Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 199,271 (2025)	1-Sep-2024

Q(β^-)=−280.9 *5*; S(n)=10159.3 *14*; S(p)=7506.5 *14*; Q(α)=−6485.6 *20* 2021Wa16
S(2n)=18051.6 *14*, S(2p)=18919 *5* (2021Wa16).

Other Reactions:

Br(γ,γ'): photoexcitation of 35−μs 536 level via intermediate structures at 3.45 MeV *15* (1990Po07) and at 4.80 MeV *15* (1993Du10).

2015Al19: Isotopic yield cross section σ(^{81}Br)=0.125 mb *17*, in spallation of ^{136}Xe-induced reactions on deuterium at 500 MeV/nucleon.

^{81}Br Levels

Cross Reference (XREF) Flags

A	^{81}Se β^- decay (18.5 min)	E	^{80}Se(p,γ)	I	^{80}Se(α,p2nγ),^{78}Se(α,pγ)
B	^{81}Se β^- decay (57.28 min)	F	^{80}Se(p,p),(p,n) IAR	J	^{81}Br(n,n$'\gamma$)
C	^{81}Kr ε decay (2.13×10^5 y)	G	^{80}Se(d,nγ)	K	^{81}Br(p,p$'\gamma$)
D	^{81}Kr ε decay (13.10 s)	H	^{80}Se(^{3}He,d)	L	Coulomb excitation

E(level)[†]	J$^\pi$	T$_{1/2}$[a]	XREF	Comments
0.0[d]	3/2$^-$	stable	ABCDE GHIJKL	μ=+2.2686 *6* Q=+0.2579 *2* Octupole mom(mag)=+0.129 <r^2>$^{1/2}$(charge)=4.1599 fm *21* (2013An02). J$^\pi$: 3/2 from hyperfine splitting (1930Br01,1954Ki11); L(^{3}He,d)=1. (π p$_{3/2}$) configuration dominant (1996Ja09). μ: from NMR (2019StZV, from 1972Bl07). Their earlier value μ=2.262612 *4* (1970Bl08). g(^{81}Br)/g(^{79}Br)=1.0779355 *3* (1970Lu02). Q: from 2021StZZ, 2018Py01, 2013Ch52 (Atomic Beam). Others: +0.2615 *25* (2001Bi17 – (reassessment of atomic beam data from 1954Ki11)), +0.266 *4* (2004Al08, erratum) and +0.254 *6* (2000Ha64), +0.276 *4* (1989Ra17 from 1978Ta24; 1998Se09); all reassessments of atomic beam data of 1954Ki11. Sternheimer correction included. Q(^{79}Br)/Q(^{81}Br)=1.1970568 *15* (1969He04). Octupole mom(mag): atomic beam magnetic resonance (1966Br03).
275.986[d] *9*	5/2$^-$	9.7 ps *14*	ABC E GHIJKL	μ=1.6 *5* J$^\pi$: L(^{3}He,d)=3, M1+E2 275γ to 3/2$^-$. (π f$_{5/2}$) dominates configuration (1996Ja09). T$_{1/2}$: from DSAM in Coulomb excitation (1996Ja09). Others: 235 ps *15* from 290γ-276γ(t) in ^{81}Se β^- decay (18.5 min) (1974SaYH, 1974LiZL), 10 ps *6* from B(E2)↑=0.0508 *25* in Coulomb excitation and adopted transition properties. μ: from (2020StZV, 1996Ja09) transient field integral perturbed angular correlation in Coulomb excitation and adopted J.
536.291[c] *15*	9/2$^+$	36 μs *3*	B E GHIJ	μ=5.70 *5* J$^\pi$: M2 γ to 5/2$^-$. L(^{3}He,d)=4+1 for (536+538) doublet; this level is presumed to be the L=4 component since π=+ based on γ-decay mode. (π g$_{9/2}$) configuration dominant (1996Ja09). T$_{1/2}$: weighted average of 35 μs *9* and 40 μs *10* from 1967Iv03 (different reactions), 46 μs *7* (1968Iv02), 32 μs *3* (1971Ch28), 37 μs *3* (1958Du80 – γ(t) – authors speculated T$_{1/2}$ could be either of ^{79}Br or ^{81}Br – the evaluator considers it is for the latter isotope – produced by (γ,γ')).

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Adopted Levels, Gammas (continued)

^{81}Br Levels (continued)

E(level)[†]	J$^{\pi}$	$T_{1/2}$[a]	XREF	Comments
				μ: stroboscopic perturbed angular distribution [2020StZV, from 1972Ch34 (does not include Knight-shift corrections) – authors other article report g-factor=1.261 *10* (1971Ch28) yields μ=5.675 *45*]. Absolute μ=5.84 *7* from measured g-factor=1.297 *15* (1971Br31).
538.194 *14*	1/2$^-$,3/2$^-$[&]	0.76 ps *3*	A E GH JKL	J$^{\pi}$: M1+E2 γ to 3/2$^-$. L(^{3}He,d)=4+1 for (536+538) doublet; this level presumed to be the L=1 component since π=− from γ-decay mode. J=1/2 favored by excit in (d,nγ).
566.124 *9*	3/2$^-$	68 ps *+32−18*	A E G IJ L	J$^{\pi}$: E2+M1 γ to 5/2$^-$ and 3/2$^-$; log *ft*=6.4 from 1/2$^-$ in ^{81}Se β^- decay (18.5 min). $T_{1/2}$: 68 ps *+32−18* if δ(566γ)=−3.0 *5*; 0.5 ps *13-5* if δ(566γ)=−0.08 *5* (however, see comment on δ from (p,γ) for 566γ).
650.003 *16*	(3/2)$^-$[&]	2.6 ps *3*	A E GH J L	J$^{\pi}$: 1/2$^-$,3/2$^-$ from L(^{3}He,d)=1 and J=(3/2,5/2) from $\gamma(\theta)$ measurements in (p,γ).
767.04 *10*	(5/2)$^-$[&]	0.54 ps *4*	B E GH JKL	μ=1.0 *4* J$^{\pi}$: M1+E2 γ to 3/2$^-$ and 5/2$^-$; absence of β^- branch from 1/2$^-$ ^{81}Se. μ: from transient field integral perturbed angular correlation (2020StZV, 1996Ja09) in Coulomb excitation and adopted J.
789.258 *19*	5/2$^+$		B E GH	XREF: H(792.5). J$^{\pi}$: L(^{3}He,d)=2; J=5/2 from $\gamma(\theta)$ in (d,nγ). E(level): 792.5 *27* from (^{3}He,d).
828.434 *15*	3/2$^-$	0.46 ps *7*	A E GH J L	XREF: H(832.4). J$^{\pi}$: L(^{3}He,d)=1; M1+E2 γ to 5/2$^-$.
836.82[d] *10*	7/2$^-$[&]	1.05 ps *7*	A E G IJKL	μ=1.4 *4* J$^{\pi}$: direct excitation in Coulomb excitation of 3/2$^-$ ^{81}Br; $\gamma(\theta)$ in (p,γ); E2, ΔJ=2, γ to 3/2$^-$. $T_{1/2}$: from Coulomb excitation (DSAM and B(E2)). μ: from transient field integral perturbed angular correlation (2020StZV, 1996Ja09) in Coulomb excitation and adopted J.
906 *15*			E	
975 *15*			E	
1023.7 *4*	5/2$^{(-)}$		E G JK	J$^{\pi}$: D 458γ to 3/2$^-$ 566; Q 485γ to 1/2$^-$,3/2$^-$ 538; π from excit in (d,nγ).
1076.2? *7*			J	E(level): level shown as tentative because the transitions involved are weak and/or might also be placed elsewhere in ^{79}Br or ^{81}Br level schemes.
1105.3 *6*	(1/2)$^-$		A E GH J	J$^{\pi}$: L(^{3}He,d)=1; J=1/2 favored by $\gamma(\theta)$ and excit in (d,nγ). E(level): from Eγ in (d,nγ). E=1105 *2* in (n,n′γ) for tentative level.
1170 *15*			E	
1176.90[c] *20*	(13/2)$^+$		G I	J$^{\pi}$: stretched E2 641γ to 9/2$^+$; band assignment; excit in (d,nγ).
1189.9 *21*	5/2$^-$,7/2$^-$		H	J$^{\pi}$: L(^{3}He,d)=3.
1237.88 *10*			E G JK	J$^{\pi}$: γ to 3/2$^-$ and 5/2$^-$, so J≤(7/2).
1266.4[d] *3*	9/2$^{(-)}$		G I	J$^{\pi}$: stretched Q intraband 990γ to 5/2$^-$ 276; D+Q 430γ to 7/2$^-$ 837.
1266.9 *6*	(3/2$^-$,5/2,7/2$^-$)		J	J$^{\pi}$: γ to 3/2$^-$ and 7/2$^-$.
1300 *15*			E	
1323.0 *4*	(5/2)$^-$	≤0.31 ps	GH J L	XREF: H(1325.7). J$^{\pi}$: L(^{3}He,d)=3 for level at 1325.7 *19* which evaluator presumes to be this level since energy scale in (^{3}He,d) is

