Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 114, 1849 (2013)	31-Dec-2012

Q(β^-)=−14390 *SY*; S(n)=15030.1 *7*; S(p)=5105.0 *4*; Q(α)=−2691.7 *5* 2012Wa38
ΔQ(β^-)=196 syst (2012Wa38).
Others:
Atomic Mass: 2010Ka26.
GDR, Isospin mixing: 2008KiZZ, 2007Wo02, 2006Wo04.
Hyper-deformed states: 2008Vo12, 2007Zh16: ^{24}Mg(^{36}Ar,X)^{60}Zn, E=195 MeV. Studied fission fragments from exotic hyperdeformed state with J around 4552.

^{60}Zn Levels

Cross Reference (XREF) Flags

A	^{60}Ga ε decay (70 ms)	E	^{58}Ni(^{3}He,n)
B	^{61}Ge εp decay	F	^{58}Ni(^{16}O,^{14}C)
C	^{58}Ni(^{3}He,nγ)	G	^{40}Ca(^{28}Si,2$\alpha\gamma$),(^{32}S,3$\alpha\gamma$)
D	^{58}Ni(^{12}C,^{10}Be)		

E(level)[†]	Jπ[@]	$T_{1/2}$	XREF	Comments
0.0[b]	0+	2.38 min *5*	ABC EFG	%ε+%β+=100 $T_{1/2}$: Unweighted average of 1969Ho01 (2.42 min *2*) and 1972Du09 (2.33 min *5*), both γ(t) with NaI and separated sources.
1003.90[b] *20*	2+		A CDEFG	
2193.0[b] *5*	4+		CDE G	
2559.0 *5*	(2+)		A	Jπ: γ to 0+; systematics of N=30 isotones and N=Z nuclei do not support J=1.
3034.9 *11*			C	
3.2×10^3? *1*			F	
3510.3 *6*	(3+)		CDE	Jπ: L=3 or (0) for a 3520 *30* group in (^{3}He,n); (M1+E2) to 2+ and from 3(+),4(+). However, 2(+), 4(+) for a 3520 *30* group in (^{3}He,n).
3627.0 *11*			C	
3710 *50*	(4+)[a]		D	Jπ: configuration=(π $f_{5/2}$)$^{+2}$, see (^{12}C,^{10}Be).
3808.4[b] *7*	6+		G	
3812.0 *11*			CD F	
3972.4 *8*	2[&]		C E	Jπ: in conflict with L(^{3}He,n)=(1).
4180 *30*	(0+,2+)		E	
4200.1 *8*	5(+)[&]		C	
4351.0 *11*	5(+)[&]		C	
4400? *50*	(5−)[a]		D	Jπ: configuration=((π $p_{3/2}$)(π $g_{9/2}$))5−, see(^{12}C,^{10}Be).
4776.0 *11*	5(+)[&]		C F	
4852.2 *7*	(2+)		A	Jπ: probable T=1 isobaric-analog state of ^{60}Ga g.s. (2+).
4913.3 *9*	2+		C E	E(level): probably T=1 analog of ^{60}Cu(g.s.).
5200 *60*	2+		E	
5292.1[b] *9*	8+		G	
5300[#] *50*	(7−)[a]		D	Jπ: configuration=((ν $f_{5/2}$)(ν $g_{9/2}$))7− or configuration=((π $f_{5/2}$)(π $g_{9/2}$))7−, see (^{12}C,^{10}Be).
5337.3 *11*	3(+),4(+)[&]		C	
5503.5 *13*	2+		C E	
5970 *70*			D	
6360 *70*			D	

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Adopted Levels, Gammas (continued)

^{60}Zn Levels (continued)

