Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	30-Sep-2020

Q(β^-)=−3065 *3*; S(n)=11017 *10*; S(p)=5271.8 *28*; Q(α)=−4707 *5* 2017Wa10
S(2n)=20270 *5*, S(2p)=14778.6 *29* (2017Wa10).
1948Wo08: ^{77}Br isotope identified and produced in ^{74}Se(α,p) and ^{76}Se(d,n) reactions, and subsequent counting of β and γ spectra.
Theoretical calculations: consult the NSR database at www.nndc.bnl.gov for seven primary theory references dealing with nuclear structure calculations.
Additional information 1.
1995Se16: magnetic hyperfine fields at bromine in nickel host.
Other reaction:
2001Ra44: ^{76}Se(p,γ) E=2.86 MeV; measured Eγ, Iγ, deduced E1 transitions strength distributions in ^{77}Br.

^{77}Br Levels

Cross Reference (XREF) Flags

A	^{77}Kr ε decay (71.25 min)	E	^{74}Ge(^{6}Li,3nγ)	I	^{76}Se(^{3}He,d)
B	^{77}Br IT decay (4.28 min)	F	^{75}As(α,2nγ) E=27 MeV	J	^{77}Se(p,nγ)
C	^{65}Cu(^{16}O,2p2nγ),^{64}Ni(^{16}O,p2nγ)	G	^{75}As(α,2nγ) E=28 MeV		
D	^{65}Cu(^{18}O,α2nγ)	H	^{76}Se(p,p′) IAR		

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	XREF	Comments
0.0[&]	3/2$^-$	57.04 h *12*	ABCDEFG IJ	%ε+%β^+=100 μ=0.9731 *6* (1993Oh09,2019StZV) Q=+0.50 *2* (1998Se09,2016St14) μ: from NMR-nuclear orientation (1993Oh09); measured μ=0.9730 *6* by 1993Oh09 is re-evaluated to 0.9731 *6* by 2019StZV. Others: 0.9738 *5* (1992Pr06, NMR nuclear orientation); 0.92 *5* (1992Gr20,1988Gr26). Q: multiple adiabatic passage NMR on oriented nuclei (1998Se09). Value of 0.530 *22* is re-evaluated to 0.50 *2* in 2016St14. Configuration=π3/2[312] (1992Gr20). J$^\pi$: atomic-beam method (1959Gr92); parity from L(^{3}He,d)=1. T$_{1/2}$: from integral counting with an ionization chamber (1975Wa28); uncertainty quoted here is dominated by 0.2% systematic uncertainty specified in 1975Wa28, statistical uncertainty is negligible. Others: 53.76 h *96* (2012Ba12), 54.6 h *2* (1963Ku06), 58.0 h *5* (1959Gi62), 57 h *1* (1951Ho42), 58 h *2* (1948Wo08).
105.86[b] *8*	9/2$^+$	4.28 min *10*	ABCDEFG IJ	%IT=100 J$^\pi$: atomic-beam magnetic resonance method (1980Ek02); parity from L(^{3}He,d)=4. T$_{1/2}$: from γ-decay curve (1961Go39). Others: 4.2 min *2* (1972De54), 4.2 min *2* (1959Go67), 1971Do01, 1955Th01.
129.64 *4*	5/2$^+$	9.3 ns *3*	A CDEFG IJ	μ=+3.30 *3* (1991Gr15,2014StZZ) μ: time dependent perturbed angular correlation technique (1991Gr15). Static Q≈0.4 (1978HaXP, differential PAC method (1978HaXP). Note that this measurement is listed only in 1989Ra17 compilation, not in 2016St14 evaluation or 2014StZZ compilation, thus should be viewed caution. J$^\pi$: L(^{3}He,d)=2; (E2) γ to 9/2$^+$. T$_{1/2}$: $\gamma\gamma$(t) in ^{77}Kr ε decay (1967Ho16).
161.93[a] *11*	5/2$^-$	498 ps *35*	A CDEFG IJ	In (^{3}He,d), 162 and 167 levels are unresolved. J$^\pi$: L(^{3}He,d)=3; M1+E2 γ to 3/2$^-$; $\gamma(\theta)$ and excitation function in (p,nγ) rule out 1/2 and 3/2$^-$.
166.73[f] *21*	(3/2)$^-$		A EF IJ	In (^{3}He,d), 162 and 167 levels are unresolved.

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Adopted Levels, Gammas (continued)

^{77}Br Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
				J^π: L(^{3}He,d)=1; γ from (7/2$^-$) supports 3/2$^-$.
226.7 *3*	3/2$^-$		IJ	J^π: L(^{3}He,d)=1; excitation function in (p,nγ).
276.22 *6*	(3/2)$^+$	90 ps *20*	A C EFG IJ	J^π: M1+E2 γ to 5/2$^+$. Excitation function in (p,nγ) gives J=3/2 (1988Fe07); however, 1977Fe13, also from excitation in (p,nγ), assign J=5/2. $T_{1/2}$: (ce)γ(t) in ^{77}Kr ε decay.
336.7 *3*	1/2$^-$,3/2$^-$		IJ	J^π: L(^{3}He,d)=1.
417.71[c] *12*	7/2$^{(+)}$		A DEF J	J^π: log *ft*=6.4 from 5/2$^+$; ΔJ=1, (M1) γ to 9/2$^+$. Excitation function and $\gamma(\theta)$ in (p,nγ) favor 7/2 over 5/2.
424.7[f] *3*	5/2$^-$		EF IJ	J^π: L(^{3}He,d)=3; excitation function and $\gamma(\theta)$ in (p,nγ).
471.2 *4*	3/2$^-$		IJ	XREF: I(473.2). J^π: L(^{3}He,d)=1; excitation function in (p,nγ).
575.86[&] *9*	7/2$^-$	9.8 ps *15*	CDEFG IJ	XREF: I(578.6). J^π: ΔJ=2, E2 γ to 3/2$^-$; ΔJ=1, M1+E2 γ to 5/2$^-$.
640.13[b] *11*	(13/2)$^+$	9.8 ps *6*	CDEFG	J^π: ΔJ=2, E2 γ to 9/2$^+$.
649.2 *5*	(5/2)$^-$		F I	XREF: I(647.3). J^π: L(^{3}He,d)=3; γ to (3/2)$^+$.
715.7 *4*	5/2$^{(-)}$		J	J^π: from excitation function in (p,nγ).
771.0 *5*	(1/2$^+$)		IJ	XREF: I(774.6). J^π: L(^{3}He,d)=(0); isotropic $\gamma(\theta)$ in (p,nγ). Note that L(^{3}He,d)=3 was also suggested by 1978Kl10, which could relate this level to 781.1.
781.1[f] *4*	(7/2$^-$)[#]		EF	
782.49[d] *16*	(9/2)$^+$	3.0 ps *6*	CDEFG J	J^π: ΔJ=2, E2 γ to 5/2$^+$; γ to 9/2$^+$.
790.68[a] *12*	(9/2)$^-$	4.3 ps *6*	CDEFG J	J^π: ΔJ=2, E2 γ to (5/2)$^-$; excitation function in (p,nγ).
831.5 *4*	1/2$^-$,3/2$^-$		IJ	XREF: I(835.1). J^π: L(^{3}He,d)=1.
864.53 *14*	(3/2$^+$)		A J	J^π: log *ft*=6.7 from 5/2$^+$; gammas to 3/2$^-$ and (3/2)$^+$. Excitation function in (p,nγ) suggests 1/2$^+$ or 3/2$^+$.
886.9 *4*	1/2$^-$,3/2$^-$		IJ	XREF: I(889.9). J^π: L(^{3}He,d)=1.
947.62[c] *14*	(11/2$^+$)[#]		DEFG	
967.21 *17*	(7/2$^+$)		A iJ	J^π: L(^{3}He,d)=2(+4) for 972.1 level; log *ft*=6.8 from 5/2$^+$; excitation function in (p,nγ).
969.5 *5*	(5/2)$^+$		iJ	J^π: L(^{3}He,d)=2(+4) for 972.1; excitation function and $\gamma(\theta)$ in (p,nγ) favor 5/2.
1024.46 *20*	(5/2)$^+$		A E IJ	XREF: I(1028.1). J^π: L(^{3}He,d)=2; excitation function in (p,nγ).
1093.8 *3*	(11/2$^+$)		F	J^π: gammas to (13/2)$^+$ and (7/2$^+$); γ from (15/2$^+$).
1097.71 *23*	(5/2$^+$,7/2)		A J	J^π: gammas to 5/2$^+$ and 9/2$^+$; log *ft*=7.5 from 5/2$^+$. Excitation function in (p,nγ) supports 7/2 but the analysis is complicated by the presence of impurity lines (1988Fe07).
1122.6 *16*	(5/2$^-$,7/2$^-$)		I	J^π: L(^{3}He,d)=(3).
1127.9 *4*	(1/2,3/2)		J	J^π: excitation function in (p,nγ).
1138.9 *24*			I	
1239.9 *15*	7/2$^+$,9/2$^+$		I	J^π: L(^{3}He,d)=4.
1274.44[&] *12*	(11/2)$^-$	2.8 ps *7*	CDEFG	J^π: $\gamma(\theta)$ and E2 γ to (7/2)$^-$.
1275.5 *15*	5/2$^-$,7/2$^-$		I	J^π: L(^{3}He,d)=3.
1286.8[f] *5*	(9/2$^-$)[#]		EF	
1304.90[d] *21*	(13/2)$^+$	2.8 ps *7*	CDEFG	J^π: ΔJ=2, E2 γ to (9/2)$^+$.
1362.6 *15*	(5/2$^-$,7/2$^-$)		I	J^π: L(^{3}He,d)=(3).
1393.2 *23*	1/2$^-$,3/2$^-$		I	J^π: L(^{3}He,d)=1.
1462.2 *15*	(1/2$^+$)		I	J^π: L(^{3}He,d)=(0).
1482.53[b] *15*	(17/2)$^+$	0.42 ps *14*	CDEFG	J^π: ΔJ=2, E2 γ to (13/2)$^+$.

