Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 113,1735 (2012)	1-Mar-2012

Q(β^-)=2103 *4*; S(n)=7792 *5*; S(p)=15431 *7*; Q(α)=−10919 *6* 2012Wa38
Note: Current evaluation has used the following Q record 2103 4 *7792* 4 *15431* 7 −10919 *6* 2011AuZZ.
S(2n)=13600 *3*; S(2p)=27974 *5*; Q(β^-n) = −4216 *3* (2011AuZZ).
α: Additional information 1.

^{68}Ni Levels

In addition to the levels given here, peaks are reported in ^{70}Zn(^{14}C,^{16}O) at 2700 *40*, with L=0,2, at 3280 *50* with L=2,4, and at 3450 *50* and 4120 *50*. The ^{70}Zn(^{14}C,^{16}O) level at 2200 *30*, with L=2 appears to correspond to the 2034 level but the large energy difference makes it difficult to give unique associations for any of the other peaks.

Cross Reference (XREF) Flags

A	^{68}Co β^- decay (0.20 s)	F	^{70}Zn(^{14}C,^{16}Oγ)
B	^{68}Co β^- decay (1.6 s)	G	^{130}Te(^{64}Ni,Xγ),^{208}Pb(^{64}Ni,Xγ)
C	^{68}Ni IT decay (0.86 ms)	H	^{198}Pt(^{70}Zn,Xγ)
D	Coulomb excitation	I	Ni(^{86}Kr,Xγ),^{58}Ni(^{70}Zn,Xγ)
E	^{70}Zn(^{14}C,^{16}O)		

E(level)[†]	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0[‡]	0$^+$	29 s *2*	ABCDEFGHI	%β^-=100 T$_{1/2}$: from 1998Fr15. The authors also give this value in 2001Fr21. Other: 19 s *+3−6* (1988ScZH,1988KoZT).
1770 *30*	0$^+$	270 ns *5*	EF I	T$_{1/2}$: from γ(t) in ^{58}Ni(^{70}Zn,Xγ). Others: 211 ns *50* from I(ce)(t) and I(e$^+$,e$^-$)(t) in (^{14}C,^{16}Oγ), and 340 ns *30* from γ(t) in (^{86}Kr,Xγ). J$^\pi$: L=0 in (^{14}C,^{16}O); E0 transition to 0$^+$ g.s.
2034.08[‡] *16*	2$^+$	0.31 ps *5*	ABCDE GHI	XREF: E(2200). T$_{1/2}$: deduced from B(E2)=0.026 *4* in Coulomb Excitation and adopted γ-ray properties. J$^\pi$: L=2 in (^{14}C,^{16}O); Coulomb Excitation.
2511.9 *3*	(0$^+$)[#]	<15 ns	B	T$_{1/2}$: assuming that the 511γ's observed in ^{68}Co β- decay (1.6 s) originate from pair production to the g.s.
2743.82 *16*	(2)$^+$[#]		B E	XREF: E(2700). J$^\pi$: L=0,2 in (^{14}C,^{16}O).
2849.1 *3*	5$^-$	0.86 ms *5*	ABC GHI	%IT=100 T$_{1/2}$: from 0.86 ms *5* in ^{130}Te(^{64}Ni,Xγ),^{208}Pb(^{64}Ni,Xγ) and 0.86 ms *5* in Ni(^{86}Kr,Xγ), both from γ(t). J$^\pi$: E3 815γ to 2$^+$.
3120.9 *3*			A	E(level): The relative order of the 324γ-272γ cascade is reversed in ^{198}Pt(^{70}Zn,Xγ) giving a level at 3172.7 rather than 3120.9. The evaluator adopts the ordering given in ^{68}Co β decay (0.20 s) since Iγ(272γ)>Iγ(324γ) in that decay. The in-beam Iγ data are consistent with this order.
3149.2[‡] *3*	(4$^+$)		B GH	J$^\pi$: ≤4 from D,Q 1115γ to 2$^+$; (4$^+$) as member of $\nu g^{+2}_{9/2}\nu p^{-2}_{1/2}$ multiplet.
3444.4 *3*	(6$^-$,7$^-$)		A H	J$^\pi$: log *ft*=4.46 from J$^\pi$=(7$^-$), 595γ to 5$^-$. Member of $\nu f^{-1}_{7/2}\nu g^{+1}_{9/2}$ multiplet (2000Mu10). A simple δ interaction predicts J$^\pi$=7$^-$.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{68}Ni Levels (continued)