E(level)[†]	J$^{\pi}$[@]	XREF	Comments
6639.2 *10*		C E	J$^{\pi}$: L=0 in (^{3}He,n) but decays to 5$^{(+)}$.
6950[#] *50*	(8^{+})[a]	D	J$^{\pi}$: configuration=(ν g$_{9/2}$)$^{+2}$8^{+}, (^{12}C,^{10}Be).
7130 *70*		D	
7372.5 *22*	4[&]	Cd	
7380[‡] *30*	0^{+}	dEF	E(level): probably T=2 analog of ^{60}Ni(g.s.).
7660 *70*		D	
7980 *50*	(8^{+})[a]	D	J$^{\pi}$: configuration=(π g$_{9/2}$)$^{+2}$8^{+}, (^{12}C,^{10}Be).
8300[#] *50*	(6^{+})[a]	D F	J$^{\pi}$: configuration=((π g$_{9/2}$)(π d$_{5/2}$))6^{+}, (^{12}C,^{10}Be).
8475.7 *14*	10^{+}	G	
8636.3 *18*	(10^{+})	G	
8702.3 *13*	[a]	CDE	J$^{\pi}$: L(^{3}He,n)=(2,3) for E=8730 *30*. A (4^{+}) level at 8750 *50* is reported in (^{12}C,^{10}Be) but it decays to (0^{+}).
9620.4[e] *19*	(8^{+})	G	
10756.4[e] *18*	(10^{+})	G	
10.8×10^{3}? *2*		F	
12132.1[e] *17*	(12^{+})	G	
13.2×10^{3}? *2*		F	
13698.0[e] *18*	(14^{+})	G	
15437.3[e] *19*	(16^{+})	G	
17322.8[e] *20*	(18^{+})	G	
19352.7[e] *21*	(20^{+})	G	
21596.9[e] *23*	(22^{+})	G	
24132.0[e] *25*	(24^{+})	G	
27007[e] *3*	(26^{+})	G	
30257[e] *3*	(28^{+})	G	
33899[e] *5*	(30^{+})	G	
0+x[c]		G	Additional information 1.
567.3+x[c] *9*		G	
1575.6+x[c] *23*		G	
3046+x[c] *3*		G	
4967+x[c] *3*		G	
7300+x[c] *3*		G	
0+y[d]		G	Additional information 2.
756.6+y[d] *9*		G	
2005.0+y[d] *13*		G	
3697.0+y[d] *15*		G	
5832.7+y[d] *18*		G	
8414.4+y[d] *22*		G	

[†] From least-squares fit to Eγ's, except as noted.
[‡] From ^{58}Ni(^{3}He,n).
[#] From ^{58}Ni(^{12}C,^{10}Be).
[@] Low spins are from L values in ^{58}Ni(^{3}He,n), except as noted otherwise. High spins ($\geq$8) are from $\gamma(\theta)$ and band structures in (^{28}Si,2$\alpha\gamma$), (^{32}S,3$\alpha\gamma$).
[&] From nγ correlation in ^{58}Ni(^{3}He,nγ), π from multipolarity of decay gammas.
[a] Tentative J^{π} assignment of 1990Bo27 based on shell-model calculations.
[b] Band(A): g.s. band.

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Adopted Levels, Gammas (continued)

^{60}Zn Levels (continued)

[c] Band(B): Band structure.
[d] Band(C): Band structure.
[e] Band(D): SD band (1999Sv01). Q(intrinsic)=2.75 *25* from lifetime data; β_2=0.47 *7*. Configuration=[22,22], implying two holes in πf7/2 and ν7/2 extruder orbitals and two particles in πg9/2 and νg9/2 intruder orbitals. Band intensity, as a fraction of channel intensity, is 60% *4* in (^{28}Si,2$\alpha\gamma$) and 34% *3* in (^{32}S,3$\alpha\gamma$).

Adopted Levels, Gammas (continued)