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Adopted Levels, Gammas (continued)

^{77}Br Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
1484.3 *21*	$(7/2^+,9/2^+)$		I	J^π: L(^{3}He,d)=(4).
1539.03[a] *14*	$(13/2^-)$[#]		CDEFG	
1554.1 *16*			I	
1576.15 *14*	$(5/2^-)$		A I	XREF: I(1577.1). J^π: gammas to $3/2^-$, $(3/2)^+$ and $7/2^{(+)}$; L(^{3}He,d)=(3).
1602.8 *7*			F I	
1645.0 *4*	$(13/2^+)$[#]		F	
1651.5 *15*	$(3/2^+,5/2^+)$		I	J^π: L(^{3}He,d)=2 (1983Zu01). However, L=(1+3) is also suggested in 1978Kl10.
1716.4 *18*			I	
1746.3 *15*	$7/2^+,9/2^+$		I	J^π: L(^{3}He,d)=4.
1747.38[c] *21*	$(15/2^+)$[#]		DEF	
1774.0 *17*	$3/2^+,5/2^+$		I	J^π: L(^{3}He,d)=2.
1789.1 *23*			I	
1827.04 *24*	$(15/2^+)$[#]		EF	
1855.1 *15*	$(1/2^+)$		I	J^π: L(^{3}He,d)=(0) (1983Zu01), but L=(3) is also suggested by 1978Kl10.
1879?	$(5/2^-,7/2^-)$		I	J^π: L(^{3}He,d)=(3).
1907.6 *15*	$7/2^+,9/2^+$		I	J^π: L(^{3}He,d)=4.
1998.8 *15*	$1/2^-,3/2^-$		I	J^π: L(^{3}He,d)=1.
2018.9 *19*	$3/2^+,5/2^+$		I	J^π: L(^{3}He,d)=2.
2021.86[&] *13*	$(15/2^-)$[#]		CDEFG	
2047.0[d] *4*	$(17/2)^+$	<0.2 ps	CDEFG	J^π: ΔJ=2, E2 γ to $(13/2)^+$.
2129.1 *4*	$(3/2)^-$		A I	XREF: I(2131.5). J^π: log *ft*=6.7 from $5/2^+$; L(^{3}He,d)=1.
2149.9 *18*	$1/2^-,3/2^-$		I	J^π: L(^{3}He,d)=1.
2172.4 *20*	$(3/2^+,5/2^+)$		I	J^π: L(^{3}He,d)=(2).
2193.6 *6*	(3/2,5/2,7/2)		A	J^π: log *ft*=7.1 from $5/2^+$.
2224.0 *15*	$1/2^-,3/2^-$		I	J^π: L(^{3}He,d)=1.
2248.3 *19*	$(3/2^+,5/2^+)$		I	J^π: L(^{3}He,d)=(2).
2274.7 *19*	$(1/2^-,3/2^-)$		I	J^π: L(^{3}He,d)=(1).
2296.7 *15*	$(3/2^+,5/2^+)$		I	J^π: L(^{3}He,d)=(2).
2339.90[a] *15*	$(17/2^-)$	<0.2 ps	CDEFG	J^π: $\gamma(\theta)$ and E2 γ to $(13/2^-)$.
2344.3 *5*	$(3/2,5/2,7/2^+)$		A	J^π: log *ft*=6.7 from $5/2^+$; γ to $(3/2)^+$.
2550.77[b] *24*	$(21/2)^+$	0.16 ps *4*	CDEFG	J^π: ΔJ=2, E2 γ to $(17/2)^+$.
2648.18[c] *22*	$(19/2^+)$[#]		DEF	
2792.81[&] *14*	$(19/2^-)$[#]		CDEF	
2926.9 *4*	$(19/2^+)$[#]		F	
2932.02[e] *23*	$(17/2^-)$[#]		D F	
3037.0[d] *4*	$(21/2^+)$[#]		DEF	
3201.02[a] *23*	$(21/2^-)$[#]		CDEF	
3219.85[e] *24*	$(19/2^-)$[#]		D F	
3610.1[e] *3*	$(21/2^-)$[#]		D F	
3642.7? *4*	$(23/2^-)$[#]		E	
3728.29[c] *25*	$(23/2^+)$[#]		D	
3729.8[&] *4*	$(23/2^-)$[#]		CD F	
3774.9[b] *6*	$(25/2^+)$[#]	0.118 ps *35*	CDEF	
4150.0[e] *5*	$(23/2^-)$[#]		D F	
4216.3[d] *6*	$(25/2^+)$[#]		D	
4247.3[a] *4*	$(25/2^-)$[#]	0.21 ps *6*	CD F	

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Adopted Levels, Gammas (continued)

^{77}Br Levels (continued)

