Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 108,79 (2007)	15-Oct-2006

Q(β^-)=−5.58×10^3 *3*; S(n)=9.50×10^3 *3*; S(p)=2036 *18*; Q(α)=4933 *7* 2012Wa38
Note: Current evaluation has used the following Q record −5583 26 *9500* 30 *2037* 19 *4932* 7 2003Au03.
1985Pi05 interpreted the high-spin states as $h_{9/2}$ proton coupling to even-even core.

^{199}Bi Levels

Cross Reference (XREF) Flags

- A ^{199}Bi IT decay (0.10 μs)
- B ^{199}Po ε decay (5.48 min+4.17 min)
- C ^{203}At α decay (7.4 min)
- D (HI,xnγ)

E(level)†	J$^\pi$‡	T$_{1/2}$#	XREF	Comments
0.0	9/2$^-$	27 min *1*	ABCD	%ε+%β^+=100 μ=4.6 *4* %α≈3×10^{-5} from α syst (1980Sc26), Configuration=$\pi h_{9/2}\otimes\nu j^{-10}_{0+}$. J$^\pi$: spin from atomic beam (1959Ax98); π from μ and shell-model systematics for $\pi h_{9/2}$ orbital. T$_{1/2}$: from 1964Si11; other: 25 min *5* (1950Ne77). μ: static nuclear orientation (1988Wo12,2005St24).
667 *4*	(1/2$^+$)	24.70 min *15*	B	%ε+%β^+=99 *1*; %α≈0.01; %IT≤2 %α: from 1950Ne77, 1964Si11, 1970DaZM. %IT: from 1980Br23; other: ≤3.2% (1985St02). E(level): from 2003Au02. 1980Br23 and 1985St02 searched for the isomeric transition from this 3s$_{1/2}$ level (1980Br23 in the energy region 400-900 keV and 1985St02 in the region of 500-1000 keV) in both γ and ce spectra. No obvious candidate was found. However, both found an unassigned conversion line, which, if ce(K) in Bi, corresponds to Eγ=667 keV. Since this was the strongest unassigned conversion line in the spectrum, an upper limit could be determined for the isomeric M4 transition. Thus the %IT was estimated to be ≤2% (1980Br23), ≤3.2% (1985St02). If the 667γ is the isomeric transition with %IT≤2, and if the multipolarity is pure M4, then B(M4)(W.u.)≤0.0017. Other: 680 from level (3s$_{1/2}$ states in Bi nuclides and Q(α) systematics (1980Sc26). T$_{1/2}$: from α decay (1966Ma51); others: 24.5 min *4* (1970DaZM), 24.4 min *5* (1964Si11), 25 min (1950Ne77). J$^\pi$: from syst of α-decaying isomers and of retarded M4 transitions (1980Sc26,1980Br23).
845.7 *2*	(5/2)$^-$		B	J$^\pi$: syst 1985St02, E2,M1 to g.s. (5/2$^-$ assignment requires pure E2).
880.2 *2*	(7/2)$^-$		B	J$^\pi$: M1 γ to g.s., syst (1985St02).
913	(3/2$^+$)		B	J$^\pi$: M1+E2 γ to (1/2$^+$), syst of positive parity states.
1002.2 *2*	13/2$^-$		AB D	J$^\pi$: stretched E2 γ to 9/2$^-$. Configuration=$\pi h_{9/2}\otimes\nu j^{-2}_{2+}\otimes\nu j^{-8}_{0+}$.
1034.3 *3*	11/2$^-$		B D	J$^\pi$: M1+E2 γ to 9/2$^-$, γ cascade from 1647, 17/2$^+$ requires J>9/2. Configuration=$\pi h_{9/2}\otimes\nu j^{-2}_{2+}\otimes\nu j^{-8}_{0+}$.
1119	(5/2$^+$)		B	J$^\pi$: γ deexcitation suggests 1/2$^+$, 3/2$^+$ or 5/2$^+$; syst of positive parity (single proton hole) levels suggests 2d$_{5/2}$ (see ^{201}Bi,^{203}Bi,^{205}Bi).
1197.4 *2*	(11/2,13/2)$^-$		B	J$^\pi$: M1 γ to 13/2$^-$; γ to 9/2$^-$.
1248.4 *2*	(−)		B	J$^\pi$: (E2,M1) γ to 9/2$^-$.
1321.0 *2*	(−)		B	J$^\pi$: (E2) γ to 9/2$^-$.