γ(^{60}Zn)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	δ‡	α#	Comments
1003.90	2^+	1003.9† *2*	100	0.0	0^+				
2193.0	4^+	1189.2† *4*	100	1003.90	2^+				
2559.0	(2^+)	1554.9 *6*	92 *38*	1003.90	2^+				
		2559.0 *8*	100 *38*	0.0	0^+				
3034.9		2031 *1*	100	1003.90	2^+				
3510.3	(3^+)	1318 *1*	14	2193.0	4^+				
		2506 *1*	100	1003.90	2^+	(M1+E2)	−3 *1*	0.000596 *12*	α=0.000596 *12*; α(K)=4.17×10^{-5} *6*; α(L)=4.13×10^{-6} *6*; α(M)=5.91×10^{-7} *9*; α(N+..)=0.000549 *11* α(N)=2.40×10^{-8} *4*; α(IPF)=0.000549 *11*
3627.0		2623 *1*	100	1003.90	2^+				
3808.4	6^+	1615.4 *5*	100	2193.0	4^+				
3812.0		2808 *1*	100	1003.90	2^+				
3972.4	2	462 *1*	9	3510.3	(3^+)				
		1780 *1*	20	2193.0	4^+				
		2968 *2*	14	1003.90	2^+				
		3971 *2*	100	0.0	0^+				
4200.1	$5^{(+)}$	690 *1*	49	3510.3	(3^+)				
		2006.8 *10*	100	2193.0	4^+	(M1+E2)	+4 *2*	0.000380 *10*	α=0.000380 *10*; α(K)=6.18×10^{-5} *10*; α(L)=6.13×10^{-6} *10*; α(M)=8.78×10^{-7} *14*; α(N+..)=0.000311 *9* α(N)=3.56×10^{-8} *6*; α(IPF)=0.000311 *9*
4351.0	$5^{(+)}$	2158 *1*	100	2193.0	4^+	(M1+E2)	+3.5 *5*	0.000444 *7*	α=0.000444 *7*; α(K)=5.42×10^{-5} *8*; α(L)=5.37×10^{-6} *8*; α(M)=7.69×10^{-7} *11*; α(N+..)=0.000384 *6* α(N)=3.12×10^{-8} *5*; α(IPF)=0.000384 *6*
4776.0	$5^{(+)}$	2583 *1*	100	2193.0	4^+	(M1+E2)	<+4.5	0.00060 *4*	α=0.00060 *4*; α(K)=3.91×10^{-5} *8*; α(L)=3.87×10^{-6} *8*; α(M)=5.55×10^{-7} *11*; α(N+..)=0.00055 *4* α(N)=2.25×10^{-8} *5*; α(IPF)=0.00055 *4*
4852.2	(2^+)	2293.0 *10*	18 *9*	2559.0	(2^+)				
		3848.3 *7*	100 *23*	1003.90	2^+				
4913.3	2^+	1403 *1*	39	3510.3	(3^+)				
		3909 *2*	100	1003.90	2^+				
5292.1	8^+	1483.7 *6*	100	3808.4	6^+				
5337.3	$3^{(+)},4^{(+)}$	1827 *1*	100	3510.3	(3^+)	(M1+E2)		0.000287 *24*	α=0.000287 *24*; α(K)=7.21×10^{-5} *19*; α(L)=7.16×10^{-6} *20*; α(M)=1.03×10^{-6} *3*; α(N+..)=0.000207 *22* α(N)=4.16×10^{-8} *11*; α(IPF)=0.000207 *22* δ: if $J_f=4^+$, then $J_i=3^+$ (or 4^+) with δ=−1.0 *5* (or 0.0 *2*); if $J_f=2^+$, then $J_i=3^+$ and δ=−0.5 *1*.
		4333 *2*	54	1003.90	2^+				
5503.5	2^+	1531 *1*	100	3972.4	2				
6639.2		1726 *1*	40	4913.3	2^+				
		2439 *1*	100	4200.1	$5^{(+)}$				
		3129 *2*	72	3510.3	(3^+)				

$^{60}_{30}Zn_{30}$-4

Adopted Levels, Gammas (continued)

γ(^{60}Zn) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.‡	α#	Comments
7372.5	4	3400 *2*	100	3972.4	2			
8475.7	10^+	3183.6 *12*	100	5292.1	8^+	E2	0.000890 *13*	α=0.000890 *13*; α(K)=2.82×10^{-5} *4*; α(L)=2.78×10^{-6} *4*; α(M)=3.99×10^{-7} *6*; α(N+..)=0.000858 *12* α(N)=1.621×10^{-8} *23*; α(IPF)=0.000858 *12*
8636.3	(10^+)	3344.1 *20*	100	5292.1	8^+			
8702.3		2063 *1*	100	6639.2				
		4502 *2*	43	4200.1	$5^{(+)}$			
9620.4	(8^+)	5810 *5*	100	3808.4	6^+			
10756.4	(10^+)	1135.9 *9*	100 *9*	9620.4	(8^+)			
		5464 *4*	60 *11*	5292.1	8^+			
12132.1	(12^+)	1375.6 *7*	100 *6*	10756.4	(10^+)			
		3495.7 *20*	11.2 *19*	8636.3	(10^+)			
		3656.4 *14*	54 *4*	8475.7	10^+	E2	0.001068 *15*	α=0.001068 *15*; α(K)=2.27×10^{-5} *4*; α(L)=2.24×10^{-6} *4*; α(M)=3.20×10^{-7} *5*; α(N+..)=0.001042 *15* α(N)=1.304×10^{-8} *19*; α(IPF)=0.001042 *15*
13698.0	(14^+)	1565.9 *6*	100	12132.1	(12^+)			
15437.3	(16^+)	1739.3 *6*	100	13698.0	(14^+)			
17322.8	(18^+)	1885.5 *7*	100	15437.3	(16^+)			
19352.7	(20^+)	2029.8 *7*	100	17322.8	(18^+)			
21596.9	(22^+)	2244.2 *8*	100	19352.7	(20^+)			
24132.0	(24^+)	2535.0 *9*	100	21596.9	(22^+)			
27007	(26^+)	2874.8 *10*	100	24132.0	(24^+)			
30257	(28^+)	3250.5 *12*	100	27007	(26^+)			
33899	(30^+)	3641.3 *35*	100	30257	(28^+)			
567.3+x		567.3 *9*	100	0+x				
1575.6+x		1008.3 *21*	100	567.3+x				
3046+x		1470.1 *12*	100	1575.6+x				
4967+x		1921.2 *9*	100	3046+x				
7300+x		2332.5 *11*	100	4967+x				
756.6+y		756.6 *9*	100	0+y				
2005.0+y		1248.4 *9*	100	756.6+y				
3697.0+y		1692.0 *8*	100	2005.0+y				
5832.7+y		2135.6 *10*	100	3697.0+y				
8414.4+y		2581.7 *12*	100	5832.7+y				