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Adopted Levels, Gammas (continued)

^{81}Br Levels (continued)

E(level)[†]	J^π	XREF	Comments
			typically several keV high; 1323γ to 3/2⁻ g.s.; 486γ to 7/2⁻ 837; J=5/2 from excit in (d,nγ), consistent with γ(θ). $T_{1/2}$: from measured B(E2) in Coulomb excitation and adopted branching, assuming J=5/2.
1327.3 *4*		A E	J^π: γ to (5/2)⁻ and (3/2)⁻, so J≤(7/2).
1349.8 *5*		E JK	J^π: γ to 3/2⁻ and (5/2)⁻, so J≤(7/2).
1371.4 *10*	7/2⁺	GH	XREF: H(1375.7). E(level): other: 1375.7 *29* (^{3}He,d). J^π: L(^{3}He,d)=4; D(+Q) 582γ to 5/2⁺ 789.
1400.9? *10*		E J	J^π: possible γ to 3/2⁻ g.s.
1481.8 *6*	(7/2⁻)	G	J^π: D(+Q) 714.6γ to (5/2)⁻ 767; 915.7γ to 3/2⁻ 566; excit in (d,nγ).
1513.0 *10*	(1/2⁻,3/2⁻)	E G	J^π: from γ(θ) and excit in (d,nγ). D γ to 3/2⁻.
1522.4 *8*	(11/2⁺)	G	J^π: D+Q 986γ to 9/2⁺ 536; γ to (13/2)⁺ 1177; excit in (d,nγ).
1535.9 *7*	(3/2⁻)	e G	J^π: D 1536γ to 3/2⁻ g.s.; J=3/2 from excit in (d,nγ).
1536.0 *5*		e J	J^π: γ to 3/2⁻ and 5/2⁻, so J≤(7/2). Level assumed to differ from 1535.9 level in (d,nγ) because γ branching differs significantly.
1541.5 *10*	(9/2⁺)	e G	J^π: Q γ to 5/2⁺; excit in (d,nγ).
1543.0 *6*		e h J	J^π: 715γ to 3/2⁻ 828 and 775γ to (5/2)⁻ 767, so J≤(7/2). L(^{3}He,d)=1 for a 1545-keV level.
1543.2 *5*	(3/2⁻)	e Gh	J^π: D 977.0γ to 3/2⁻ 566 and D 1267.2γ to 5/2⁻ 276; 706.6γ to 7/2⁻ 837; excit in (d,nγ). L(^{3}He,d)=1 for a 1545-keV level.
1586.8 *10*	1/2⁺	GH	J^π: L(^{3}He,d)=0; γ to 5/2⁺. E(level): from (^{3}He,d).
1587.4 *7*		J	J^π: γ to 3/2⁻ and 5/2⁻, so J≤(7/2).
1615 *15*		E	
1670.7 *3*		E JK	J^π: γ to 3/2⁻ and 5/2⁻, so J≤(7/2).
1681.2 *8*	(7/2⁻)	G	J^π: D(+Q) γ to 5/2$^{(-)}$ 1024; excit in (d,nγ).
1696.0 *10*	(3/2⁺)	E G	J^π: D 907γ to 5/2⁺ 789; excit in (d,nγ).
1751.5 *10*		E G	J^π: γ to 7/2⁻.
1788.7 *10*	(7/2⁺)	G	J^π: D+Q 999γ to 5/2⁺ 789; excit in (d,nγ).
1798.9 *10*	(5/2⁻)	G	J^π: D 1032γ to (5/2)⁻ 767; J=5/2 from excit in (d,nγ).
1866.4 *10*	(3/2⁻)	e G	J^π: 3/2⁻ from excit in (d,nγ); isotropic 1030γ to 7/2⁻ 836.
1885.3 *7*	(3/2⁻,5/2,7/2⁻)	e G	J^π: γ to 3/2⁻ and 7/2⁻.
1945.6[d] *4*	11/2$^{(-)}$	G I	J^π: stretched Q 1108.8γ to 7/2⁻ 837; D(+Q) 679γ to 9/2$^{(-)}$ 1266.4; possible band assignment.
1948.3 *13*	(9/2)⁺	E GH	J^π: L(^{3}He,d)=4; D 425.9γ to (11/2⁺) 1522. E(level): 1949.9 *20* from (^{3}He,d).
1985.2 *26*	3/2⁺,5/2⁺	e H	E(level): from (^{3}He,d). J^π: L(^{3}He,d)=2.
1995.9 *8*	7/2$^{(-)}$	e G	J^π: D(+Q) 729γ to 9/2$^{(-)}$ 1266.4; D+Q 972γ to 5/2$^{(-)}$ 1023.
2000.4 *11*		G	
2022.0 *10*	(5/2⁺)	E G	J^π: D 1233γ to 5/2⁺ 789; excit in (d,nγ).
2055.9[#] *21*	1/2⁻,3/2⁻	E H	J^π: L(^{3}He,d)=1.
2085 *4*	7/2⁺,9/2⁺	H	J^π: L(^{3}He,d)=4.
2117.9 *10*	3/2⁺,5/2⁺	GH	XREF: H(2122.5). E(level): 2122.5 *21* in (^{3}He,d). J^π: L(^{3}He,d)=2.
2164.1[#] *22*	1/2⁻,3/2⁻	E H	J^π: L(^{3}He,d)=1.
2215? *4*		H	Probably differs from 2221 level in (d,nγ) because E from (^{3}He,d) is typically too high by several keV.
2221.1 *10*	(3/2,5/2)	G	J^π: D 1432γ to 5/2⁺ 789; 3/2 or 5/2 from excit in (d,nγ).
2245 *15*		E	
2277.9[c] *11*	(17/2⁺)	G I	J^π: γ to (13/2)⁺. Band assignment favors (17/2⁺).