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Adopted Levels, Gammas (continued)

^{199}Bi Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	XREF	Comments
1396.3 *3*	$(13/2)^+$		B D	Jπ: E1 γ to $11/2^-$. Configuration=$\pi i_{13/2}$.
1459	$(1/2^+,3/2^+,5/2^+)$		B	Jπ: M1 γ to $(3/2^+)$.
1501.8 *3*	$17/2^-$		AB D	Jπ: stretched E2 γ to $13/2^-$. Configuration=$\pi h_{9/2}\otimes\nu(f^{-1}_{5/2}p^{-1}_{3/2}+f^{-2}_{5/2})_{4+}\otimes\nu j^{-8}_{0+}$.
1523.6 *2*			B	
1619.4 *5*			B D	
1635.9 *4*	$(13/2)^+$		B D	Jπ: E1 γ to $11/2^-$.
1647.5 *3*	$17/2^+$	34.1 ns *24*	AB D	Jπ: ΔJ=0, E1 γ to $17/2^-$. Configuration=$\pi h_{9/2}\otimes\nu(p^{-1}_{3/2}i^{-1}_{13/2}+f^{-1}_{5/2}\ i^{-1}_{13/2})_{5-}\otimes\nu j^{-8}_{0+}$.
1663.4 *2*			B	
1683.2 *2*			B	
1706.2 *2*			B	
1822.1 *2*			B	
1922.3 *4*	$(21/2^+)$	<50 ns	A D	Jπ: stretched (E2) γ to $17/2^+$. Configuration=$\pi h_{9/2}\otimes\nu(p^{-1}_{3/2}i^{-1}_{13/2}+f^{-1}_{5/2}\ i^{-1}_{13/2})_{7-}\otimes\nu j^{-8}_{0+}$.
1922.3+x	$(25/2^+)$	0.10 μs *3*	A D	Jπ: from syst and shell-model calculation of 1985Pi05 for Configuration=$\pi h_{9/2}\otimes\nu(f^{-1}_{5/2}i^{-1}_{13/2}(9^-)\otimes\ \nu j^{-8}(0^+)$.
1999.5 *5*	$(19/2^-)$		D	
2001.0 *5*			D	
2029.8+x *3*	$(27/2^+)$		D	
2133.1 *2*			B	
2179.8+x *2*	$(27/2^-)$		D	
2238.1+x *2*	$(27/2^-)$		D	
2345.6+x? *3*			D	
2435.7+x? *4*			D	
2443.2+x *3*			D	
2523.2+x *2*	$29/2^-$	168 ns *13*	D	Configuration=$\pi h_{9/2}\otimes\nu i^{-2}_{13/2}(12^+)\otimes\nu j^{-8}(0^+)$.
2570.4+x *3*	$(27/2^+)$		D	
2749.2+x *4*			D	
2928.1+x *3*	(29/2)		D	
3018.0+x *3*	$(31/2^-)$		D	Configuration=$\pi h_{9/2}\otimes\nu i^{-2}_{13/2}(12^+)\otimes\nu j^{-8}(0^+)$.
3401.2+x *3*	$(33/2^-)$		D	Configuration=$\pi h_{9/2}\otimes\nu i^{-2}_{13/2}(12^+)\otimes\nu j^{-8}(0^+)$.
3635.0+x *5*			D	
3780.9+x *5*	$(35/2^-)$		D	Configuration=$\pi h_{9/2}\otimes\nu i^{-2}_{13/2}(10^+,12^+)\otimes\ \nu^{-2}(2^+,4^+)\otimes\nu j^{-6}(0^+)$.
3903.0+x? *5*			D	
4296.9+x *11*			D	
y@	J		D	
184.4+y@ *5*	J+1		D	
400.2+y@ *7*	J+2		D	
642.0+y@ *9*	J+3		D	
923.2+y@ *10*	J+4		D	
1236.7+y@ *11*	J+5		D	
1590.3+y@ *12*	J+6		D	
1950.8+y@ *13*	J+7		D	
2316.7+y@ *14*	J+8		D	

† From least squares fit to adopted Eγ. For additional levels suggested by 1985St02, see ^{199}Po ε decay (4.17 min) data set.

‡ The J^π assignments for levels above the 1947-keV isomer are from (^{10}B,5nγ) data (1985Pi05) and are based on γ(θ), excit, and α limits extracted from measured Iγ.