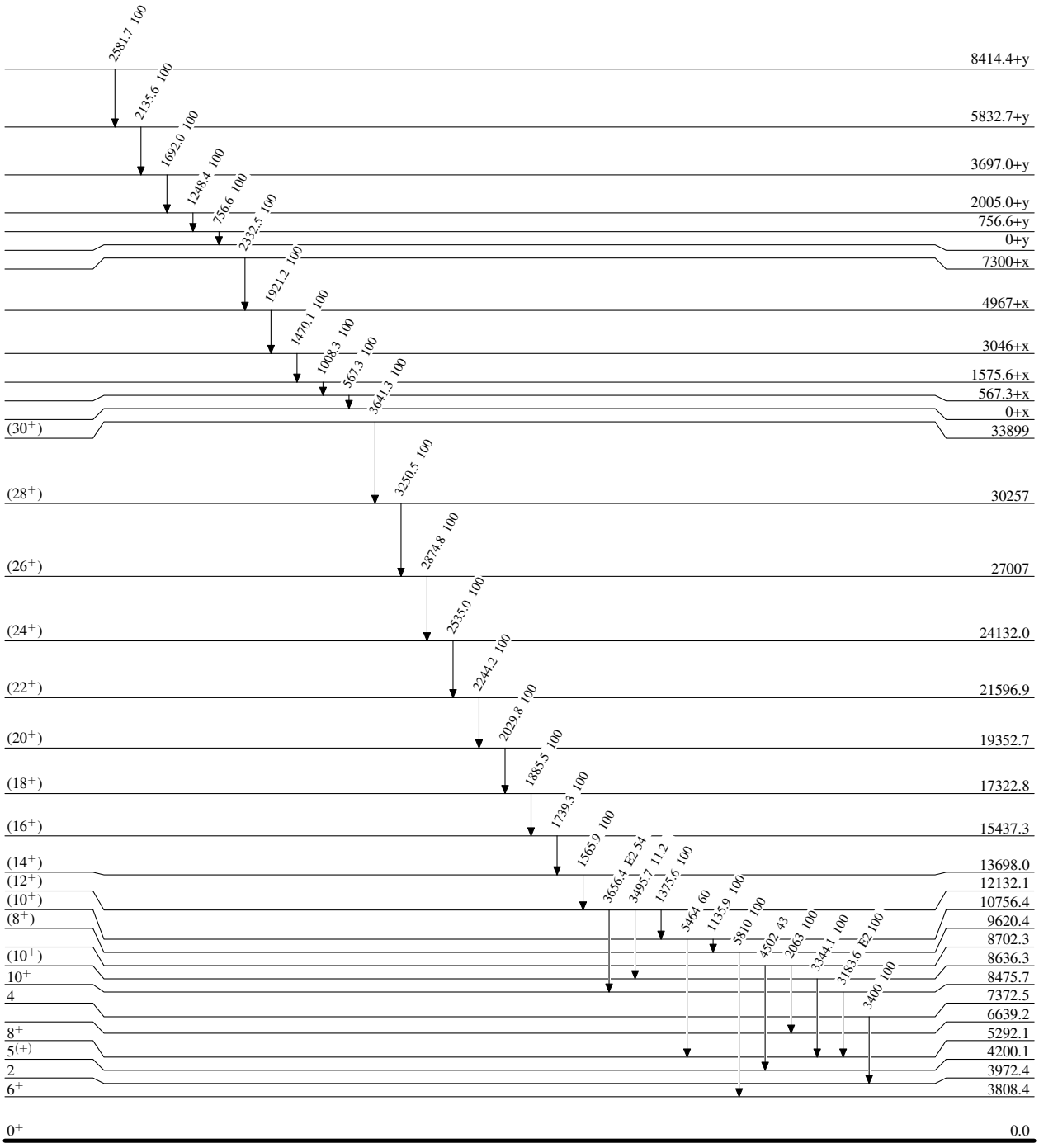
† From weighted average of available data.
‡ From nγ correlation analysis in ^{58}Ni(^{3}He,nγ), Δπ assumed no from large δ values.
# Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