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	XREF	Comments
4903.0[&] *4*	(27/2$^-$)[#]		D	
4981.1[c] *4*	(27/2$^+$)[#]		D	
5149.4[b] *8*	(29/2$^+$)[#]	0.042 ps *21*	CD	
5517.4[a] *5*	(29/2$^-$)[#]	0.111 ps *35*	CD	
5528.3[d] *8*	(29/2$^+$)[#]		D	
6297.0[&] *11*	(31/2$^-$)[#]		D	
6410.8[c] *7*	(31/2$^+$)[#]		D	
6691.5[b] *9*	(33/2$^+$)[#]	<0.069 ps	CD	
6979.5[a] *7*	(33/2$^-$)[#]	<0.14 ps	CD	
7876.0[&] *15*	(35/2$^-$)[#]		D	
8028.8[c] *12*	(35/2$^+$)[#]		D	
8401 *11*	(1/2$^-$)[@]		H	
8421[b] *4*	(37/2$^+$)[#]		CD	
8579.5[a] *12*	(37/2$^-$)[#]		D	
8608 *11*	(3/2$^-$,5/2$^-$)[@]		H	
8922 *11*	(3/2)$^-$ [@]		H	J$^\pi$: L=1 in ^{76}Se(p,p′) IAR.
9092 *11*	(5/2)$^+$ [@]		H	J$^\pi$: L=2 in ^{76}Se(p,p′) IAR.
9364 *11*	1/2$^+$ [@]		H	J$^\pi$: L=0 in ^{76}Se(p,p′) IAR.
9430 *11*	(3/2)$^-$ [@]		H	J$^\pi$: L=1 in ^{76}Se(p,p′) IAR.
9488 *11*	1/2$^+$ [@]		H	J$^\pi$: L=0 in ^{76}Se(p,p′) IAR.
9609.0[&] *18*	(39/2$^-$)[#]		D	
9632 *11*	(5/2)$^+$ [@]		H	J$^\pi$: L=2 in ^{76}Se(p,p′) IAR.
10280[a] *5*	(41/2$^-$)[#]		D	
10316?[b] *6*	(41/2$^+$)[#]		D	
11344?[&] *2*	(43/2$^-$)[#]		D	

[†] From least-squares fit to Eγ data for levels populated in γ-ray studies.

[‡] Values for levels between 150 and 2500 keV (except that for 276 keV level) are from recoil-distance Doppler-shift (RDDS) method in ^{64}Ni(^{16}O,p2nγ) (1979Sc28). For levels above 2500 keV, values are from DSAM (2001Ra33) in ^{65}Cu(^{16}O,2p2nγ) reaction.

[#] From $\gamma(\theta)$, $\gamma\gamma(\theta)$ and/or probable band assignment in in-beam γ-ray studies.

[@] From L-transfer and/or J^π of parent of analog state in ^{77}Se (see ^{77}Se Adopted Levels).

[&] Band(A): g.s. band,α=−1/2.

[a] Band(a): g.s. band,α=+1/2.

[b] Band(B): $\nu g_{9/2}$,α=+1/2.

[c] Band(b): $\nu g_{9/2}$,α=−1/2.

[d] Band(C): Band based on (9/2)$^+$,α=+1/2.

[e] Band(D): Band based on (17/2$^-$), 3-qp. Possible configuration=$\pi g_{9/2}\otimes\nu g_{9/2}\otimes(\nu p_{1/2}$ or $\nu p_{3/2}$ or $\nu f_{5/2})$ (1993Do14). Similar bands are seen in ^{79}Br and ^{81}Br.

[f] Band(E): Band based on (3/2)$^-$.

$\gamma(^{77}Br)$

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ	α&	Comments
105.86	$9/2^+$	105.87 *10*	100	0.0	$3/2^-$	E3#		6.30	α(K)=4.85 *7*; α(L)=1.236 *19*; α(M)=0.198 *3*; α(N)=0.01486 *22* B(E3)(W.u.)=0.0123 *4*
129.64	$5/2^+$	24.2 *5*	0.045 *7*	105.86	$9/2^+$	(E2)#		146 *12*	α(K)=82 *5*; α(L)=54 *6*; α(M)=8.6 *9*; α(N)=0.59 *6* B(E2)(W.u.)=1.5×10^2 *4* Transition seen in conversion data only. I_γ: deduced from intensity balance (see ^{77}Kr ε decay).
		129.64 *4*	100	0.0	$3/2^-$	E1#		0.0391	B(E1)(W.u.)=1.67×10^{-5} *6* α(K)=0.0348 *5*; α(L)=0.00370 *6*; α(M)=0.000584 *9*; α(N)=5.34×10^{-5} *8*
161.93	$5/2^-$	161.9 *2*	100	0.0	$3/2^-$	M1+E2	−0.27 *10*	0.039 *7*	α(K)=0.035 *6*; α(L)=0.0039 *7*; α(M)=0.00062 *11*; α(N)=5.7×10^{-5} *10* B(M1)(W.u.)=0.0093 *9*; B(E2)(W.u.)=34 *24* δ: −0.27 *10* or −1.6 *4* from $\gamma(\theta)$ in (p,nγ). $\gamma(\theta)$ in (HI,xnγ) consistent with lower value of δ. RUL=300 for E2 gives δ<1.6. Mult.: from $T_{1/2}$(162 level) and RUL for E2 and M2 transitions.
166.73	$(3/2)^-$	166.8 *4*	100	0.0	$3/2^-$	[M1,E2]		0.08 *6*	α(K)=0.07 *5*; α(L)=0.009 *6*; α(M)=0.0014 *9*; α(N)=0.00012 *8*
226.7	$3/2^-$	60.0 *5*	100 *18*	166.73	$(3/2)^-$	[M1,E2]		3 *3*	α(K)=2.6 *22*; α(L)=0.5 *5*; α(M)=0.08 *7*; α(N)=0.006 *6*
		226.6 *5*	100 *18*	0.0	$3/2^-$				
276.22	$(3/2)^+$	146.59 *4*	100 *5*	129.64	$5/2^+$	M1+E2	0.25 *7*	0.051 *6*	α(K)=0.045 *6*; α(L)=0.0051 *7*; α(M)=0.00081 *11*; α(N)=7.4×10^{-5} *9* B(M1)(W.u.)=0.065 *16*; B(E2)(W.u.)=2.5×10^2 *15* Mult.,δ: from ce data in ^{77}Kr ε decay. From $\gamma(\theta)$ in (p,nγ), δ=−0.87 *30* or −5.7 *37*.
		276.0 *2*	7.8 *5*	0.0	$3/2^-$	(E1)#		0.0043	B(E1)(W.u.)=1.4×10^{-5} *4*
336.7	$1/2^-,3/2^-$	170.0 *5*	11 *7*	166.73	$(3/2)^-$				
		336.9 *5*	100 *14*	0.0	$3/2^-$				δ: −0.32 *20* or infinity from $\gamma(\theta)$ in (p,nγ).
417.71	$7/2^{(+)}$	287.9 *3*	5.0 *5*	129.64	$5/2^+$				
		311.86 *14*	100 *13*	105.86	$9/2^+$	(M1)#		0.0059	Mult.: ce data in ^{77}Kr ε decay give M1,E2. DCO ratio in (^{18}O,α2nγ) indicates ΔJ=1, mainly dipole. δ: +0.10 *5* or infinity from $\gamma(\theta)$ in (p,nγ).
424.7	$5/2^-$	258.0 *4*	18 *9*	166.73	$(3/2)^-$				
		425.0 *4*	100 *30*	0.0	$3/2^-$				δ: +0.58 *3* or +4.3 *10* from $\gamma(\theta)$ in (p,nγ).
471.2	$3/2^-$	244.5 *5*	100 *37*	226.7	$3/2^-$				
		304.5 *5*	35 *9*	166.73	$(3/2)^-$				
		471.1 *5*	38 *9*	0.0	$3/2^-$				
575.86	$7/2^-$	413.9 *1*	27 *3*	161.93	$5/2^-$	M1+E2	−0.8 *5*	0.0039 *8*	B(M1)(W.u.)=0.0041 *22*; B(E2)(W.u.)=20 *16* δ: δ(E2/M1)=−0.8 *5* from $\gamma(\theta)$ in (^{6}Li,3nγ); DCO ratio in (^{18}O,α2nγ) indicates ΔJ=1, dipole.
		575.9 *1*	100 *5*	0.0	$3/2^-$	E2			B(E2)(W.u.)=37 *7*