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Adopted Levels, Gammas (continued)

^{199}Bi Levels (continued)

From (^{10}B,5nγ) data set, unless otherwise noted.

@ Band(A): Magnetic-dipole rotational band (1994Da17). Oblate structure. Population intensity ≈20% relative to 100 for 494.8γ from 31/2$^-$ level. Tentative configuration=$\pi(h_{9/2}i_{13/2}s^{-1}_{1/2})\otimes \nu(i^{-1}_{13/2}$ or $i^{-3}_{13/2})$.

Adopted Levels, Gammas (continued)

$\gamma(^{199}Bi)$

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	δ	α[#]	Comments
667	$(1/2^+)$	(667)		0.0	$9/2^-$	[M4]		0.70	B(M4)(W.u.)≤0.0017 for %IT≤2.
845.7	$(5/2)^-$	845.7	100	0.0	$9/2^-$	(E2,M1)		0.021 *11*	
880.2	$(7/2)^-$	880.2	100	0.0	$9/2^-$	M1		0.0281	α(K)=0.0230; α(L)=0.00387
913	$(3/2^+)$	246.0	100	667	$(1/2^+)$	M1+E2	2.1 *3*	0.34 *4*	α(K)=0.21 *3*; α(L)=0.0953 *15*; α(M)=0.0242 *2*; α(N+..)=0.00803 *8*
1002.2	$13/2^-$	1002.19 *20*	100	0.0	$9/2^-$	E2		0.0070	α(K)=0.00557; α(L)=0.00111
1034.3	$11/2^-$	1034.3 *3*	100	0.0	$9/2^-$	M1+E2	−1.3 *10*	0.011 *7*	α(K)=0.0099 *6*; α(L)=0.0016 *9*
1119	$(5/2^+)$	206.7	100	913	$(3/2^+)$	(M1)		1.36	α(K)=1.10; α(L)=0.192; α(M)=0.0452; α(N+..)=0.0151
		452.5	79	667	$(1/2^+)$	[E2]		0.0396	α(K)=0.0266; α(L)=0.00970; α(M)=0.00244; α(N+..)=0.00081
1197.4	$(11/2,13/2)^-$	195.5	29	1002.2	$13/2^-$	M1		1.59	α(K)=1.29; α(L)=0.225; α(M)=0.0529; α(N+..)=0.0177
		1197.5	100	0.0	$9/2^-$				
1248.4	$(^-)$	1248.4	100	0.0	$9/2^-$	(E2,M1)		0.008 *3*	
1321.0	$(^-)$	1321.0	100	0.0	$9/2^-$	(E2)		0.00416	
1396.3	$(13/2)^+$	362.01 *25*	100 *2*	1034.3	$11/2^-$	E1		0.0200	α(K)=0.0164; α(L)=0.00275; α(M)=0.00064; α(N+..)=0.00021
		394.1	59 *21*	1002.2	$13/2^-$	[E1]		0.0166	α(K)=0.0136; α(L)=0.00226; α(M)=0.000527; α(N+..)=0.000173
		1395.9	20	0.0	$9/2^-$	[M2,E3]			
1459	$(1/2^+,3/2^+,5/2^+)$	545.8 *2*	100	913	$(3/2^+)$	M1		0.0976	α(K)=0.0796; α(L)=0.0135
1501.8	$17/2^-$	499.61 *20*	100	1002.2	$13/2^-$	E2		0.0310	α(K)=0.0216; α(L)=0.00708; α(M)=0.00177; α(N+..)=0.00059
1523.6		1523.6	100	0.0	$9/2^-$				
1619.4		617.2 *4*	100	1002.2	$13/2^-$				
1635.9	$(13/2)^+$	239.8 *4*	29.1 *16*	1396.3	$(13/2)^+$	M1+E2[‡]	1.2 *2*	0.51 *6*	α(K)=0.37 *6*; α(L)=0.111 *3*; α(M)=0.0276 *4*; α(N+..)=0.00916 *13*
		601.5 *3*	100 *2*	1034.3	$11/2^-$	E1[‡]		0.00684	α(K)=0.00564; α(L)=0.00090
1647.5	$17/2^+$	145.70 *20*	100.0 *11*	1501.8	$17/2^-$	E1[‡]		0.177	B(E1)(W.u.)=1.48×10^{-6} *25* α(K)=0.142; α(L)=0.0266; α(M)=0.00627; α(N+..)=0.00204
		251.13 *25*	8.51 *9*	1396.3	$(13/2)^+$	(E2)		0.213	α(K)=0.101; α(L)=0.0829; α(M)=0.0216; α(N+..)=0.00713 B(E2)(W.u.)=0.016 *3*
1663.4		1663.4	100	0.0	$9/2^-$				
1683.2		1683.2	100	0.0	$9/2^-$				
1706.2		1706.2	100	0.0	$9/2^-$				
1822.1		1822.1	100	0.0	$9/2^-$				
1922.3	$(21/2^+)$	274.82 *20*	100	1647.5	$17/2^+$	(E2)		0.160	α(K)=0.0818; α(L)=0.0580; α(M)=0.0150; α(N+..)=0.00497 B(E2)(W.u.)>0.10
1922.3+x	$(25/2^+)$	x		1922.3	$(21/2^+)$				