$^{60}_{30}Zn_{30}$-5

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

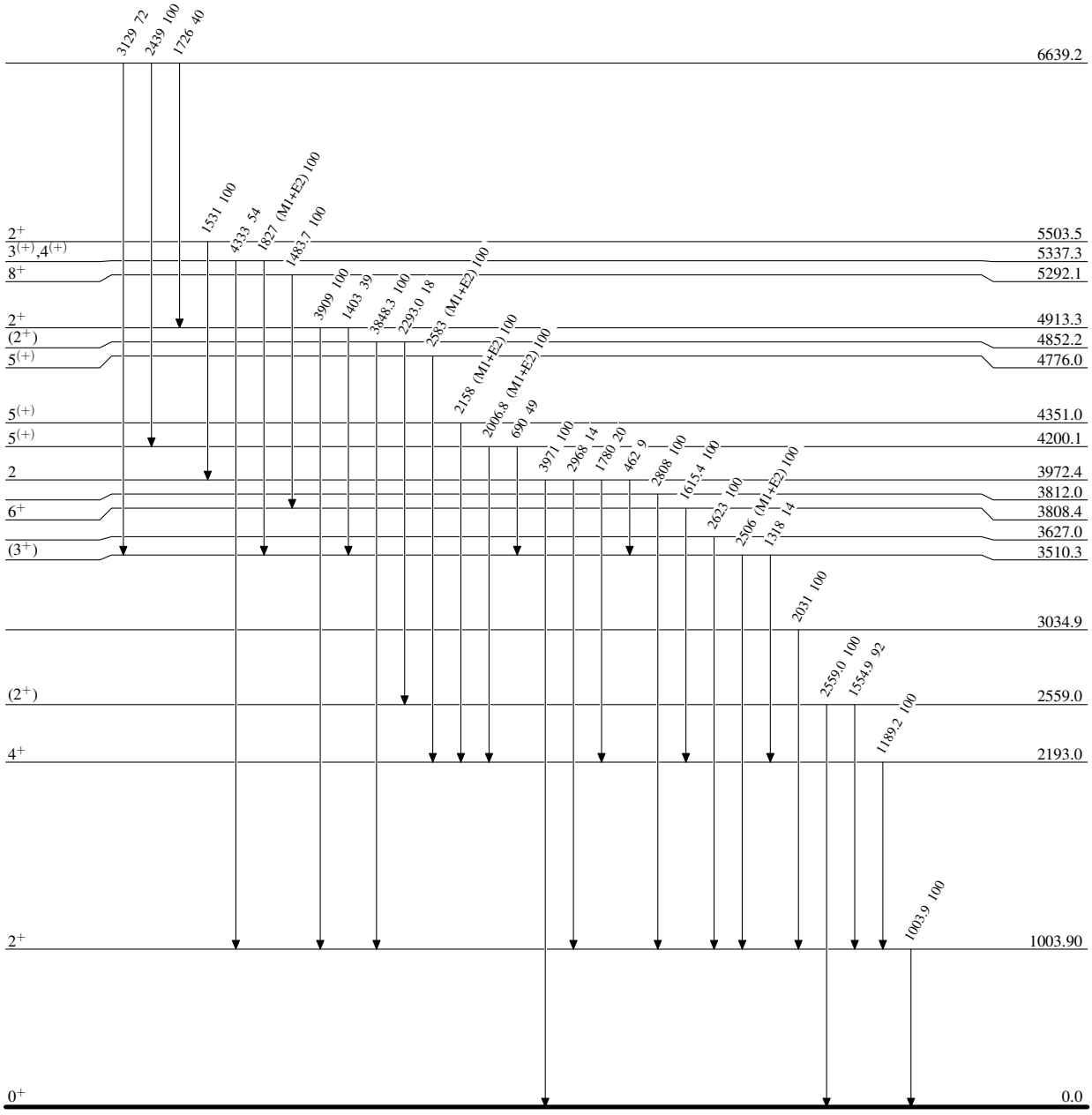


$^{60}_{30}Zn_{30}$

Adopted Levels, Gammas

