	(19/2 ⁻)	2029.8	(31/2 ⁺)	186.3 3	100 9	1843.8	(29/2 ⁻)
1457.2	(25/2 ⁻)	195.8 3	100 5	1261.4	(23/2 ⁺)			398.4 3	64 9	1631.4	(27/2 ⁺)
		360.2 3	49 5	1097.0	(21/2 ⁻)	2095.3	(31/2 ⁻)	251.4 3		1843.6	(29/2 ⁺)
1459.7	(25/2 ⁺)	134.8 3		1324.8	(23/2 ⁻)			398.3 3		1697.1	(27/2 ⁻)
		353.7 3		1106.0	(21/2 ⁺)	2255.3	(33/2 ⁻)	225.4 3		2029.8	(31/2 ⁺)
1631.4	(27/2 ⁺)	174.1 3	100 5	1457.2	(25/2 ⁻)			411.5 3		1843.8	(29/2 ⁻)
		369.9 3	64 5	1261.4	(23/2 ⁺)	2255.4	(33/2 ⁺)	160.3 3		2095.3	(31/2 ⁻)
1697.1	(27/2 ⁻)	237.5 3		1459.7	(25/2 ⁺)			411.7 3		1843.6	(29/2 ⁺)
		372.4 3		1324.8	(23/2 ⁻)	2454.2	(35/2 ⁺)	198.8 3		2255.3	(33/2 ⁻)
1843.6	(29/2 ⁺)	146.4 3		1697.1	(27/2 ⁻)			425.2 8		2029.8	(31/2 ⁺)
		384.0 3		1459.7	(25/2 ⁺)	2514.4	(35/2 ⁻)	259.0 3		2255.4	(33/2 ⁺)
1843.8	(29/2 ⁻)	212.3 3	100 6	1631.4	(27/2 ⁺)			419.1 3		2095.3	(31/2 ⁻)

† From ce (1994Ai01).

‡ Relative photon branching from each level.

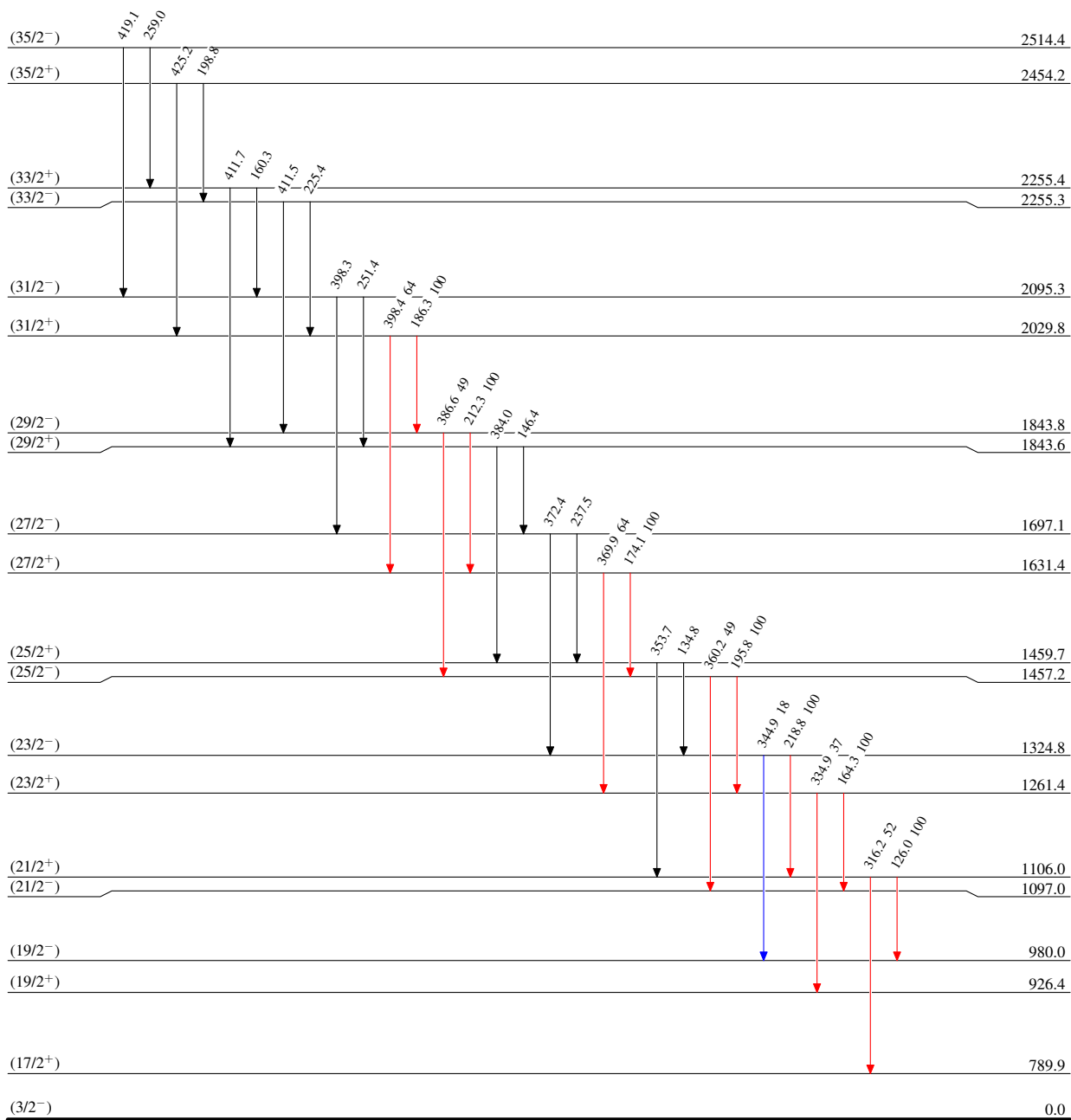
Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