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Adopted Levels, Gammas (continued)

^{81}Br Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[a]	XREF	Comments
2288.4[#] *21*	1/2+		E H	Jπ: L(^{3}He,d)=0.
2305.0 *10*	(7/2−)		G	Jπ: γ(θ) to 7/2− in (d,nγ).
2387.5?[d] *4*	(13/2−)		I	Jπ: D γ to 11/2(−); γ to 9/2(−); band assignment favors (13/2−).
2410 *15*			E	
2421.2 *11*			G	Jπ: γ to (13/2)+.
2477.3[#] *22*			E H	E(level),Jπ: unresolved doublet with L=1+4 in (^{3}He,d).
2531.7 *22*			H	E(level),Jπ: unresolved doublet with L=0+1 in (^{3}He,d).
2549.4[b] *4*	(13/2−)		G I	Jπ: γ to 11/2(−); Q γ to 9/2(−); band assignment.
2620 *15*			E	
2657.1[#] *22*	3/2+,5/2+		E H	Jπ: L(^{3}He,d)=2.
2668.5[b] *4*	(15/2−)	<0.2 ns	I	Jπ: γ to 11/2(−); (M1) γ to (13/2−); band assignment. $T_{1/2}$: from centroid shift in (α,p2nγ).
2704.4[#] *23*	1/2−,3/2−		E H	Jπ: L(^{3}He,d)=1.
2731.5 *27*	+		H	E(level),Jπ: unresolved doublet with L=2+4 in (^{3}He,d).
2788 *15*			E	E(level): probably corresponds to at least one component of E=2797.4 doublet in (^{3}He,d).
2797.4 *20*			H	E(level): unresolved doublet with L=4+(1,2) in (^{3}He,d).
2912.6[#] *21*			E H	
2940 *3*			H	
2942.1[b] *4*	(17/2−)		I	Jπ: M1 274.6γ to (15/2−) 2669; band assignment.
3001[#] *3*			E H	
3027 *3*			H	
3067 *3*			H	
3089.0? *5*			I	Jπ: γ to (17/2−).
3101[#] *15*			E H	
3190 *15*			E H	E(level): from (p,γ).
3196.1? *5*			I	Jπ: γ to (17/2−).
3242 *15*			E	
3322[‡] *15*			H	
3333.5[b] *4*	(19/2−)	0.69 ps *28*	I	Jπ: (M1+E2) γ to (17/2−); band assignment. $T_{1/2}$: from DSAM (α,p2nγ).
3429[‡] *15*			H	
3508[‡] *20*			H	
3526.9[c] *13*	(21/2+)		I	Jπ: band assignment favors (21/2+).
3598[‡] *20*			H	
3680?[‡] *20*			H	
3740[‡] *20*			H	
3759 *15*			E	
3798.8[b] *5*	(21/2−)		I	Jπ: D γ to (19/2−); band assignment.
3835[‡] *20*			H	
3965[‡] *15*			H	
4106[‡] *20*			H	
4174[‡] *20*			H	
4302[‡] *15*			H	
4428[‡] *15*			H	
4512[‡] *15*			H	
4559[‡] *15*			H	
5632[‡] *15*			H	

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Adopted Levels, Gammas (continued)

^{81}Br Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[a]	XREF	Comments
5791[‡] *20*			H	
11286 *10*	1/2⁻	19 keV *3*	F	J^π: L(p,p)=1 (1968Ba23); IAS. Analog of ^{81}Se g.s..
11392 *10*	7/2+[@]		F	Analog of ^{81}Se(103 level).
11755 *10*	3/2−[@]	18 keV *3*	F	Analog of ^{81}Se(468 level).
12297 *10*	5/2+	18 keV *3*	F	J^π: L(p,p)=2 (1968Ba23); IAS. Analog of ^{81}Se(1053 level).
12428 *10*	1/2+	48 keV *5*	F	J^π: L(p,p)=0 (1968Ba23). Analog of $1/2^+$ ^{81}Se(1233 level).
12509 *10*	5/2+	32 keV *4*	F	J^π: L(p,p)=2 (1968Ba23); IAS. Analog of $5/2^+$ ^{81}Se(1304 level).
12668	3/2−[@]	24 keV *4*	F	Analog of ^{81}Se(1406 level).

† For a least-squares fit to adopted Eγ, assigning ΔE=1 keV to Eγ data for which no uncertainty was reported by the authors. Eγ data from (d,nγ) are within 0.2 keV of those determined precisely in other reactions, whenever comparison can be made.

‡ From 1967Ev03 in (^{3}He,d), whose energy scale is consistently high. Energy probably at least 35 keV lower than the reported values by authors.

\# From (^{3}He,d).

@ From J^π for corresponding IAS.

& Based on particle-vibrator-core model, which predicts B(E2) for this level more successfully than does the particle-rotor-core model, this state can be described by a wave function which contains a significant contribution from configuration=((π $p_{3/2}$) coupled to 2^+ core) (1996Ja09).

a From DSAM and/or Doppler broadening in Coulomb excitation (except as noted) for E(level)<6 MeV; Γ(tot) from ^{80}Se(p,p), (p,n) IAR otherwise.

b Band(A): Possible 3-quasiparticle band (1986Fu04). Configuration probably includes at least one $g_{9/2}$ proton (low-energy ΔJ=1 γ cascade in band suggests large angular momentum alignment) (1986Fu04).

c Band(B): Possible (π $g_{9/2}$) band (1986Fu04).

d Band(C): Possible (π $p_{3/2}$) g.s. band (1986Fu04). 3/2[301] or 3/2[312] orbital suggested in (d,nγ) (1989DjZW).

Adopted Levels, Gammas (continued)

$\gamma(^{81}Br)$

E_i(level)	J_i^{π}	E_{γ}[†]	I_{γ}[†]	E_f	J_f^{π}	Mult.[†]	δ[†]	α[e]	Comments
275.986	5/2⁻	275.990[@] *10*	100	0.0	3/2⁻	M1+E2	−0.10 *3*	0.00816 *14*	B(E2)(W.u.)=16.3 *8*; B(M1)(W.u.)=0.106 *+18−14* α(K)=0.00724 *13*; α(L)=0.000781 *14*; α(M)=0.0001242 *23* α(N)=1.158×10^{-5} *21* Mult.: from α(K)exp in ^{81}Se β^- decay (18.5 min). δ: from $\gamma(\theta)$ in Coulomb excitation. Other: 0.45 *+14−15* from α(K)exp and α(L)exp in ^{81}Se β^- decay (18.5 min). B(E2)(W.u.): same value from measured B(E2)↑=0.0508 *25*.
536.291	9/2⁺	260.305[&] *12*	100	275.986	5/2⁻	M2		0.0454 *6*	B(M2)(W.u.)=0.0368 *+34−28* α(K)=0.0399 *6*; α(L)=0.00468 *7*; α(M)=0.000749 *10* α(N)=6.92×10^{-5} *10* Mult.,δ: pure M2 from α(K)exp, α(L)exp in ^{81}Se β^- decay (57.28 min).
538.194	1/2⁻,3/2⁻	538.189[@] *14*	100	0.0	3/2⁻	M1+E2	0.087 *15*	1.63×10^{-3} *2*	B(M1)(W.u.)=0.184 *7*; B(E2)(W.u.)=5.9 *+23−19* α(K)=0.001454 *20*; α(L)=0.0001540 *22*; α(M)=2.448×10^{-5} *34* α(N)=2.293×10^{-6} *32*
566.124	3/2⁻	290.138[@] *13*	100.0[@] *10*	275.986	5/2⁻	E2+M1	+1.11[d] *22*	0.0131 *12*	B(M1)(W.u.)=0.0043 *+20−15*; B(E2)(W.u.)=77 *29* α(K)=0.0115 *11*; α(L)=0.00130 *12*; α(M)=0.000205 *20* α(N)=1.87×10^{-5} *17* Mult.: from α(K)exp in ^{81}Se β^- decay (18.5 min). δ: other: M1+93(2)% E2 yields δ=3.6 *+7−5*, 290γ-276γ A_{22}=0.060 *9* and A_{44}=0.14 *14* (1980MuZR).
		566.123[&] *14*	37.8 *5*	0.0	3/2⁻	E2+M1	−3.0 *5*	0.00199 *4*	B(M1)(W.u.)=4.9×10^{-5} *+27−18*; B(E2)(W.u.)=1.7 *+6−5* α(K)=0.001763 *32*; α(L)=0.0001908 *35*; α(M)=3.03×10^{-5} *6* α(N)=2.80×10^{-6} *5* I_{γ}: weighted average of 37.8 *4* from ^{81}Se β^- decay (18.5 min) and 35.1 *27* from Coulomb excitation. Others: 46 *23* from (p,γ) and 45 *4* from (n,n′γ). B(E2)(W.u.): same value from measured B(E2)↑. δ: δ(D,Q): −3.0 *5* or −0.08 *5* from (p,γ); the latter δ implies a $T_{1/2}$(566 level) value which is inconsistent with RUL and δ(290γ).

