Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. R. Bhat	NDS 85, 415 (1998)	24-Sep-1998

Q(β^-)=−8775.0 *5*; S(n)=10247.6 *6*; S(p)=7332.4 *6*; Q(α)=−7561.4 *18* 2012Wa38
Note: Current evaluation has used the following Q record.
Q(β^-)=−8770 *16*; S(n)=10247 *11*; S(p)=7329 *3*; Q(α)=−7559 *3* 1995Au04
CRC: coupled reaction channel analysis.

Isobaric analog states of ^{57}Co:

^{57}Ni Ex,J^π	^{57}Co Ex,J^π(t)	^{57}Ni Ex,J^π	Ex,J^π(t)
5134,7/2$^-$	g.s.,7/2-(3/2)	7580,(7/2)$^-$	2311,7/2-(3/2)
5239,7/2$^-$	g.s.,7/2-(3/2)	8287,1/2$^+$	2981,1/2+(1/2,3/2)
5368,7/2$^-$	g.s.,7/2-(3/2)	8541,(5/2$^-$,7/2$^-$)	3357,3/2-((3/2))
6475,(9/2$^-$)	1224,9/2-(?)	8840,3/2$^+$,5/2$^+$	3554,3/2$^+$,5/2+(3/2)
6546,3/2$^-$,1/2$^-$	1378,3/2-(3/2)	11120,(5/2$^+$,3/2$^+$)	6013,3/2$^+$,5/2+((3/2))
6592,3/2$^-$,1/2$^-$	1378,3/2-(3/2)	11155,5/2$^+$,3/2$^+$	6013,3/2$^+$,5/2+(3/2)
6955,(3/2)$^-$	1758,3/2-(3/2)	11195,5/2$^+$,3/2$^+$	6013,3/2$^+$,5/2+(3/2)
7131,7/2$^-$	1897,7/2-(3/2)		

^{57}Co

^{57}Ni Levels

T: from (^{3}He,α) and (p,d), (pol p,d).
See ^{58}Ni(p,d),(d,t),(^{3}He,α) for (pol p,d) and (pol d,t) results.

Cross Reference (XREF) Flags

A	^{57}Cu β^+ decay	E	^{58}Ni(p,d) E=121 MeV	I	^{58}Ni(γ,n), (e,e′n) res
B	^{58}Ni(pol p,d), (pol d,t),	F	^{58}Ni(^{3}He,α) E=130-217 MeV	J	^{58}Ni(γ,nγ')
C	^{59}Ni(p,t) E=40 MeV	G	^{58}Ni(^{3}He,$\alpha\gamma$), (pol P,dγ)	K	^{2}H(^{56}Ni,p)
D	^{54}Fe(α,n), (α,nγ), (^{6}Li,t)	H	^{40}Ca(^{20}Ne,2pnγ)		

E(level)†	J^π@	$T_{1/2}$&	XREF	Comments
0.0[a]	3/2$^-$	35.60 h *6*	ABCDEFGHIJK	%ε+%β^+=100 μ=−0.7975 *14* (1996Oh02); T_z=−1/2 J^π: J=3/2 from $\beta\gamma$(CP) (1968At03); π=− from L(n)=1 in pickup. $T_{1/2}$: weighted average of 35.54 h *5* (1986Di02) and 35.65 h *5* (1982Gr10). Other: 36.16 h *11* (1974Ro18; NaI well, chem; >7 $T_{1/2}$′s). See also 1978LeZA. See 1987De19 for measurement of difference in ε decay rate of ^{57}Ni in different chemical compounds. μ: from nuclear magnetic resonance on oriented nuclei. Additional information 1.
768.5 *5*	5/2$^-$[b]	3.2 ps *4*	ABCDEFGHIJK	
1112.6 *5*	1/2$^-$[b]	106 fs *23*	ABCDE G IJK	
2443.3 *5*	5/2$^-$	31 fs *5*	ABCD H J	J^π: 5/2 from $\gamma(\theta)$ in (α,nγ); π=− from L(p,t)=4(+2).
2577.4[a] *5*	7/2$^-$[b]	47 fs *6*	ABCDEFGHIJ	T=1/2
3007.1 *10*	3/2$^-$	12 fs *4*	A CD J	J^π: predominantly L=0 transfer in (p,t).
3009 *8*	7/2$^+$,9/2$^+$		B	