γ(^{77}Br) (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.‡	α&	Comments
640.13	(13/2)$^+$	534.3 *1*	100	105.86	9/2$^+$	E2		B(E2)(W.u.)=68 *5*
649.2	(5/2)$^-$	372.9 *5*		276.22	(3/2)$^+$			
		520[@] *1*		129.64	5/2$^+$			
715.7	5/2$^{(-)}$	489.1 *5*	23 *5*	226.7	3/2$^-$			
		715.7 *5*	100 *20*	0.0	3/2$^-$	(D+Q)		δ: −0.19 +*4*−*7* or −1.7 *2* from $\gamma(\theta)$ in (p,nγ).
771.0	(1/2$^+$)	494.8[a] *5*	100	276.22	(3/2)$^+$			
781.1	(7/2$^-$)	356.6 *4*	100 *24*	424.7	5/2$^-$	D		
		613.8 *5*	83 *21*	166.73	(3/2)$^-$			
		619.1[b] *5*		161.93	5/2$^-$			
782.49	(9/2)$^+$	364.6 *5*	<7	417.71	7/2$^{(+)}$	(M1)	0.0041	B(M1)(W.u.)=0.004 *4*
		652.7 *4*	33 *4*	129.64	5/2$^+$	E2		B(E2)(W.u.)=20 *5*
		676.56 *18*	100 *5*	105.86	9/2$^+$			
790.68	(9/2)$^-$	214.6 *3*	5.9	575.86	7/2$^-$	[M1]	0.0151	B(M1)(W.u.)=0.027 *4*
		628.78 *11*	100	161.93	5/2$^-$	E2		B(E2)(W.u.)=61 *9*
		685.1 *3*	6.5 *25*	105.86	9/2$^+$	(E1)		B(E1)(W.u.)=1.6×10^{-5} *7*
831.5	1/2$^-$,3/2$^-$	494.8[a] *5*		336.7	1/2$^-$,3/2$^-$			
		604.8[b] *5*		226.7	3/2$^-$			
		664.9[b] *5*		166.73	(3/2)$^-$			
		669.5[b] *5*		161.93	5/2$^-$			
		831.4 *5*	100	0.0	3/2$^-$			
864.53	(3/2$^+$)	588.2 *3*	30 *4*	276.22	(3/2)$^+$			
		698.1 *4*	11 *2*	166.73	(3/2)$^-$			
		734.9 *2*	100 *10*	129.64	5/2$^+$			
		864.4 *3*	8 *2*	0.0	3/2$^-$			
886.9	1/2$^-$,3/2$^-$	720.2 *5*	54 *11*	166.73	(3/2)$^-$			
		886.9 *5*	100 *20*	0.0	3/2$^-$			
947.62	(11/2$^+$)	307.5 *1*	100 *11*	640.13	(13/2)$^+$	D		
		529.9 *3*	70 *10*	417.71	7/2$^{(+)}$	(Q)		
		841.0 *5*	70 *10*	105.86	9/2$^+$			
967.21	(7/2$^+$)	837.5 *2*	76 *7*	129.64	5/2$^+$			
		861.5 *3*	100 *10*	105.86	9/2$^+$			
969.5	(5/2)$^+$	551.7[b] *5*		417.71	7/2$^{(+)}$			
		693.3[b] *5*		276.22	(3/2)$^+$			
		839.7[b] *5*		129.64	5/2$^+$			
		969.5 *5*		0.0	3/2$^-$	(D+Q)		δ: −0.25 *4* or −1.61 *13* from $\gamma(\theta)$ in (p,nγ).
1024.46	(5/2)$^+$	606.5 *4*	100 *9*	417.71	7/2$^{(+)}$			
		748.3 *3*	7.5 *13*	276.22	(3/2)$^+$			
		894.9 *3*	30 *4*	129.64	5/2$^+$			
1093.8	(11/2$^+$)	311 *1*		782.49	(9/2)$^+$			
		453.5 *5*		640.13	(13/2)$^+$			

$\gamma(^{77}Br)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ	Comments
1093.8	(11/2$^+$)	676 *1*		417.71	7/2$^{(+)}$			
		987.9 *5*		105.86	9/2$^+$			
1097.71	(5/2$^+$,7/2)	968.2 *4*	36 *8*	129.64	5/2$^+$			
		991.7 *3*	100 *16*	105.86	9/2$^+$			
1127.9	(1/2,3/2)	791.2 *5*	40 *8*	336.7	1/2$^-$,3/2$^-$			
		901.2 *5*	19 *5*	226.7	3/2$^-$			
		1127.8 *5*	100 *21*	0.0	3/2$^-$			
1274.44	(11/2)$^-$	483.6 *3*	20	790.68	(9/2)$^-$	[M1+E2]		E_γ: in 1989NaZZ and 1974De51 483.4γ and 483.1γ (from 2021 level) proposed as unresolved doublet. Other studies place it from 1274 level only. B(M1)(W.u.)=0.0052 *14*, B(E2)(W.u.)=29 *8* for δ=1.
		698.6 *1*	100 *5*	575.86	7/2$^-$	E2		B(E2)(W.u.)=47 *12*
		1167.8 *5*	14 *4*	105.86	9/2$^+$	(E1)		B(E1)(W.u.)=9.E−6 *4*
1286.8	(9/2$^-$)	505.3 *5*		781.1	(7/2$^-$)			
		862.5 *5*		424.7	5/2$^-$			
1304.90	(13/2)$^+$	357 *1*	15	947.62	(11/2$^+$)	[M1+E2]		B(M1)(W.u.)=0.0044 *12*, B(E2)(W.u.)=45 *12* for δ=1.
		522.1 *3*	103 *13*	782.49	(9/2)$^+$	E2		B(E2)(W.u.)=9.E+1 *3* E_γ: may be contributed by an impurity as suggested in 1989NaZZ.
		665.0 *3*	100 *13*	640.13	(13/2)$^+$			
		1199.1 *4*	79	105.86	9/2$^+$	E2		B(E2)(W.u.)=1.1 *3* I_γ: other: 11 *2* in 1973EbZQ. E_γ: γ not consistently present in all in-beam γ-ray studies, 1989NaZZ suggested contribution from an impurity.
1482.53	(17/2)$^+$	842.3 *2*	100	640.13	(13/2)$^+$	E2		B(E2)(W.u.)=1.6×10^2 *6*
1539.03	(13/2$^-$)	264.6 *5*	4.6	1274.44	(11/2)$^-$	D		
		748.4 *1*	100 *5*	790.68	(9/2)$^-$	Q		
		898.5 *5*	4.7	640.13	(13/2)$^+$			
1576.15	(5/2$^-$)	1158.5 *3*	12 *1*	417.71	7/2$^{(+)}$			
		1300.0 *2*	100 *10*	276.22	(3/2)$^+$			
		1446.4 *3*	29 *4*	129.64	5/2$^+$			
		1576.0 *3*	8 *1*	0.0	3/2$^-$			
1602.8		317[b] *1*		1286.8	(9/2$^-$)			
		821.7 *5*		781.1	(7/2$^-$)			
1645.0	(13/2$^+$)	551.0 *5*		1093.8	(11/2$^+$)			
		1005.1 *5*		640.13	(13/2)$^+$			
1747.38	(15/2$^+$)	265 *1*	<7	1482.53	(17/2)$^+$			
		653 *1*		1093.8	(11/2$^+$)			
		799.7 *2*	100	947.62	(11/2$^+$)	Q		
		1108.0 *5*	<7	640.13	(13/2)$^+$	D		
1827.04	(15/2$^+$)	344.2 *5*		1482.53	(17/2)$^+$			
		879.5 *5*		947.62	(11/2$^+$)			
		1186.8 *3*		640.13	(13/2)$^+$	(M1+E2)	−2.5 *5*	
2021.86	(15/2$^-$)	483.1[b]		1539.03	(13/2$^-$)			Additional information 2.