$^{81}_{35}Br_{46}$-6

Adopted Levels, Gammas (continued)

$\gamma(^{81}Br)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[†]	δ[†]	α[e]	Comments
650.003	(3/2)$^-$	649.990[@] *19*	100	0.0	3/2$^-$	M1+E2	+0.111 *7*	1.07×10^{-3} *2*	B(M1)(W.u.)=0.0304 *+40−32*; B(E2)(W.u.)=1.09 *6* α(K)=0.000950 *13*; α(L)=0.0001003 *14*; α(M)=1.593×10^{-5} *22* α(N)=1.494×10^{-6} *21* B(E2)(W.u.): from measured B(E2)↑=0.00226 *13*. Other: B(E2)W.u.=1.10 *+21−17* using the $T_{1/2}$ and adopted γ-ray properties. δ: sign from (p,γ). Other: +0.08 *4* from (p,γ).
767.04	(5/2)$^-$	491.3 *3*	15.1 *12*	275.986	5/2$^-$	M1+E2	+0.25 *13*	0.00208 *8*	B(M1)(W.u.)=0.042 *+5−6*; B(E2)(W.u.)=14 *+15−10* α(K)=0.00184 *7*; α(L)=0.000196 *8*; α(M)=3.12×10^{-5} *13* α(N)=2.92×10^{-6} *12* E_γ: weighted average of 491.7 *6* from (p,γ) and 491.2 *3* from Coulomb excitation. I_γ: weighted average of 14.9 *15* from (n,n′γ) and 15.3 *12* from Coulomb excitation. Other Iγ: 26 *4* from (p,γ), 157 from (d,nγ) if Iγ(767)=100.
		767.01 *10*	100 *4*	0.0	3/2$^-$	M1+E2	−0.263 *11*	7.49×10^{-4} *11*	B(M1)(W.u.)=0.074 *6*; B(E2)(W.u.)=10.1 *5* α(K)=0.000666 *9*; α(L)=7.02×10^{-5} *10*; α(M)=1.114×10^{-5} *16* α(N)=1.045×10^{-6} *15* B(E2)(W.u.): from measured B(E2)↑=0.0315 16. Other: 10.7 *12* from adopted $T_{1/2}$ and 767.01γ-ray properties. E_γ: weighted average of 766.9 *5* from ^{81}Se β^- decay (57.28 min), 767.0 *1* from (p,p′γ), and 767.2 *4* from Coulomb excitation. Other: 767.0 *7* from (p,γ). δ: from B(E2)↑ and $T_{1/2}$ in Coulomb excitation. Also others: −0.16 *3* and 0.33 *5* from $\gamma(\theta)$, from Coulomb excitation.
789.258	5/2$^+$	513.5[‡]	37[‡]	275.986	5/2$^-$	D[c]			
		789.254[&] *19*	100	0.0	3/2$^-$	D[c]			
828.434	3/2$^-$	178.416[@] *24*	2.11[@] *9*	650.003	(3/2)$^-$	(M1+E2)	<0.28	0.0272 *29*	B(M1)(W.u.)>0.097 α(K)=0.0241 *25*; α(L)=0.00267 *32*; α(M)=0.00042 *5* α(N)=3.9×10^{-5} *4* B(E2)(W.u.)<452 upper limit exceeds RUL=300. Mult.,δ: E1 or M1(+E2) from α(K)exp<0.05, α(L)exp<0.003 in ^{81}Se β^- decay (18.5 min); adopted $\Delta\pi$=no. δ from α(L)exp.

Adopted Levels, Gammas (continued)

$\gamma(^{81}Br)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	δ[†]	α[e]	Comments
828.434	3/2⁻	290.1[@] *1*	5.5[@] *11*	538.194	1/2⁻,3/2⁻				
		552.455[@] *14*	31.26 *23*	275.986	5/2⁻	M1+E2	+0.32 *20*	0.00160 *8*	B(M1)(W.u.)=0.058 *11*; B(E2)(W.u.)=24 *+32−20* α(K)=0.00142 *7*; α(L)=0.000151 *8*; α(M)=2.40×10^{-5} *13* α(N)=2.24×10^{-6} *12* I_γ: weighted average of 31.26 *23* from ^{81}Se β^- decay (18.5 min), 33 *6* from (p,γ), 33 *4* from (n,n′γ), and 32 *4* from Coulomb excitation. δ: +0.32 *20* or +1.6 *5* from (p,γ); evaluator rejects latter value because it gives B(E2)(W.u.)=241 *93* (possible, but abnormally high for this mass region [see 1979En04]). Other: δ=0.40 *+4−5* from M1+13.5(25)%, 553γ-276γ A_{22}=−0.182 *27* and A_{44}=−0.02 *5* (1980MuZR). Mult.: D+Q from (p,γ); π from Coulomb excitation.
		828.36 *17*	100.0 *12*	0.0	3/2⁻	M1+E2	+0.18 *3*	6.29×10^{-4} *9*	B(M1)(W.u.)=0.059 *+11−8*; B(E2)(W.u.)=3.4 *+14−11* α(K)=0.000560 *8*; α(L)=5.89×10^{-5} *8*; α(M)=9.35×10^{-6} *13* α(N)=8.77×10^{-7} *12* B(E2)(W.u.): from measured B(E2)=0.058 *5*. E_γ: weighted average of 828.33 *17* from ^{81}Se β^- decay (18.5 min), 828.2 *7* from (p,γ), and 828.7 *5* from Coulomb excitation. I_γ: Weighted average of 100 *7* from β^- decay (18.5 min), 100 *4* from Coulomb excitation, 100 *22* from (p,γ) and 100 *11* from (n,n′γ). δ: other: +0.16 *+5−10* (p,γ).
836.82	7/2⁻	560.9[a] *1*	100 *7*	275.986	5/2⁻	M1+E2	−0.199 *12*	1.51×10^{-3} *2*	B(M1)(W.u.)=0.084 *7*; B(E2)(W.u.)=13.0 *+19−17* α(K)=0.001339 *19*; α(L)=0.0001420 *20*; α(M)=2.256×10^{-5} *32* α(N)=2.112×10^{-6} *30* Mult.: from Coulomb excitation; D+Q from (p,γ). δ: weighted average of −0.24 *3* from (p,γ) and −0.193 *12* from $\gamma(\theta)$ in Coulomb excitation and −0.19 *+3−4* in (d,nγ). Other: 0.30 *4* from $\gamma(\theta)$ in Coulomb excitation (1996Ja09); the weighted average −0.21 *2* including the other datum.
		836.2 *4*	37 *5*	0.0	3/2⁻	E2		7.06×10^{-4} *10*	B(E2)(W.u.)=17.1 *+23−21* α(K)=0.000628 *9*; α(L)=6.68×10^{-5} *9*; α(M)=1.060×10^{-5} *15*