$^{199}_{83}Bi_{116}$-4

Adopted Levels, Gammas (continued)

γ(^{199}Bi) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	δ	α[#]
1999.5	(19/2⁻)	352.0 *4*	100	1647.5	17/2⁺			
2001.0		353.5 *4*	100	1647.5	17/2⁺			
2029.8+x	(27/2⁺)	107.3 *4*	100	1922.3+x	(25/2⁺)			
2133.1		2133.1	100	0.0	9/2⁻			
2179.8+x	(27/2⁻)	257.55 *25*	100	1922.3+x	(25/2⁺)	D		
2238.1+x	(27/2⁻)	315.80 *20*	100	1922.3+x	(25/2⁺)	D		
2345.6+x?		423.3 *3*	100	1922.3+x	(25/2⁺)			
2435.7+x?		197.6 *3*	100	2238.1+x	(27/2⁻)			
2443.2+x		205.13 *25*	100	2238.1+x	(27/2⁻)	D		
2523.2+x	29/2⁻	(80.0)		2443.2+x				
		(87.6)		2435.7+x?				
		285.16 *25*	78.7 *8*	2238.1+x	(27/2⁻)	D+Q		
		343.4 *3*	29 *5*	2179.8+x	(27/2⁻)			
		493.2 *3*	100 *1*	2029.8+x	(27/2⁺)	D		
2570.4+x	(27/2⁺)	648.09 *25*	100	1922.3+x	(25/2⁺)	D		
2749.2+x		403.65 *25*	100	2345.6+x?				
2928.1+x	(29/2)	1005.8 *3*	100	1922.3+x	(25/2⁺)	Q		
3018.0+x	(31/2⁻)	494.80 *25*	100	2523.2+x	29/2⁻	(M1+E2)	−1.9 *17*	0.05 *7*
3401.2+x	(33/2⁻)	383.05 *25*	100 *2*	3018.0+x	(31/2⁻)	D+Q	−0.10 *11*	
		878.06 *25*	67 *2*	2523.2+x	29/2⁻	Q		
3635.0+x		617.0 *3*	100	3018.0+x	(31/2⁻)			
3780.9+x	(35/2⁻)	379.7 *4*	100	3401.2+x	(33/2⁻)	D		
3903.0+x?		885.0 *3*	100	3018.0+x	(31/2⁻)	D		
4296.9+x		393.9	100	3903.0+x?				
184.4+y	J+1	184.4 *5*		y	J	D		
400.2+y	J+2	215.8 *5*		184.4+y	J+1	D		
642.0+y	J+3	241.8 *5*		400.2+y	J+2	D		
923.2+y	J+4	281.2 *5*		642.0+y	J+3	D		
1236.7+y	J+5	313.5 *5*		923.2+y	J+4	D		
1590.3+y	J+6	353.6 *5*		1236.7+y	J+5	D		
1950.8+y	J+7	360.5 *5*		1590.3+y	J+6	D		
2316.7+y	J+8	365.9 *5*		1950.8+y	J+7	D		

[†] Based on α(K)exp in ^{199}Po ε decay and on γ(θ) in (HI,xnγ).

[‡] From ce data in ^{199}Po ε decay.