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Adopted Levels, Gammas (continued)

^{57}Ni Levels (continued)

E(level)[†]	Jπ[@]	$T_{1/2}$[&]	XREF	Comments
3230.1[#] *7*	$7/2^{-}$[b]		ABC EFGH J	
3311[c] *3*	$(5/2^{-},7/2^{-})$		BC	
3363.8 *8*	$7/2^{-}$[b]		BC E GH	
3701.7 *7*	$(5/2)^{-}$[b]		B DE gH	
3713.6 *5*	$(^{+})$[d]		C gH	
3728.8 *12*	$(^{+})$[d]		C g	
3840 *8*	$3/2^{-}$		B DE g J	Jπ: $1/2^{-},3/2^{-}$ from L(p,d)=1; γ to $7/2^{-}$ rules out $1/2^{-}$. E(level): possible doublet. See (p,d) E= 121 MeV.
3865.6 *6*	$11/2^{-}$	0.29 ps *10*	CD gH	Jπ: 11/2 from γ(θ) and excitation function in (α,nγ); π=− from E2 to $7/2^{-}$.
3882 *5*	–[d]		C	
4027.1 *8*			B H	
4046[‡] *5*	$(7/2^{-},5/2^{-})$		BC	
4073 *5*	–[d]		C	
4234[c] *5*	$7/2^{-}$[b]		BC EFG J	T=1/2 Jπ: see also footnote in (p,t).
4372 *8*	$3/2^{+},5/2^{+}$		B	
4374 *5*	–[d]		C	
4461[#] *4*	$(3/2)^{-}$[b]		BC	
4503.0 *6*			f H	
4544 *8*	$(9/2^{+})$		B fg	T=1/2 Jπ: from CRC analysis in ^{58}Ni(p,d), (d,t), (3He,α).
4576[#] *4*	$7/2^{-}$[b]		BC E g	
4606 *5*	–[d]		C	
4711.2 *7*	$(11/2^{-})$		B H	Jπ: from CRC analysis in ^{58}Ni(p,d), (d,t), (^{3}He,α).
4886[‡] *6*	$7/2^{-},5/2^{-}$		BC	
4927[#] *4*	$3/2^{-}$[b]		BC	
4941.1 *6*			H	
5009 *5*			C	
5092[#] *4*	$3/2^{-},1/2^{-}$		BC	
5134[#e] *4*	$7/2^{-}$[b]		BC	T=3/2
5193[#] *4*	$3/2^{-}$		BC	Jπ: predominantly L=0 transfer in (p,t).
5238.8[e] *7*	$7/2^{-}$[b]		BC EFG	T=3/2
5320.6[a] *6*	$15/2^{-}$	0.64 ps *17*	D H	Jπ: 15/2 from γ(θ) in (α,nγ); π=− from E2 to $11/2^{-}$.
5352 *5*			C	
5368[#e] *4*	$7/2^{-}$[b]		BC	T=3/2
5435 *8*			B	
5488 *6*			C	
5505 *8*			B	
5515.0 *6*			H	
5546[c] *6*	$(^{+})$[d]		C g	5560 *20*; 1/2,3/2; state in (^{3}He,αγ) may correspond to this or the following two states.
5561[c] *6*	$(^{+})$[d]		C g	
5580 *8*	$1/2^{+}$		B E g J	T=1/2
5601 *8*			C	
5646 *8*			C	
5663.3 *8*			H	
5664[#] *6*	$3/2^{-},1/2^{-}$		BC	
5706[#] *6*	$7/2^{-},5/2^{-}$		BC	
5740 *9*			C	