From ENSDF

$^{81}_{35}Br_{46}$-8

γ(^{81}Br) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[†]	δ[†]	α[e]	Comments
									α(N)=9.87×10^{-7} *14* E_γ: weighted average of 835.5 *5* from ^{81}Se β^- decay (18.5 min), 835.4 *11* from (p,γ), 836.5 *4* from (α,p2nγ), and 836.5 *5* from Coulomb excitation. I_γ: weighted average of 42 *17* from (α,p2nγ), 41 *4* from (n,n′γ), and 23 *7* from Coulomb excitation. Other: 60 *30* from (p,γ).
1023.7	5/2$^{(-)}$	457.5[‡]	21[‡]	566.124	3/2$^-$	D[c]			
		485.4[‡]	12	538.194	1/2$^-$,3/2$^-$	Q[c]			I_γ: other: 19 *5* (n,n′γ).
		747.5[‡]	100	275.986	5/2$^-$	D[c]			E_γ: other: 748.2 *9* from (p,γ) − higher value. I_γ: other: 100 *26* (p,γ).
		1023.6[‡]	16	0.0	3/2$^-$				I_γ: other: 9.0 *26* (n,n′γ).
1076.2?		538.2[#f]		538.194	1/2$^-$,3/2$^-$				
		1076.0[#f]		0.0	3/2$^-$				
1105.3	(1/2)$^-$	539.2[‡]	35[‡]	566.124	3/2$^-$				
		566.2[#f]		538.194	1/2$^-$,3/2$^-$				E_γ: absent in (d,nγ).
		829.4[‡]	77[‡]	275.986	5/2$^-$				
		1105.3[‡]	100[‡]	0.0	3/2$^-$	D[c]			
1176.90	(13/2)$^+$	640.6 *2*	100	536.291	9/2$^+$	E2		1.44×10^{-3} *2*	α(K)=0.001274 *18*; α(L)=0.0001373 *19*; α(M)=2.177×10^{-5} *31* α(N)=2.017×10^{-6} *28* E_γ,Mult.: from γ(θ) and linear polarization measurements (α,p2nγ).
1237.88		961.9[a] *1*	100[#] *26*	275.986	5/2$^-$				
		1236.7[#]	100[#] *26*	0.0	3/2$^-$				
1266.4	9/2$^{(-)}$	430[b] *1*	≈45[b]	836.82	7/2$^-$	D+Q	−0.19 *+4−30*		Mult.,δ: from (d,nγ). I_γ: other: 72 in (d,nγ).
		990.4[b] *3*	100[b] *18*	275.986	5/2$^-$	(E2)		4.67×10^{-4} *7*	α(K)=0.000416 *6*; α(L)=4.40×10^{-5} *6*; α(M)=6.98×10^{-6} *10* α(N)=6.52×10^{-7} *9* Mult.: Q from γ(θ), M2 unlikely from systematics (from (α,p2nγ)).
1266.9	(3/2$^-$,5/2,7/2$^-$)	430.6[#]	100[#] *25*	836.82	7/2$^-$				
		500.0[#]	100[#] *25*	767.04	(5/2)$^-$				
		1266.1[#]	50[#] *13*	0.0	3/2$^-$				possible doublet.

$^{81}_{35}Br_{46}$-9

γ(^{81}Br) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$[†]	I$_\gamma$[†]	E$_f$	J$^\pi_f$	Mult.[†]	δ[†]	Comments
1323.0	(5/2)$^-$	486.4 *4*	25 *10*	836.82	7/2$^-$			I$_\gamma$: unweighted average of 15 *4* from (n,n′γ) and 35 *8* from Coulomb excitation.
		1046.1 *10*	100 *8*	275.986	5/2$^-$			
		1322.8[#]	20[#] *5*	0.0	3/2$^-$			From measured B(E2), B(E2)(W.u.)=3.9 *5* or 3.0 *4* for J=5/2$^-$ or 7/2$^-$, respectively.
1327.3		492[f]		836.82	7/2$^-$			E$_\gamma$: from (p,γ).
		561.4 *12*	20 *20*	767.04	(5/2)$^-$			E$_\gamma$: from (p,γ). I$_\gamma$: from divided Iγ for doublet in (p,γ).
		676.6 *7*	15 *5*	650.003	(3/2)$^-$			E$_\gamma$,I$_\gamma$: from (p,γ).
		789.3 *5*	100 *25*	538.194	1/2$^-$,3/2$^-$			E$_\gamma$: weighted average 789.6 *7* from from (p,γ) and 789.1 *5* from β^- decay (18.5 min). I$_\gamma$: from (p,γ).
1349.8		326.0[a] *4*	100[#] *25*	1023.7	5/2$^{(-)}$			
		583.1[#]	55[#] *13*	767.04	(5/2)$^-$			
		1350.0[#]	34[#] *9*	0.0	3/2$^-$			
1371.4	7/2$^+$	582.1	100	789.258	5/2$^+$	D(+Q)[c]	+0.04 *+8−4*	E$_\gamma$,δ: from (d,nγ).
1400.9?		572.6[#f]	85[#] *22*	828.434	3/2$^-$			
		1400.7[#f]	100[#] *26*	0.0	3/2$^-$			
1481.8	(7/2$^-$)	714.6[‡]	32[‡]	767.04	(5/2)$^-$	D(+Q)[c]	−0.12[c] *+81−10*	
		831.9[‡]		650.003	(3/2)$^-$			
		915.7[‡]	100[‡]	566.124	3/2$^-$			
1513.0	(1/2$^-$,3/2$^-$)	946.9[‡]	100	566.124	3/2$^-$	D[c]		
1522.4	(11/2$^+$)	345.4[‡]		1176.90	(13/2)$^+$			
		986.2[‡]	100[‡]	536.291	9/2$^+$	D+Q[c]	+0.09[c] *+21−2*	
1535.9	(3/2$^-$)	997.7[‡]	71[‡]	538.194	1/2$^-$,3/2$^-$	D[c]		
		1535.9[‡]	100[‡]	0.0	3/2$^-$	D[c]		
1536.0		458.5[#f]		1076.2?				
		886.0[#]	100[#] *24*	650.003	(3/2)$^-$			
		997.7[#]	38[#] *11*	538.194	1/2$^-$,3/2$^-$			
		1260.1[#]	51[#] *14*	275.986	5/2$^-$			
		1536.0[#]	81[#] *22*	0.0	3/2$^-$			
1541.5	(9/2$^+$)	752.2[‡]	100	789.258	5/2$^+$	Q[c]		
1543.0		715.4[#]	100[#] *25*	828.434	3/2$^-$			
		775.0[#]	10.6[#] *24*	767.04	(5/2)$^-$			
		1266.1[f]		275.986	5/2$^-$			E$_\gamma$: from (n,n′γ) for multiply-placed γ.

$\gamma(^{81}Br)$ (continued)