$^{77}_{35}Br_{42}$-7

Adopted Levels, Gammas (continued)

γ(^{77}Br) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.‡	α&	Comments
2021.86	(15/2⁻)	747.4 1	100	1274.44	(11/2)⁻	Q		
		1382.0 5	25	640.13	(13/2)⁺	D		
2047.0	(17/2)⁺	300 1	<4	1747.38	(15/2⁺)	(M1+E2)		
		742.0 3	100	1304.90	(13/2)⁺	E2		B(E2)(W.u.)>6.3×10^2 B(E2)(W.u.): calculated upper limit greater than recommended upper limit (RUL(E2)=300).
		1407 1		640.13	(13/2)⁺			
2129.1	(3/2)⁻	1031.3 4	38 9	1097.71	(5/2⁺,7/2)			
		1999.7 6	100 21	129.64	5/2⁺			
		2129.1 6	62 12	0.0	3/2⁻			
2193.6	(3/2,5/2,7/2)	2031.7 8	31 13	161.93	5/2⁻			
		2063.9 7	100 19	129.64	5/2⁺			
2339.90	(17/2⁻)	317.8 2	8 3	2021.86	(15/2⁻)	(M1)	0.0057	B(M1)(W.u.)>0.25
		800.9 1	100	1539.03	(13/2⁻)	E2		B(E2)(W.u.)>4.1×10^2 B(E2)(W.u.): calculated upper limit greater than recommended upper limit (RUL(E2)=300).
2344.3	(3/2,5/2,7/2⁺)	1479.7 5	95 16	864.53	(3/2⁺)			
		2068.3 7	100 16	276.22	(3/2)⁺			
2550.77	(21/2)⁺	1068.3 2	100	1482.53	(17/2)⁺	E2		B(E2)(W.u.)=1.3×10^2 4
2648.18	(19/2⁺)	900.8 1	100	1747.38	(15/2⁺)	Q		
		1165.5 5	<14	1482.53	(17/2)⁺	D		
2792.81	(19/2⁻)	454[b]		2339.90	(17/2⁻)			
		771.0 1	100	2021.86	(15/2⁻)	Q		
		1310.2 1	82	1482.53	(17/2)⁺	D		
2926.9	(19/2⁺)	1099.4 5		1827.04	(15/2⁺)			
		1444.9 5		1482.53	(17/2)⁺			
2932.02	(17/2⁻)	591.9 3	100	2339.90	(17/2⁻)			
		1393.0 3	100	1539.03	(13/2⁻)	Q		
3037.0	(21/2⁺)	389[b] 1	<6	2648.18	(19/2⁺)			
		990.0 1	100	2047.0	(17/2)⁺	Q		
3201.02	(21/2⁻)	408.3 5		2792.81	(19/2⁻)	D		
		861.1 2	100	2339.90	(17/2⁻)	Q		
3219.85	(19/2⁻)	287.8 1	100	2932.02	(17/2⁻)	D+Q		
		1737.7 4	50	1482.53	(17/2)⁺	D		
3610.1	(21/2⁻)	390.3 2	100	3219.85	(19/2⁻)	D+Q		
		1059 1	<10	2550.77	(21/2)⁺			
3642.7?	(23/2⁻)	850.1[b] 5		2792.81	(19/2⁻)	(Q)		
3728.29	(23/2⁺)	1080.1 1	100	2648.18	(19/2⁺)	(Q)		
		1177[b]	<14	2550.77	(21/2)⁺			
3729.8	(23/2⁻)	936.6 4	100	2792.81	(19/2⁻)	Q		
		1179.5 5		2550.77	(21/2)⁺			
3774.9	(25/2⁺)	1224.1 5	100	2550.77	(21/2)⁺	E2		B(E2)(W.u.)=9.E+1 3

$^{77}_{35}Br_{42}$-8

$\gamma(^{77}Br)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	Comments
4150.0	(23/2⁻)	539.9 *3*	100	3610.1	(21/2⁻)	D+Q	
4216.3	(25/2⁺)	1179.3 *4*	100	3037.0	(21/2⁺)	Q	
4247.3	(25/2⁻)	518[b]	<4	3729.8	(23/2⁻)	[M1+E2]	B(M1)(W.u.)<0.015, B(E2)(W.u.)<80 for δ=1.
		1046.3 *3*	100	3201.02	(21/2⁻)	E2	B(E2)(W.u.)=1.1×10^2 *4*
4903.0	(27/2⁻)	1173.2 *1*	100	3729.8	(23/2⁻)	Q	
4981.1	(27/2⁺)	1252.8 *3*	100	3728.29	(23/2⁺)	Q	
5149.4	(29/2⁺)	1374.5 *5*	100	3774.9	(25/2⁺)	E2	B(E2)(W.u.)=1.4×10^2 *7*
5517.4	(29/2⁻)	614[b]	<4	4903.0	(27/2⁻)	[M1+E2]	B(M1)(W.u.)<0.018, B(E2)(W.u.)<60.
		1270.1 *3*	100	4247.3	(25/2⁻)	E2	B(E2)(W.u.)=78 *25*
5528.3	(29/2⁺)	1312.0 *5*	100	4216.3	(25/2⁺)	(Q)	
6297.0	(31/2⁻)	1394 *1*	100	4903.0	(27/2⁻)	Q	
6410.8	(31/2⁺)	1429.7 *5*	100	4981.1	(27/2⁺)	Q	
6691.5	(33/2⁺)	1542.1 *5*	100	5149.4	(29/2⁺)	E2	B(E2)(W.u.)>48
6979.5	(33/2⁻)	1462.0 *4*	100	5517.4	(29/2⁻)	E2	B(E2)(W.u.)>31
7876.0	(35/2⁻)	1579 *1*	100	6297.0	(31/2⁻)	Q	
8028.8	(35/2⁺)	1618 *1*	100	6410.8	(31/2⁺)	Q	
8421	(37/2⁺)	1729 *3*	100	6691.5	(33/2⁺)	(Q)	
8579.5	(37/2⁻)	1600 *1*	100	6979.5	(33/2⁻)	(Q)	
9609.0	(39/2⁻)	1733 *1*	100	7876.0	(35/2⁻)		
10280	(41/2⁻)	1701 *4*	100	8579.5	(37/2⁻)	(Q)	
10316?	(41/2⁺)	1895[b] *5*	100	8421	(37/2⁺)		
11344?	(43/2⁻)	1735[b]	100	9609.0	(39/2⁻)		

† From ^{77}Kr ε decay for levels below 200 keV. Above this the levels are populated in various reactions.