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Adopted Levels, Gammas (continued)

^{57}Ni Levels (continued)

E(level)[†]	J$^{\pi}$[@]	XREF	Comments
5765[#] *6*	(7/2)$^{-}$[*b*]	BC	
5795 *8*	7/2^{-},5/2^{-}	B	
5848[#] *6*	7/2^{-},5/2^{-}	BC	
5980[#] *6*	(3/2)$^{+}$[*b*]	BC g	6000 *20*, 3/2, state in (^{3}He,$\alpha\gamma$) may correspond to this or the 6029 state. However, the evaluator has assigned the two gammas seen in (^{3}He,$\alpha\gamma$) to this level.
6029[#] *7*	3/2^{+},5/2^{+}	BC EFg	T=1/2
6079 *10*		C	
6115 *10*	7/2^{-},5/2^{-}	B	
6231[#] *7*	3/2^{-},1/2^{-}	BC	
6280 *10*	7/2^{-},5/2^{-}	B	
6318[#] *7*	3/2^{+},5/2^{+}	BC	
6328 *10*		C	
6341[#] *7*		BC	
6418[‡] *9*	7/2^{-},5/2^{-}	BC	
6421.0 *7*		H	
6454 *10*	−[*d*]	C	Distinct from the 6475, (9/2^{-}), state due to L=2 admixture in (p,t).
6475[*e*] *10*	(9/2^{-})	B	J$^{\pi}$: from CRC analysis in (^{3}He,α). Good agreement between dσ/dΩ and calculations. From E(level) and J$^{\pi}$, this state may be the analog of the IAS(^{57}Co,1224,9/2^{-}) but there are problems. See (^{3}He,α) for discussion.
6520 *10*	7/2^{-},5/2^{-}	Bc	
6546[#*e*] *7*	3/2^{-},1/2^{-}	Bc	T=3/2
6592[*e*] *10*	3/2^{-},1/2^{-}	B	T=3/2
6631 *10*	−[*d*]	C	
6655 *10*	3/2^{+},5/2^{+}	B	
6693[#] *7*	1/2^{-},3/2^{-}	BC	
6721[‡] *10*	3/2^{+},5/2^{+}	BC	
6807 *10*		B	
6851[#] *7*	7/2^{-},5/2^{-}	BC	
6880 *10*	7/2^{-},5/2^{-}	B	
6905 *8*	−[*d*]	C	
6920 *10*		B	
6935 *8*	−[*d*]	C	
6955[*e*] *10*	(3/2)$^{-}$[*b*]	B	T=3/2 J$^{\pi}$: IAS(^{57}Co 1758); L(^{3}He,α)=1.
7005 *10*		B	
7042 *10*	3/2^{-},1/2^{-}	B	
7131[#*e*] *6*	7/2^{-}[*b*]	BC F	T=3/2 J$^{\pi}$: see also footnote in (p,t).
7194[‡] *6*	3/2^{+},5/2^{+}	BC	
7275 *10*	3/2^{+},5/2^{+}	B	
7313[‡] *7*	3/2^{+},5/2^{+}	BC	
7355 *10*		B	
7416[‡] *8*		BC	
7452[‡] *10*	3/2^{+},5/2^{+}	BC	
7454.5 *7*		H	
7529[#] *6*	3/2^{+},5/2^{+}	BC	
7551 *8*		C	
7580[*e*] *10*	(7/2)$^{-}$	B	T=3/2 J$^{\pi}$: L(^{3}He,α)=3. IAS(^{57}Co 2311).
7640[‡] *10*		BC	

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Adopted Levels, Gammas (continued)

^{57}Ni Levels (continued)