E(level)†	J^π	$T_{1/2}$	XREF	Comments
3543.4? *3*			B	
3557.9 *3*	(6$^-$)		A H	J^π: log *ft*=4.78 from J^π=(7$^-$), 709γ to 5$^-$. Member of $\nu f^{-1}_{7/2}\nu g^{+1}_{9/2}$ multiplet (2000Mu10). A simple δ interaction predicts J^π=6$^-$.
3935.3 *5*	(7)		A H	J^π: ΔJ=1 d 377γ to (6$^-$) and ΔJ=1 d 275γ from (8$^+$).
3988.5? *3*			B	
4000.7‡ *7*	(6$^+$)		H	J^π: ≤6 from D,Q 851γ to (4$^+$); (6$^+$) as member of $\nu g^{+2}_{9/2}\nu p^{-2}_{1/2}$ multiplet.
4026.7 *3*	(1,2)		B	J^π: log *ft*=6.06 from J^π=(1$^+$) and 1515γ to (0$^+$).
4165.8 *3*	(0,1,2)		B	J^π: log *ft*=6.01 from J^π=(1$^+$).
4210.0‡ *7*	(8$^+$)	23 ns *1*	H	$T_{1/2}$: from γ(t) in ^{198}Pt(^{70}Zn,Xγ). J^π: ΔJ=2, E2 209γ to (6$^+$).
5513.2 *20*	(0$^+$,1$^+$,2$^+$)		B	J^π: log *ft*=5.76 from J^π=(1$^+$).
5550.2 *20*	(0$^+$,1$^+$,2$^+$)		B	J^π: log *ft*=5.88 from J^π=(1$^+$).
5775.2 *20*	(0$^+$,1$^+$,2$^+$)		B	J^π: log *ft*=5.53 from J^π=(1$^+$).

† From least-squares fit to Eγ′s by evaluator; ΔE=1 keV assumed when not given.

‡ Band(A): $\nu g^2_{9/2}\nu p^{-2}_{1/2}$ configuration. From comparison to the level spacings in ^{70}Ni, the 6$^+$ and 8$^+$ states have a very pure $\nu g^2_{9/2}\nu p^{-2}_{1/2}$ configuration while the 4$^+$ contains a significant admixture of other components, likely the $(\nu g^2_{9/2}\nu f^{-2}_{5/2})_{4+}$ configuration.

\# Low-lying J=1 states are not expected from the available neutron fp orbitals. A strong γ to the g.s. indicates J^π=2$^+$ for the 2744 state. Lack of a similar transition from the 2512 state and the possible E0 transition to the g.s. supports a J^π=0$^+$ assignment.

Adopted Levels, Gammas (continued)

$\gamma(^{68}Ni)$

E_i(level)	J^π_i	E_γ[†]	I_γ[†‡]	E_f	J^π_f	Mult.	α	$I_{(\gamma+ce)}$[‡]	Comments
1770	0^+	1770		0.0	0^+	E0		100	E_γ: from (^{14}C,$^{16}O\gamma$). Mult.: from conversion electrons and pair production in (^{14}C,$^{16}O\gamma$).
2034.08	2^+	2033.2 *2*	100	0.0	0^+	[E2]	0.000383 *6*		α(K)=4.96×10^{-5} *7*; α(L)=4.81×10^{-6} *7*; α(M)=6.77×10^{-7} *10*; α(N+..)=0.000328 *5* B(E2)(W.u.)=3.2 *7*
2511.9	(0^+)	477.8 *2*	100 *5*	2034.08	2^+	[E2]	0.00191 *3*		α(K)=0.001717 *25*; α(L)=0.0001711 *24*; α(M)=2.40×10^{-5} *4*; α(N+..)=1.005×10^{-6} *1*
		2511.9[&]		0.0	0^+	(E0)		≤138	The source of the observed 511γ's in ^{68}Co β decay (1.6 s) may be from (e^+,e^-) from the 2512 state to the 0^+ g.s.; however, no 1511γ-511γ coincidences were observed.
2743.82	$(2)^+$	708.9 *2*	41 *3*	2034.08	2^+				
		2744.6 *2*	100 *5*	0.0	0^+	[E2]	0.000700 *10*		α(K)=2.95×10^{-5} *5*; α(L)=2.85×10^{-6} *4*; α(M)=4.01×10^{-7} *6*; α(N+..)=0.000668 *10* Mult.: strong γ ray to 0^+ g.s.; level scheme.
2849.1	5^-	815.0[#] *2*	100[#]	2034.08	2^+	E3	0.000928 *13*		α(K)=0.000832 *12*; α(L)=8.36×10^{-5} *12*; α(M)=1.176×10^{-5} *17*; α(N+..)=4.92×10^{-7} B(E3)(W.u.)=0.0215 *13* Mult.: from comparison with RUL.
3120.9		271.9[#] *2*	100[#]	2849.1	5^-				
3149.2	(4^+)	1115.1 *2*	100	2034.08	2^+	[E2]	0.000188 *3*		α(K)=0.0001683 *24*; α(L)=1.645×10^{-5} *23*; α(M)=2.32×10^{-6} *4*; α(N+..)=1.431×10^{-6} Mult.: $\Delta J\leq2$ since no retardation observed for this cascade in ^{198}Pt(^{70}Zn,Xγ).
3444.4	$(6^-,7^-)$	323.6[#] *2*	100.0[#] *19*	3120.9					
		595.2[#] *2*	83.8[#] *19*	2849.1	5^-				
3543.4?		694.3[&] *2*	100	2849.1	5^-				
3557.9	(6^-)	113.5[#] *2*	43.1[#] *11*	3444.4	$(6^-,7^-)$	(M1)	0.0334		α(K)=0.0299 *5*; α(L)=0.00304 *5*; α(M)=0.000428 *7*; α(N+..)=1.80×10^{-5} *3* Mult.: stretched dipole from γ-ray anisotropy in ^{198}Pt(^{70}Zn,Xγ); $\Delta\pi$=no from level scheme.
		708.9[#] *2*	100.0[#] *26*	2849.1	5^-				
3935.3	(7)	377.4[#] *5*	100[#]	3557.9	(6^-)	D			Mult.: stretched dipole from γ-ray anisotropy in ^{198}Pt(^{70}Zn,Xγ).
3988.5?		1139.4[&] *2*	100	2849.1	5^-				
4000.7	(6^+)	851.2[@]	67[@]	3149.2	(4^+)	[E2]	0.000360 *5*		α(K)=0.000324 *5*; α(L)=3.18×10^{-5} *5*; α(M)=4.48×10^{-6} *7*; α(N+..)=1.91×10^{-7} *3*