‡ Unless otherwise stated, the assignments are from $\gamma\gamma(\theta)$(DCO) ratios and/or $\gamma(\theta)$ data in in-beam γ-ray studies Mult=Q or E2 (from RUL) is for ΔJ=2 and mult=D or D+Q from ΔJ=1, as suggested by $\gamma\gamma(\theta)$(DCO) and/or $\gamma(\theta)$.

From ce data in ^{77}Kr ε decay.

@ From high-spin data set.

& 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.

[a] Multiply placed.

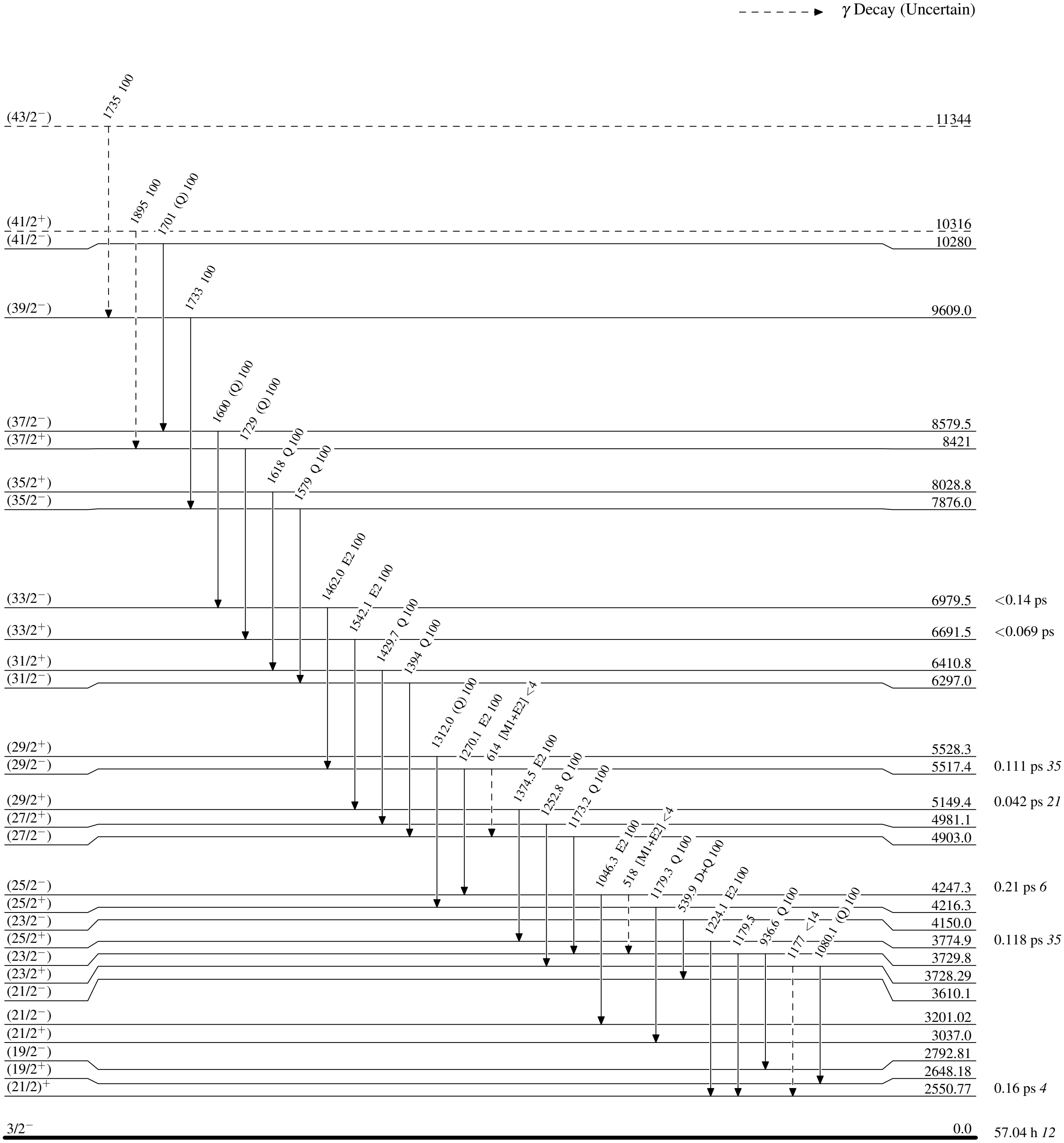
[b] Placement of transition in the level scheme is uncertain.

$^{77}_{35}Br_{42}$-9

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



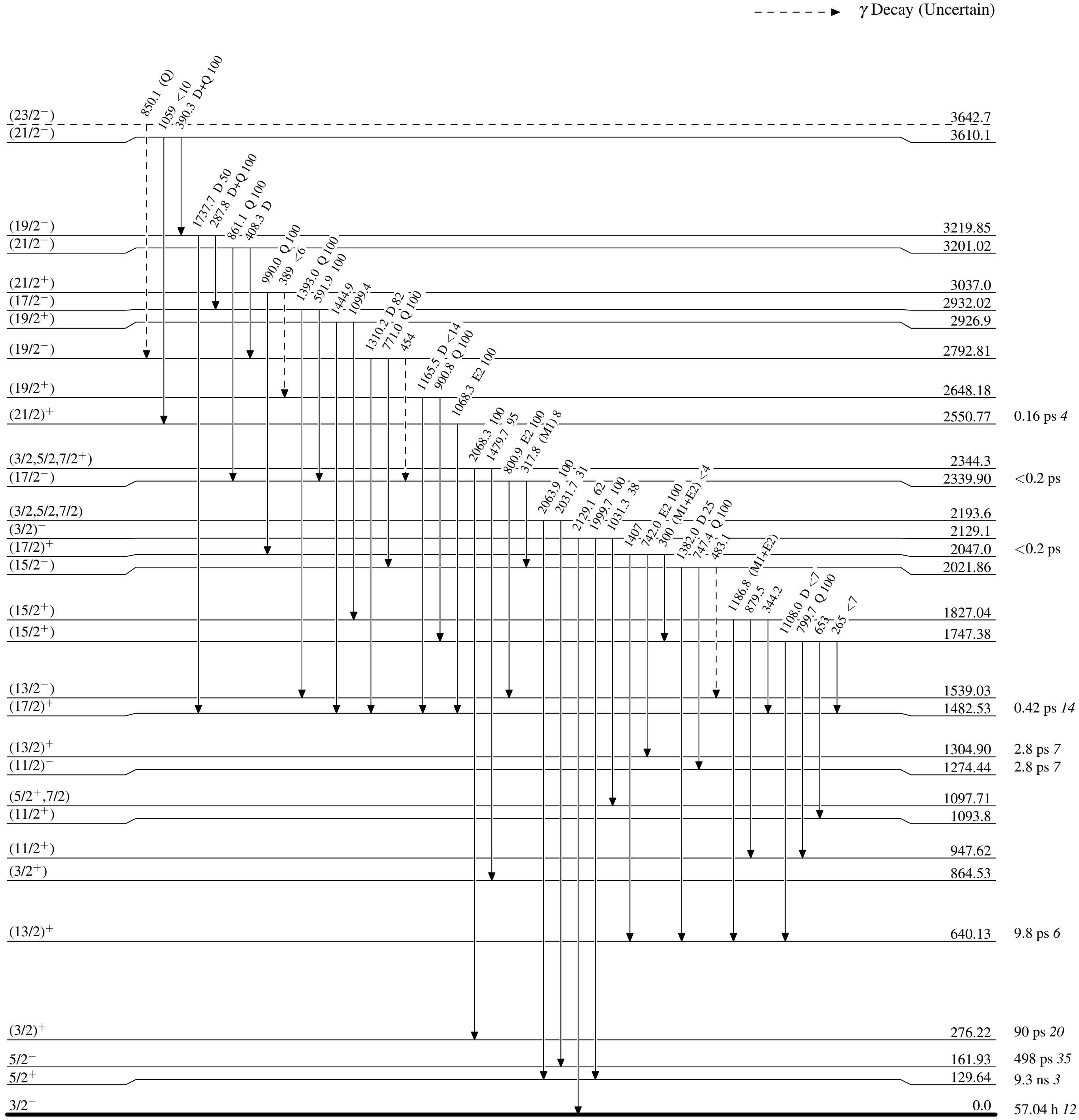
$^{77}_{35}Br_{42}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{77}_{35}Br_{42}$