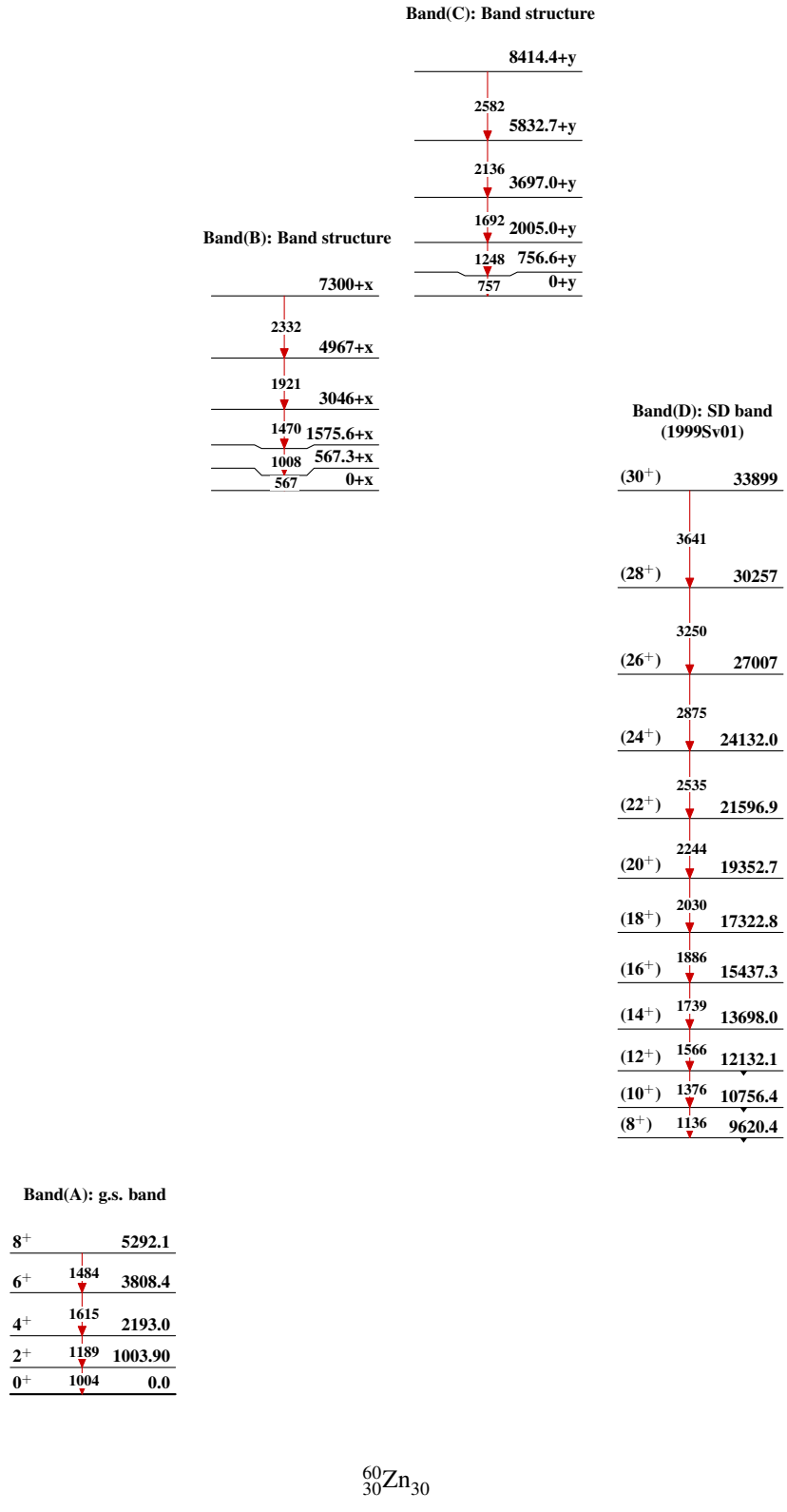
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{60}_{30}Zn_{30}$

Adopted Levels, Gammas



$^{60}_{30}Zn_{30}$