E(level)[†]	Jπ[@]	XREF	Comments
7671 *8*		C	This state and the following state may be the same.
7700 *10*	(3/2$^+$,5/2$^+$)	B	
7745 *10*		B	
7802 *10*	3/2$^+$,5/2$^+$	B	
7872[#] *6*	(3/2$^+$,5/2$^+$)	BC	
7900[#] *6*		BC	
7985 *10*	7/2$^-$,5/2$^-$	B	
8015 *10*	3/2$^+$,5/2$^+$	B	
8062 *8*		C	
8102[#] *6*	3/2$^+$,5/2$^+$	BC	
8130 *10*	3/2$^+$,5/2$^+$	B	
8170 *10*		B	
8234[#] *6*	3/2$^+$,5/2$^+$	BC	
8287[#e] *6*	1/2$^+$	BC	T=1/2,3/2 E(level): this may be a multiplet.
8325 *10*	(3/2$^+$,5/2$^+$)	B	
8345.7 *8*		H	
8380 *10*		B	
8410 *10*		B F	
8445 *10*	(5/2$^+$,3/2$^+$)	B	
8477 *10*	(−)[d]	C	
8521[#] *7*	1/2$^+$	BC	
8541[‡e] *10*	(5/2$^-$,7/2$^-$)	BC	T=(3/2) T: if J^π=7/2$^-$.
8630 *10*		B	
8668[#] *7*	5/2$^+$,3/2$^+$	BC	
8723 *10*	1/2$^+$	B	
8759[#] *7*		BC	
8780 *10*		C	T=3/2
8795 *10*	(5/2$^+$,3/2$^+$)	B	
8840[e] *10*	3/2$^+$,5/2$^+$	B F	T=3/2
8872 *10*	−[d]	C	
8952[‡] *8*	5/2$^+$,3/2$^+$	BC	
9030 *10*		B	
9110 *10*	(7/2$^-$,5/2$^-$)	B	
9150 *10*		B	
9185 *10*	(5/2$^+$,3/2$^+$)	B	
9205 *10*		B	
9280 *10*	5/2$^+$,3/2$^+$	B	
9340 *10*		B	
9400 *10*	5/2$^+$,3/2$^+$	B	
9430 *10*	5/2$^+$,3/2$^+$	B	
9495 *10*		B	
9585 *15*	5/2$^+$,3/2$^+$	B	
9705 *15*		B	
9790 *15*		B	
9865 *15*	5/2$^+$,3/2$^+$	B	
9930 *15*	5/2$^+$,3/2$^+$	B	
10020 *15*		B	
10070 *15*		B	
10115 *15*		B	
10175 *15*		B	
10210 *15*	5/2$^+$,3/2$^+$	B	

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Adopted Levels, Gammas (continued)

^{57}Ni Levels (continued)

E(level)[†]	J$^{\pi}$[@]	XREF	Comments
10240 *15*	5/2$^+$,3/2$^+$	B	
10335 *15*		B	
10375 *15*		B	
10515 *15*	5/2$^+$,3/2$^+$	B	
10695 *15*		B	
10790 *15*	5/2$^+$,3/2$^+$	B	Doublet.
11120[e] *15*	(5/2$^+$,3/2$^+$)	B	T=(3/2)
11155[e] *15*	5/2$^+$,3/2$^+$	B	T=3/2
11195[e] *15*	5/2$^+$,3/2$^+$	B	T=3/2
11235 *15*		B	
11280 *15*		B	
11500 *15*		B	
12120 *15*		B	The 12.1-, 13.1-, and 13.3 MeV states may be the T=1/2 states of 12.4 MeV, 3/2$^-$; 13.16 MeV, 5/2$^-$; and 13.48 MeV, 1/2$^-$, suggested as the principal states fed by the ^{58}Ni 16.4 MeV, T(<)=1, GDR (1973RoYN). See (γ,n), (e,e′n) res.
13090 *15*		B	
13140 *15*		B	
13300 *15*		B	
≈30.×10^3		F	E(level): 10.8 MeV≤E(level)≤50 MeV from (^{3}He,α) E=130-217 MeV.