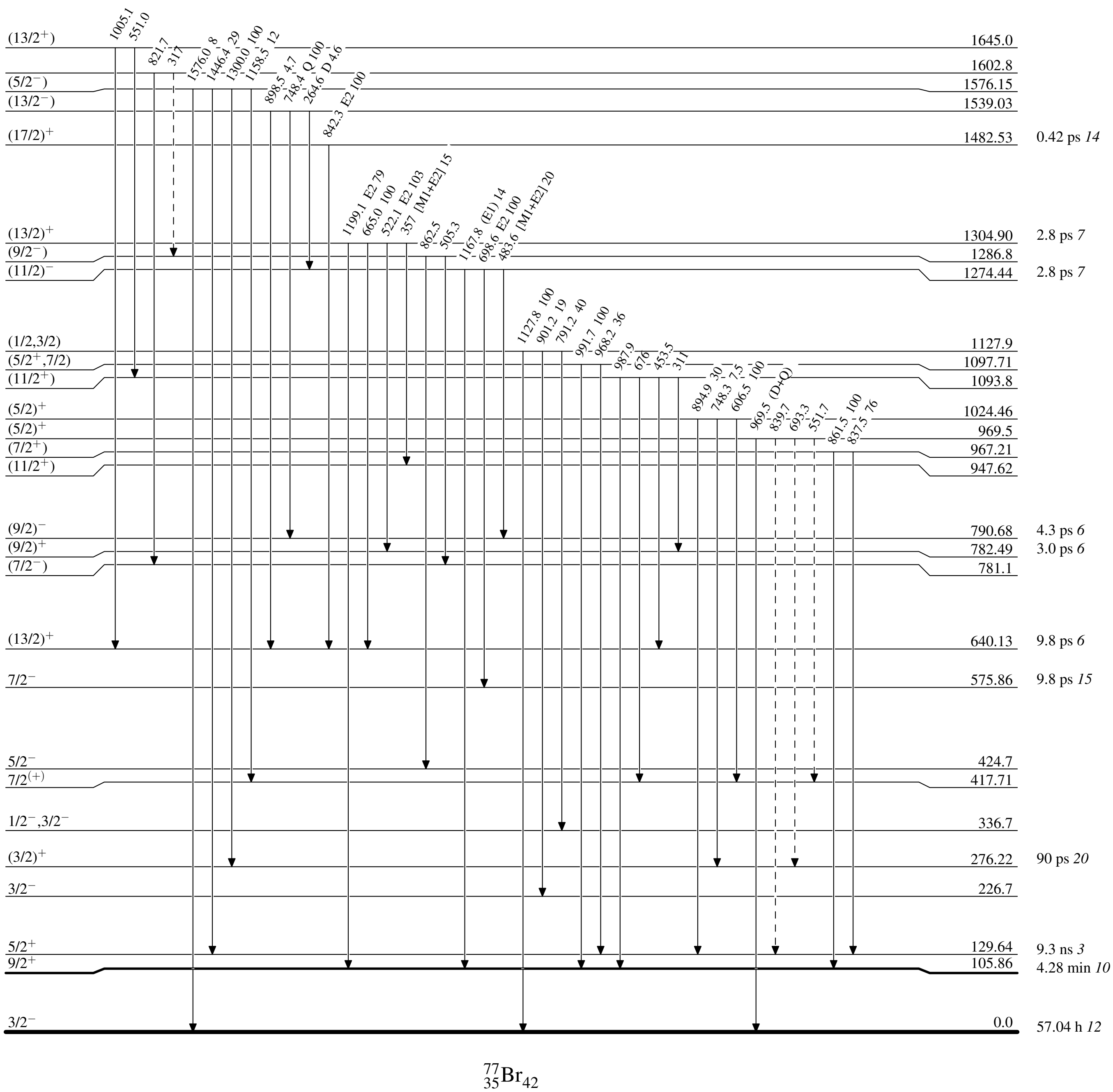
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



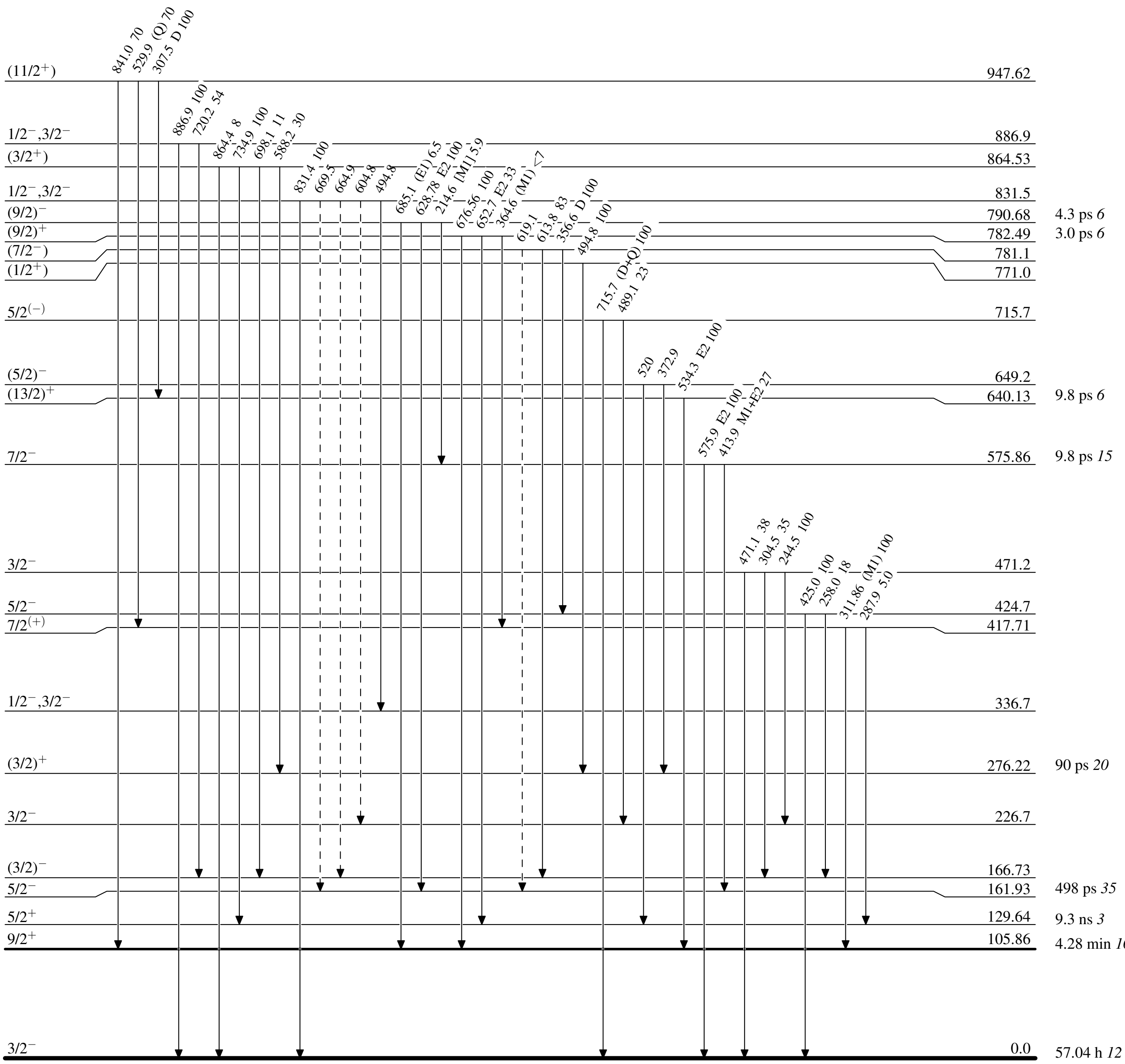
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)