From ENSDF

$^{68}_{28}Ni_{40}$-3

Adopted Levels, Gammas (continued)

$\gamma(^{68}Ni)$ (continued)

E_i(level)	J^π_i	E_γ [†]	I_γ [†‡]	E_f	J^π_f	Mult.	α	Comments
								α(K)=0.000324 *5*; α(L)=3.18×10^{-5} *5*; α(M)=4.48×10^{-6} *7*; α(N+..)=1.91×10^{-7} *3* Mult.: $\Delta J\leq2$ since no retardation observed for this cascade in $^{198}Pt(^{70}Zn,X\gamma)$.
4000.7	(6^+)	1151.8 [@]	100 [@]	2849.1	5^-			
4026.7	(1,2)	1514.8 *2*	100	2511.9	(0^+)			
4165.8	(0,1,2)	1422.0 *2*	100	2743.82	$(2)^+$			
4210.0	(8^+)	209.3 [@]	89 [@]	4000.7	(6^+)	E2	0.0347	α(K)=0.0311 *5*; α(L)=0.00322 *5*; α(M)=0.000450 *7*; α(N+..)=1.767×10^{-5} *25* B(E2)(W.u.)=1.57 *9* Mult.: stretched quadrupole from γ-ray anisotropy in $^{198}Pt(^{70}Zn,X\gamma)$; M2 is excluded by comparison to RUL.
		274.7 [@]	100 [@]	3935.3	(7)	D	0.00246 *4*	Mult.: stretched dipole from γ-ray anisotropy in $^{198}Pt(^{70}Zn,X\gamma)$.
		652.0 [@]	15 [@]	3557.9	(6^-)			
5513.2	$(0^+,1^+,2^+)$	3479 *2*	100	2034.08	2^+			
5550.2	$(0^+,1^+,2^+)$	3516 *2*	100	2034.08	2^+			
5775.2	$(0^+,1^+,2^+)$	3741 *2*	100	2034.08	2^+			

† From ^{68}Co β- decay (1.6 s), except as noted.

‡ Relative photon or I(γ+ce) branching ratio from each level.

From ^{68}Co β- decay (0.20 s).

@ From $^{198}Pt(^{70}Zn,X\gamma)$.