[†] From a least-squares fit to Eγ data, except as noted otherwise. Levels and gammas from the (^{3}He,$\alpha\gamma$), (pol p,dγ) were left out of the fit because of large uncertainties.
[‡] Unweighted average of level energies from (p,t) and (p,d), (d,t), (^{3}He,α) reactions.
[#] Weighted average of level energies from (p,t) and (p,d), (d,t), (^{3}He,α) reactions.
[@] From angular momentum transfer in pickup reactions, except as noted.
[&] From DSAM in (α,nγ), except as noted.
[a] Band(A): yrast band?
[b] From angular momentum transfer in pickup reactions and analyzing power in (pol p,d) or (pol d,t).
[c] From (p,t).
[d] From angular momentum transfer in (p,t).
[e] Band(B): Isobaric analog state of ^{57}Co. See table above.

$\gamma(^{57}Ni)$

E$_i$(level)	J$_i^{\pi}$	E$_\gamma$[†]	I$_\gamma$[#]	E$_f$	J$_f^{\pi}$	Mult.	δ	Comments
768.5	5/2$^-$	768.5 *5*	100	0.0	3/2$^-$	M1+E2	+0.23 *2*	B(M1)(W.u.)=0.0144 *18*; B(E2)(W.u.)=2.5 *6* Mult.: from $\gamma(\theta)$ in (^{3}He,$\alpha\gamma$) and RUL.
1112.6	1/2$^-$	1112.6 *5*	100	0.0	3/2$^-$	M1,E2		B(M1)(W.u.)≤0.19; B(E2)(W.u.)≤3.0×10^2 Mult.: from ΔJ^{π} and RUL.
2443.3	5/2$^-$	2443.1 *5*	100	0.0	3/2$^-$	(M1(+E2))[@]	<+0.8[@]	B(M1)(W.u.)<0.024; B(E2)(W.u.)=0.049
2577.4	7/2$^-$	2577.5 *5*	100	0.0	3/2$^-$	E2		B(E2)(W.u.)=7.7 *11* Mult.: d,E2 in (α,nγ) and E2(+M3) in (^{3}He,$\alpha\gamma$). Comparison to RUL excludes M3 admixture.
3007.1	3/2$^-$	3007 *1*	100	0.0	3/2$^-$	M1,E2		B(M1)(W.u.)<0.13; B(E2)(W.u.)<27 Mult.: from ΔJ^{π} and RUL.
3230.1	7/2$^-$	2461.6[‡]	100	768.5	5/2$^-$	(M1+E2)	+0.58 *8*	Mult.: from $\gamma(\theta)$ in (^{3}He,$\alpha\gamma$) and ΔJ^{π}.
		3230.1[‡]	67	0.0	3/2$^-$	(E2(+M3))	−0.02 *5*	Mult.: from $\gamma(\theta)$ in (^{3}He,$\alpha\gamma$) and ΔJ^{π}.
3363.8	7/2$^-$	786.4[‡]		2577.4	7/2$^-$			

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Adopted Levels, Gammas (continued)