[#] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with "Frozen Orbitals" approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

$^{199}_{83}Bi_{116}$-5

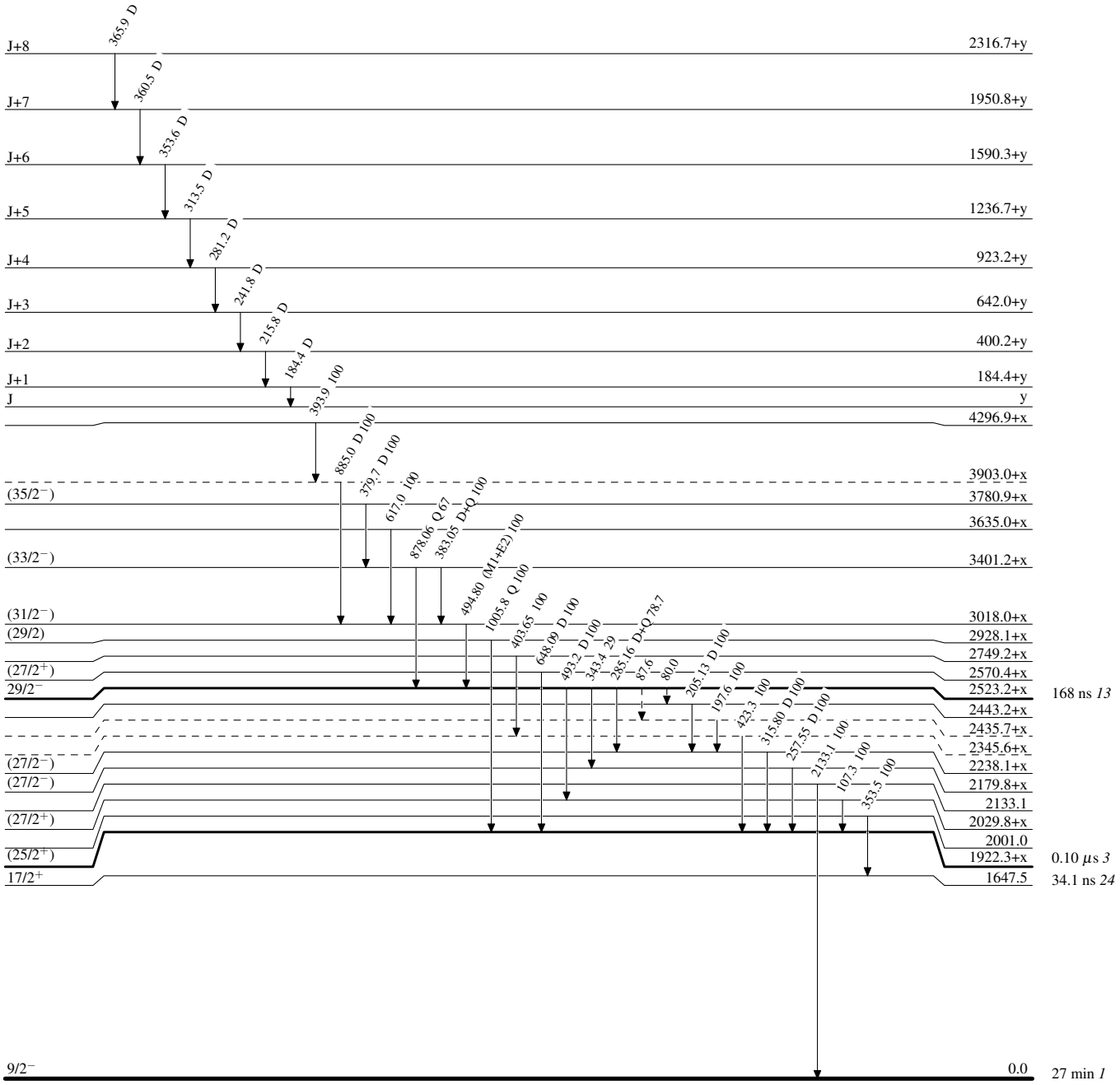
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{199}_{83}Bi_{116}$