E_i(level)	J^{π}_i	E_γ[†]	I_γ[†]	E_f	J^{π}_f	Mult.[†]	δ[†]	α[e]	Comments
1543.0		1543.2[#]	7.1[#] *24*	0.0	3/2⁻				
1543.2	(3/2⁻)	706.6[‡]	19[‡]	836.82	7/2⁻				
		977.0[‡]	62[‡]	566.124	3/2⁻	D[c]			
		1267.2[‡]	100[‡]	275.986	5/2⁻	D[c]			
		1543.1[‡]		0.0	3/2⁻				
1586.8	1/2⁺	797.5[‡]	100	789.258	5/2⁺				
1587.4		1311.5[#]	41[#] *10*	275.986	5/2⁻				
		1587.2[#]	100[#] *25*	0.0	3/2⁻				
1670.7		1393.7[#]	23[#] *6*	275.986	5/2⁻				
		1670.8[a] *3*	100[#] *25*	0.0	3/2⁻				
1681.2	(7/2⁻)	657.4[‡]	18[‡]	1023.7	5/2$^{(-)}$	D(+Q)[c]	−0.02[c] *+8−9*		
		844.5[‡]	100[‡]	836.82	7/2⁻				
1696.0	(3/2⁺)	906.7[‡]	100	789.258	5/2⁺	D[c]			
1751.5		914.7[‡]	100	836.82	7/2⁻				
1788.7	(7/2⁺)	999.4[‡]	100	789.258	5/2⁺	D+Q[c]	−0.18[c] *+6−5*		
1798.9	(5/2⁻)	1031.9[‡]	100	767.04	(5/2)⁻	D[c]			
1866.4	(3/2⁻)	1029.6[‡]	100	836.82	7/2⁻				
1885.3	(3/2⁻,5/2,7/2⁻)	1048.6[‡]	12[‡]	836.82	7/2⁻				
		1319.0[‡]	100[‡]	566.124	3/2⁻				
1945.6	11/2$^{(-)}$	679.4[b] *4*	≈100	1266.4	9/2$^{(-)}$	(M1(+E2))	−0.09 *13*	9.67×10^{-4} *17*	α(K)=0.000860 *15*; α(L)=9.07×10^{-5} *16*; α(M)=1.441×10^{-5} *26* α(N)=1.351×10^{-6} *24* Mult.,δ: from (d,nγ) for intraband γ. I_γ: I(679γ):I(1109γ)=3.2 *8*:6 *2* from (α,p2nγ), but 2.1:1.7 from (d,nγ).
		1108.8[b] *5*	≈100	836.82	7/2⁻	(E2)		3.61×10^{-4} *5*	α(K)=0.000321 *5*; α(L)=3.38×10^{-5} *5*; α(M)=5.37×10^{-6} *8* α(N)=5.02×10^{-7} *7*; α(IPF)=9.60×10^{-7} *20* I_γ: see comment on 679γ from 1946 level. Mult.: Q from (d,nγ); M2 unlikely since it would lead to $T_{1/2}$(1946 level)>0.6 ns from RUL ($\gamma\gamma$ coin observed from that level); intraband γ.
1948.3	(9/2)⁺	425.9[‡]	100	1522.4	(11/2⁺)	D[c]			
1995.9	7/2$^{(-)}$	729.4[‡]	64[‡]	1266.4	9/2$^{(-)}$	D(+Q)[c]	−0.1[c] *5*		

From ENSDF

$^{81}_{35}Br_{46}$-11

$\gamma(^{81}Br)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	δ[†]	α[e]	Comments
1995.9	$7/2^{(-)}$	972.2[‡]	100[‡]	1023.7	$5/2^{(-)}$	D+Q[c]	−0.65[c] *+12−24*		
2000.4		823.5[‡]	100	1176.90	$(13/2)^+$				
2022.0	$(5/2^+)$	1232.7[‡]	100	789.258	$5/2^+$	D[c]			
2117.9	$3/2^+,5/2^+$	1328.6[‡]	100	789.258	$5/2^+$				
2221.1	(3/2,5/2)	1431.8[‡]	100	789.258	$5/2^+$	D[c]			
2277.9	$(17/2^+)$	1101[b] *1*	100	1176.90	$(13/2)^+$				
2305.0	$(7/2^-)$	1468.2[‡]	100	836.82	$7/2^-$	D[c]			
2387.5?	$(13/2^-)$	441.9[b] *2*	56[b] *16*	1945.6	$11/2^{(-)}$	(M1)		0.00257 *4*	α(K)=0.002286 *32*; α(L)=0.0002433 *34*; α(M)=3.87×10^{-5} *5* α(N)=3.62×10^{-6} *5* Mult.: from (α,p2nγ), (α,pγ) for intraband transition.
		1120[b] *1*	≈100[b]	1266.4	$9/2^{(-)}$				
2421.2		1244.3[‡]	100	1176.90	$(13/2)^+$				
2549.4	$(13/2^-)$	603.8[b] *3*	≈17[b]	1945.6	$11/2^{(-)}$				
		1283.0[b] *3*	100[b] *17*	1266.4	$9/2^{(-)}$	Q[c]			
2668.5	$(15/2^-)$	119.1[b] *1*	100[b] *8*	2549.4	$(13/2^-)$	(M1)[b]		0.0712 *10*	α(K)=0.0630 *9*; α(L)=0.00695 *10*; α(M)=0.001107 *16* α(N)=0.0001028 *15*
		723[b] *1*	≈17[b]	1945.6	$11/2^{(-)}$				
2942.1	$(17/2^-)$	273.6[b] *1*	100	2668.5	$(15/2^-)$	M1[b]		0.00820 *12*	α(K)=0.00728 *10*; α(L)=0.000784 *11*; α(M)=0.0001247 *17* α(N)=1.164×10^{-5} *16*
3089.0?		146.9[b] *2*	100	2942.1	$(17/2^-)$				
3196.1?		254.0[b] *2*	100	2942.1	$(17/2^-)$				E_γ: from (α,p2nγ), (α,pγ).
3333.5	$(19/2^-)$	391.4[b] *1*	100	2942.1	$(17/2^-)$	(M1+E2)[b]		0.0049 *15*	α(K)=0.0044 *13*; α(L)=4.8×10^{-4} *16*; α(M)=7.6×10^{-5} *25* α(N)=7.0×10^{-6} *22*
3526.9	$(21/2^+)$	1249.0[b] *8*	100	2277.9	$(17/2^+)$				
3798.8	$(21/2^-)$	465.2[b] *2*	100	3333.5	$(19/2^-)$	D[b]			

[†] From Coulomb excitation, except as noted. Multipolarity and mixing ratio are based on γ(θ) measurements, and RUL, except where otherwise noted.
[‡] From (d,nγ).
[#] From (n,n′γ).

$^{81}_{35}Br_{46}$-12

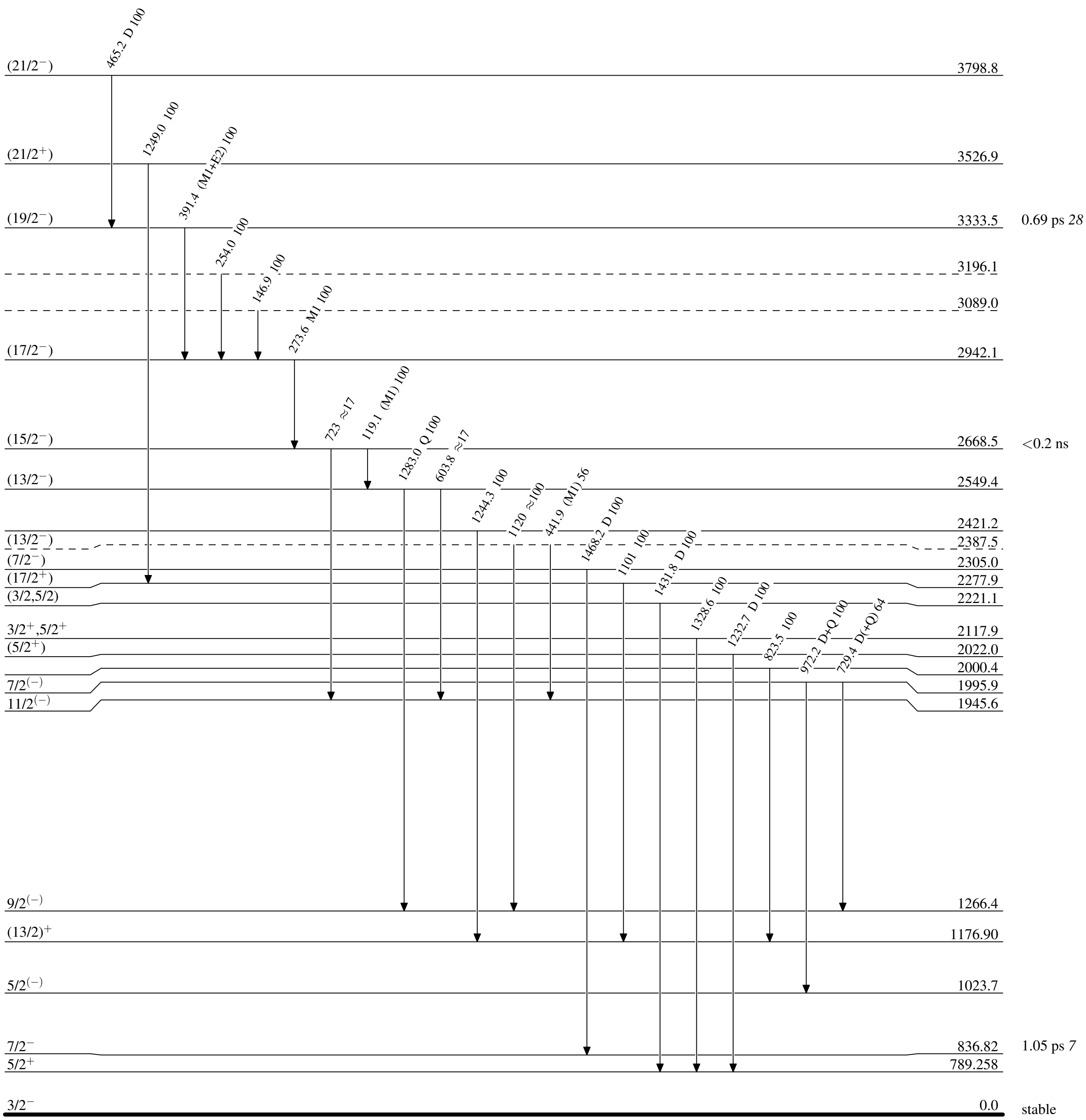
$\gamma(^{81}Br)$ (continued)