Legend

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



52 ms 2

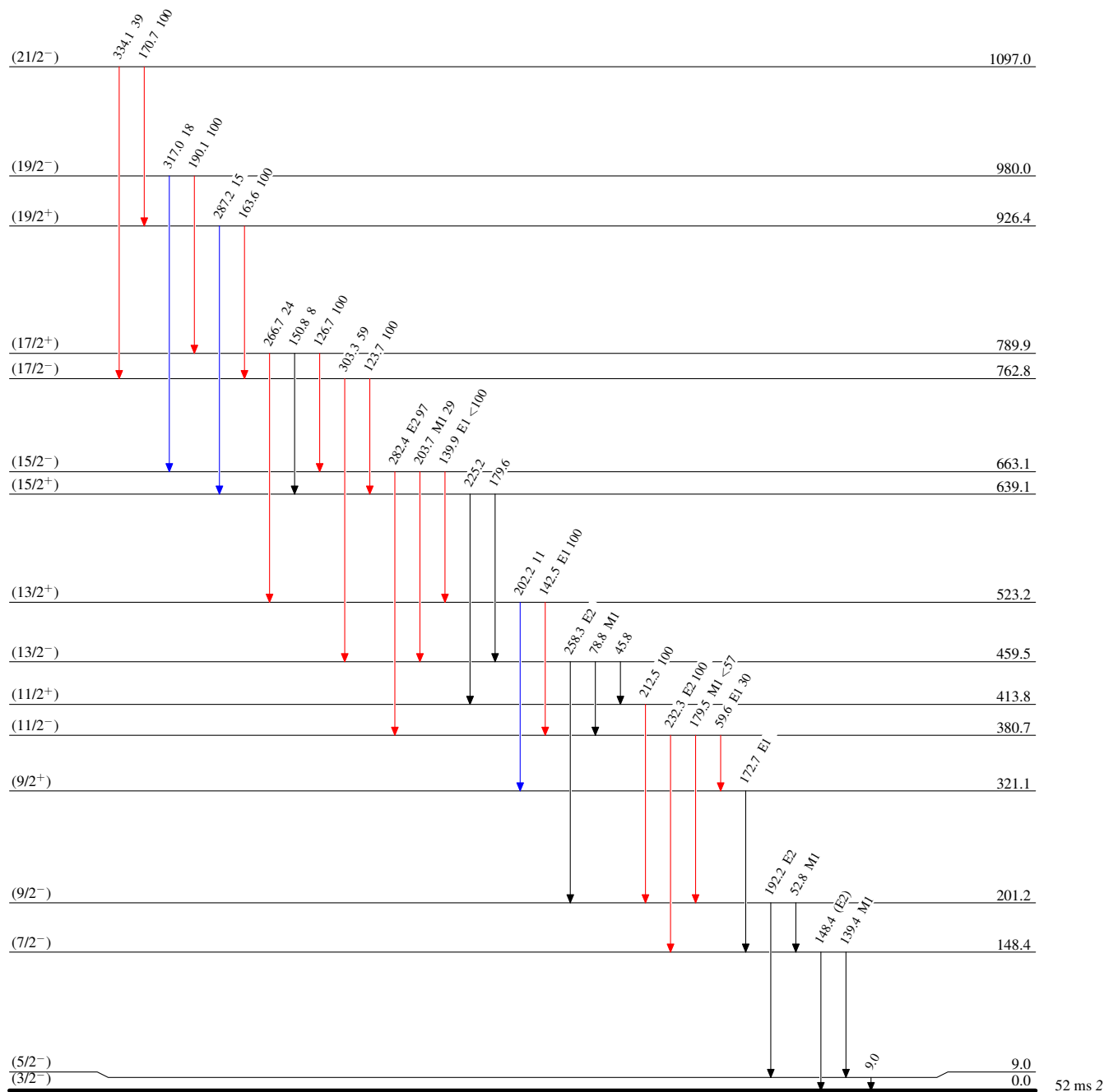
Adopted Levels, Gammas

Legend

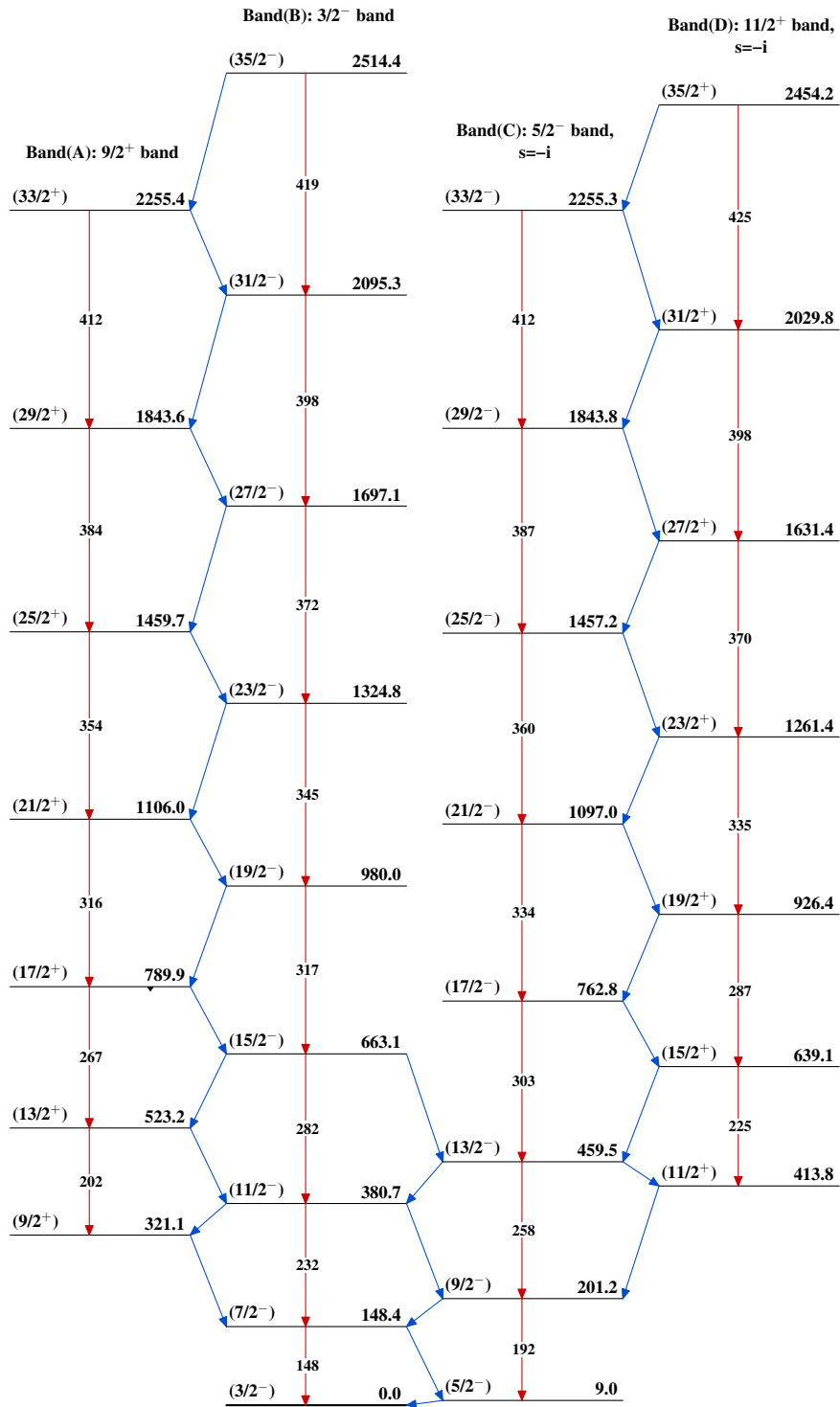
Level Scheme (continued)

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)



$^{221}_{89}\text{Ac}_{132}$

Adopted Levels, Gammas $^{221}_{89}\text{Ac}_{132}$