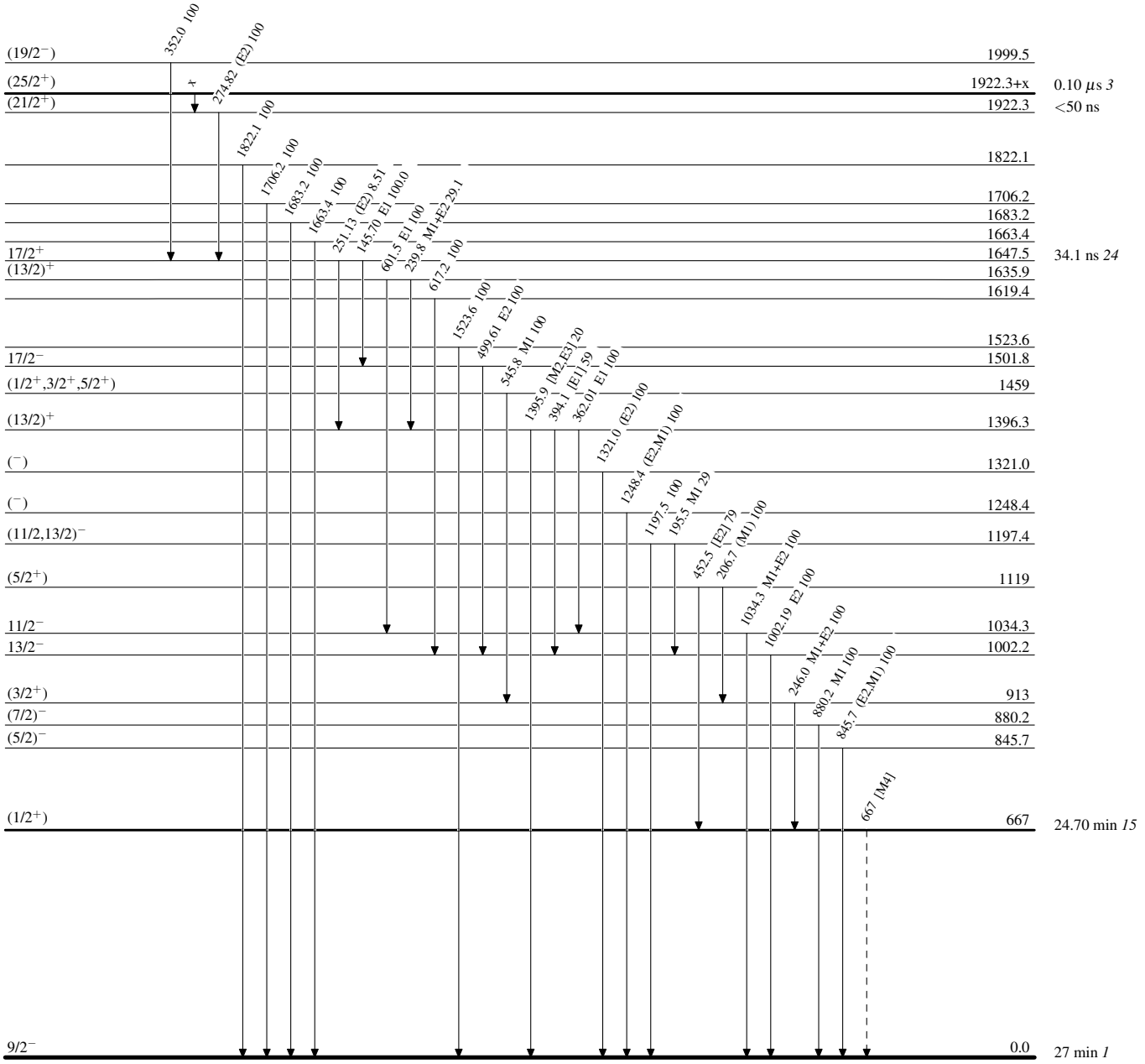
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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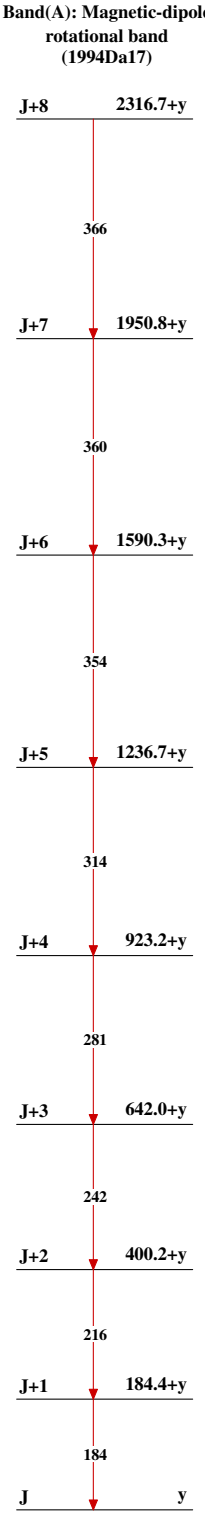
Adopted Levels, Gammas



$^{199}_{83}Bi_{116}$