[@] From ^{81}Se β- decay (18.5 m).
[&] From ^{81}Se β- decay (57.28 m).
[a] From (p,p′γ).
[b] From (α,p2nγ).
[c] From $\gamma(\theta)$ in (d,nγ).
[d] Weighted average of 1.25 *+32−23* from α(K)exp, α(L)exp in ^{81}Se β^- decay (18.5 min) and +0.85 *30* from $\gamma\gamma(\theta)$ in (p,γ). Note: 276$\gamma(\theta)$ in Coulomb excitation combined with 290γ-276$\gamma(\theta)$ in ^{81}Se β^- decay (18.5 min), and 290γ-276$\gamma(\theta)$ alone, each gives inconsistent δ value.
[e] Additional information 1.
[f] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



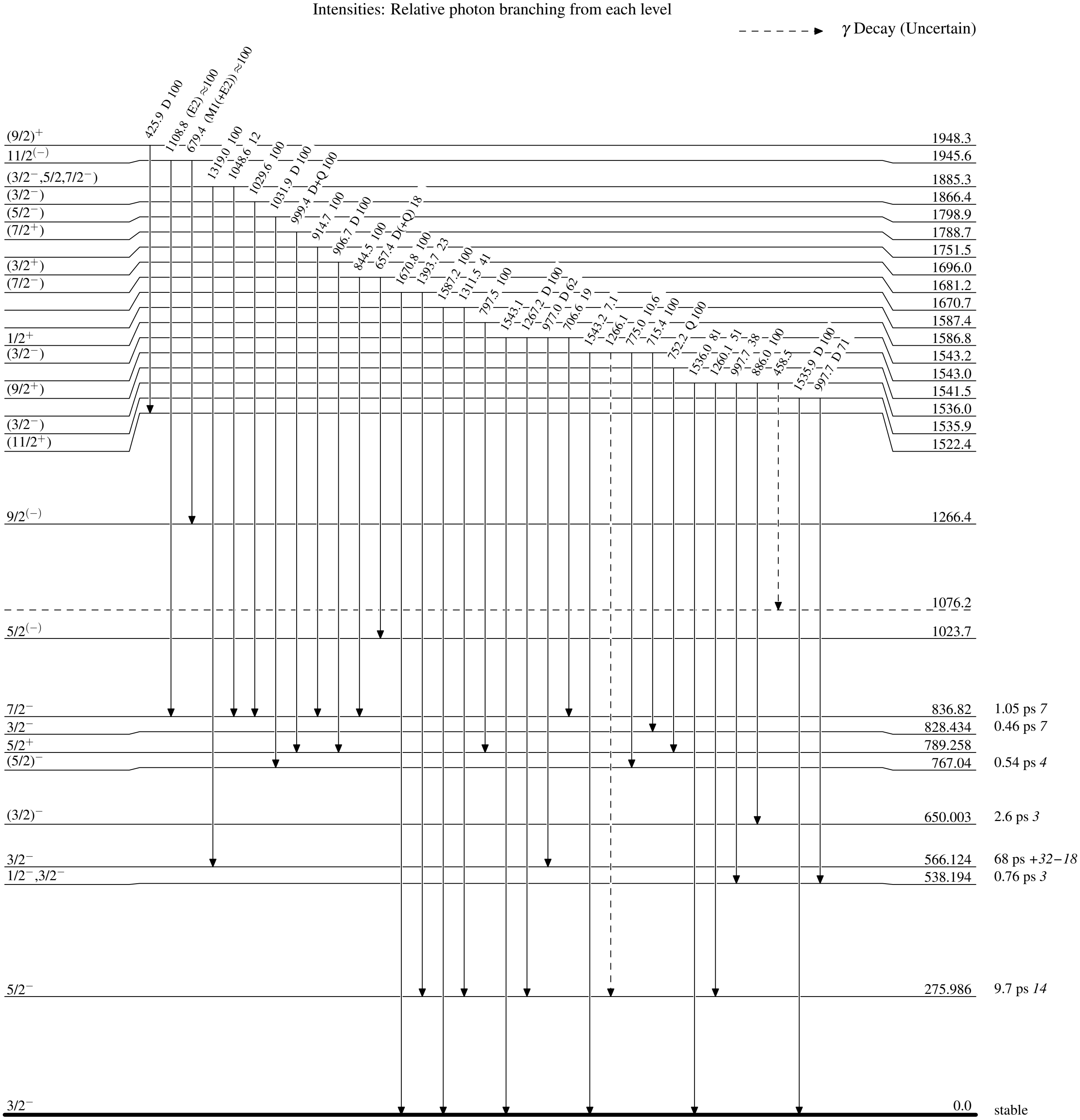
$^{81}_{35}Br_{46}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