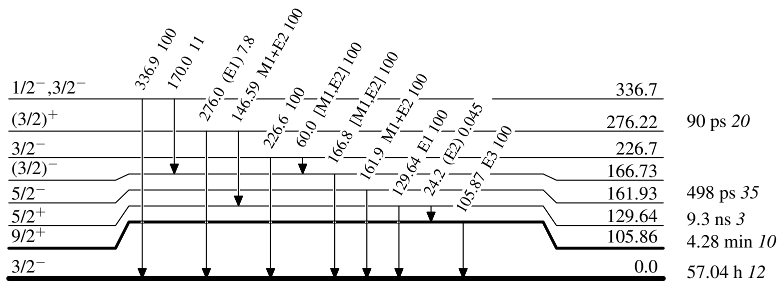


$^{77}_{35}Br_{42}$

Adopted Levels, Gammas

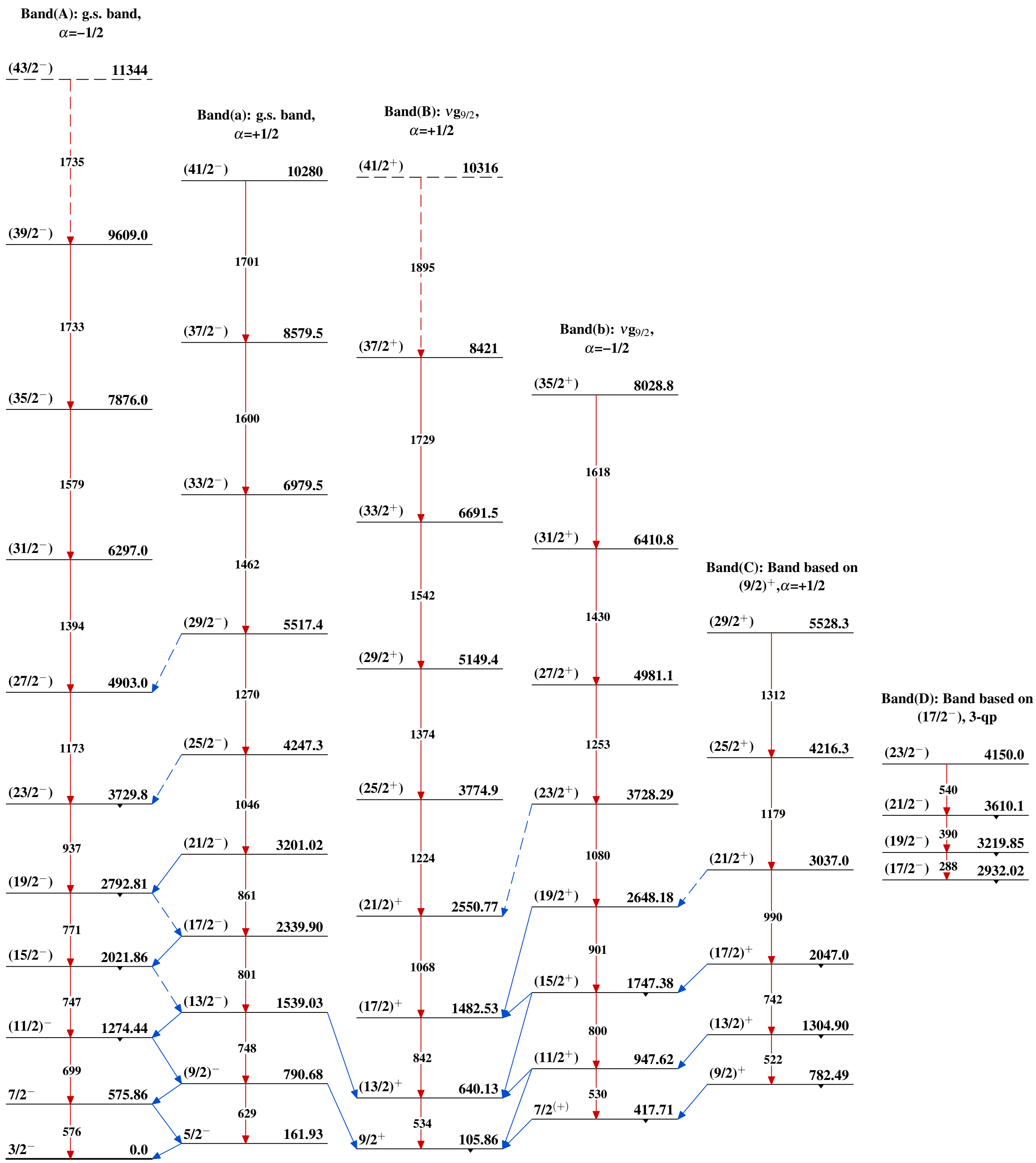
Level Scheme (continued)

Intensities: Relative photon branching from each level



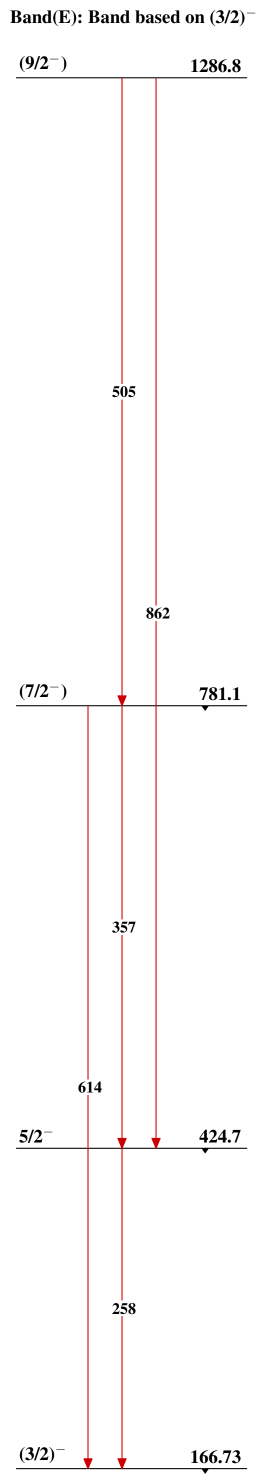
$^{77}_{35}Br_{42}$

Adopted Levels, Gammas



$^{77}_{35}Br_{42}$

Adopted Levels, Gammas (continued)



$^{77}_{35}Br_{42}$