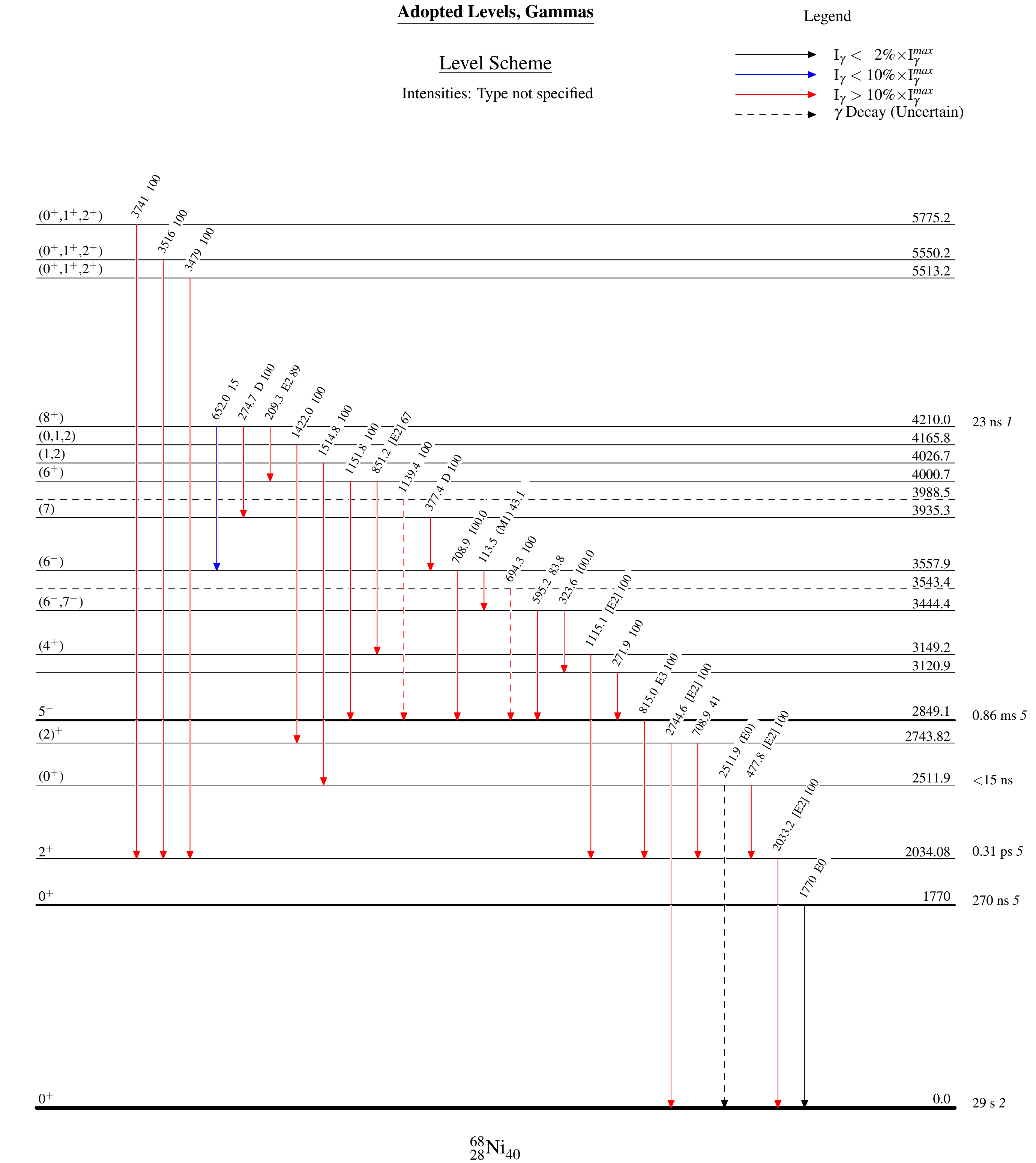
& Placement of transition in the level scheme is uncertain.

$^{68}_{28}Ni_{40}$-4

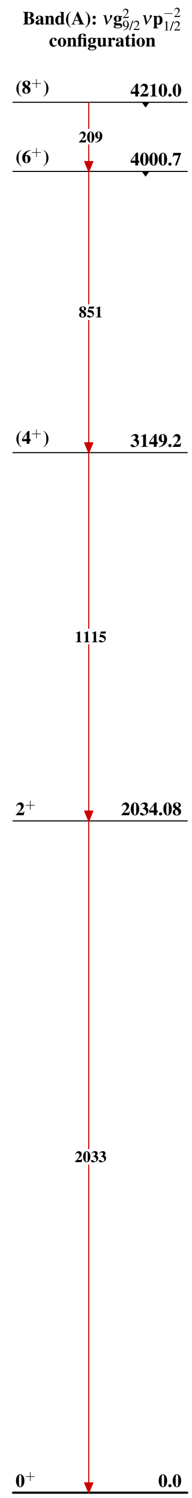
Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified



Adopted Levels, Gammas



$^{68}_{28}Ni_{40}$