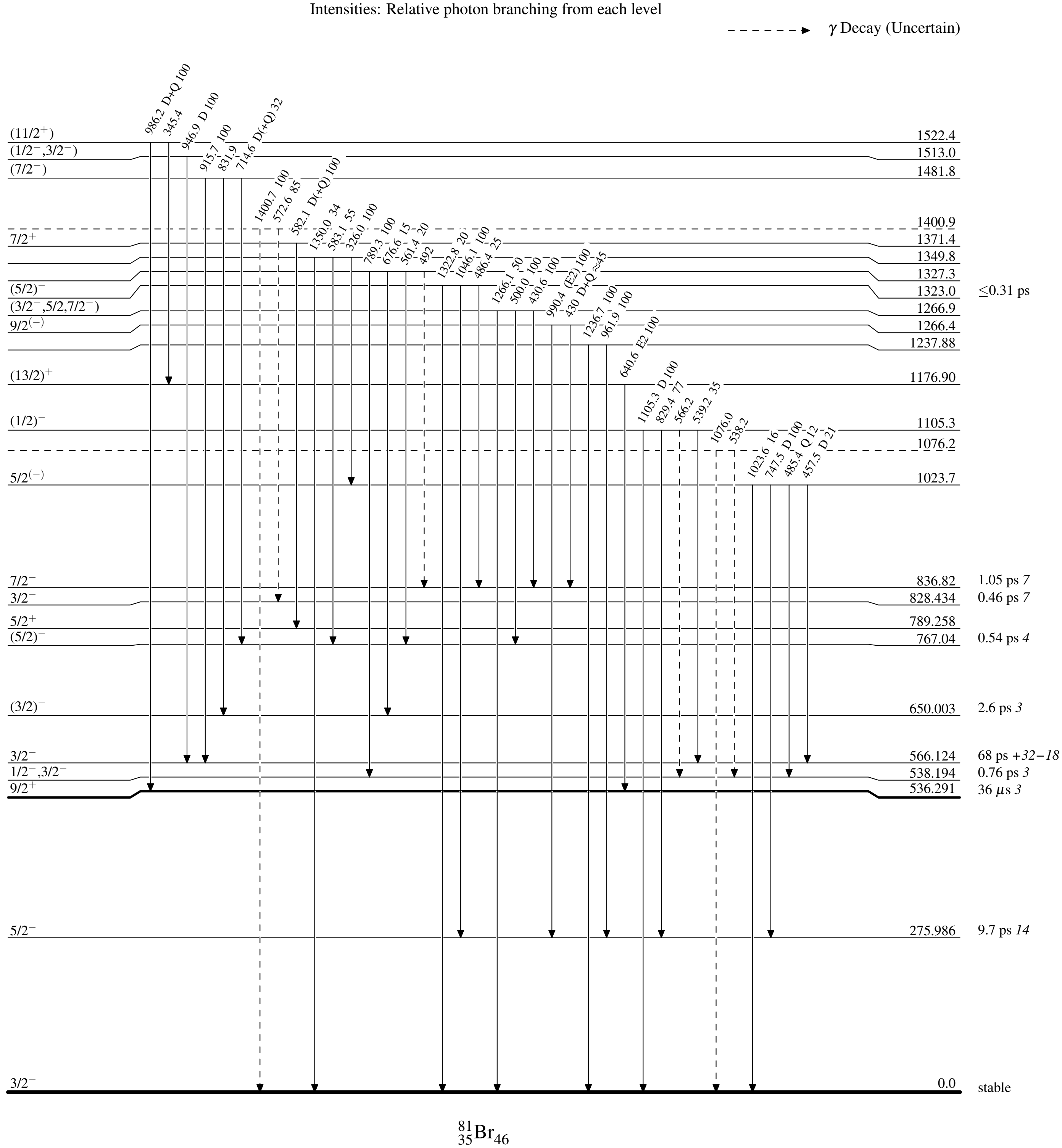


$^{81}_{35}Br_{46}$

Adopted Levels, Gammas

Level Scheme (continued)

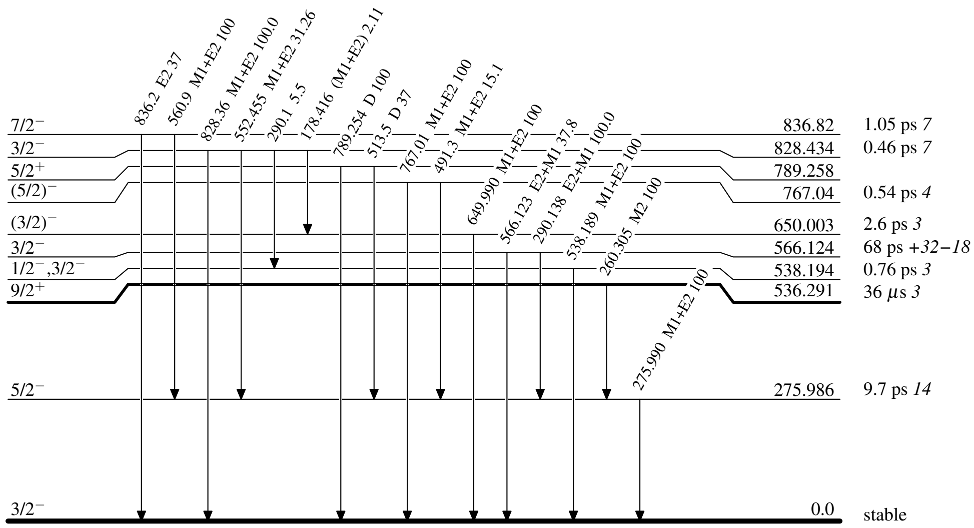
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

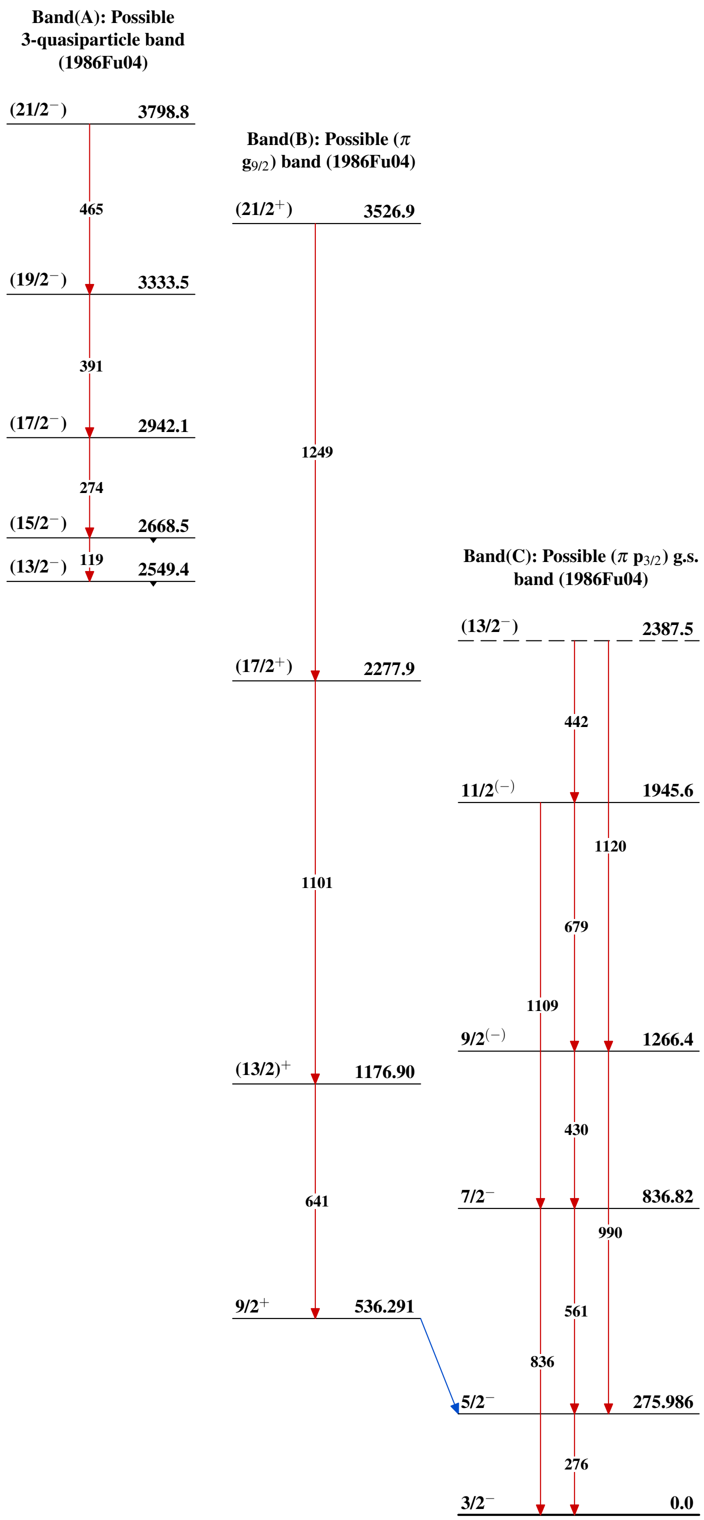
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{81}_{35}Br_{46}$

Adopted Levels, Gammas



$^{81}_{35}Br_{46}$