$\gamma(^{57}Ni)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.	Comments
3363.8	$7/2^-$	2595.3[‡&]		768.5	$5/2^-$		
3701.7	$(5/2)^-$	1124.3 *5*	36	2577.4	$7/2^-$		
		2934 *1*	≤100	768.5	$5/2^-$		
3713.6	$(^+)$	483.5 *5*		3230.1	$7/2^-$		
		1136.0 *5*		2577.4	$7/2^-$		
		1270.1 *5*		2443.3	$5/2^-$		
3840	$3/2^-$	1262.6[‡]	29	2577.4	$7/2^-$		
		2727.4[‡]	14	1112.6	$1/2^-$		
		3840[‡]	100	0.0	$3/2^-$		
3865.6	$11/2^-$	1287.7 *5*	100	2577.4	$7/2^-$	E2	B(E2)(W.u.)=42 *+24−10* Mult.: Q from $\gamma(\theta)$ in $(\alpha,n\gamma)$; E2 from RUL.
4027.1		3257[&] *1*		768.5	$5/2^-$		
4234	$7/2^-$	1656.6[‡]	54	2577.4	$7/2^-$		
		3465.5[‡]	100	768.5	$5/2^-$		
		4234[‡&]	≤3	0.0	$3/2^-$		
4503.0		475.9 *5*		4027.1			
		636.8 *5*		3865.6	$11/2^-$		
		1139.2 *5*		3363.8	$7/2^-$		
		1926.5 *5*		2577.4	$7/2^-$		
4576	$7/2^-$	3807.5[‡]	54	768.5	$5/2^-$		
		4576[‡]	100	0.0	$3/2^-$		
4711.2	$(11/2^-)$	845.4 *5*		3865.6	$11/2^-$		
		2133[&] *1*		2577.4	$7/2^-$		
4941.1		229.8 *5*		4711.2	$(11/2^-)$		
		438.5 *5*		4503.0			
		1075.6 *5*		3865.6	$11/2^-$		
		1227.0 *5*		3713.6	$(^+)$		
5238.8	$7/2^-$	(1525.2[‡])	30	3713.6	$(^+)$		Expected from existence of 1120γ and 1510γ in $\alpha\gamma$ spectra in $(^3He,\alpha\gamma)$.
		(2008.7[‡])	50	3230.1	$7/2^-$		Expected from existence of 3240γ in $\alpha\gamma$ spectra in $(^3He,\alpha\gamma)$.
		2661.4[‡]	100	2577.4	$7/2^-$	(M1+E2)	δ: + 0.95 *+26−20* or - 0.02 *6*. Mult.: from $\gamma(\theta)$ in $(^3He,\alpha\gamma)$ and ΔJ^π. The 2662γ and the 2602γ were not resolved and were analyzed together.
		4470.3[‡]	20	768.5	$5/2^-$		
5320.6	$15/2^-$	379.4 *5*		4941.1			
		1455.1 *5*	100	3865.6	$11/2^-$	E2	B(E2)(W.u.)=10 *+4−2* I_γ: based on $(\alpha,n\gamma)$, the evaluator has assumed that the 5321 level decays mostly through the 1455γ. Mult.: Q from $\gamma(\theta)$ in $(\alpha,n\gamma)$; E2 from RUL.
5515.0		194.7 *5*		5320.6	$15/2^-$		
		573.8 *5*		4941.1			
		1649.4 *5*		3865.6	$11/2^-$		
5561	$(^+)$	1721[‡&]	30	3840	$3/2^-$		
		4448.4[‡&]	100	1112.6	$1/2^-$		M,δ: see $(^3He,\alpha\gamma)$. Not adopted due to uncertainty in placement.
		5561[‡&]	70	0.0	$3/2^-$		M,δ: see $(^3He,\alpha\gamma)$. Not adopted due to uncertainty in placement.
5663.3		722[&] *1*		4941.1			
		1160.3 *5*		4503.0			
5980	$(3/2)^+$	4867.4[‡]	≈100	1112.6	$1/2^-$		

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Adopted Levels, Gammas (continued)

$\gamma(^{57}Ni)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	E_i(level)	E_γ[†]	E_f	J_f^π
5980	$(3/2)^+$	5980[‡]	≈100	0.0	$3/2^-$	7454.5	1939.5 *5*	5515.0	
6421.0		906.0 *5*		5515.0			2134[&] *1*	5320.6	$15/2^-$
		1100.3 *5*		5320.6	$15/2^-$	8345.7	891.2 *5*	7454.5	
7454.5		1033.5 *5*		6421.0			1924.7 *5*	6421.0	

[†] From (α,nγ), (^{20}Ne,2pnγ), unless indicated otherswise.
[‡] From energy difference of initial and final levels.
[#] Relative photon branching from each level from (^{3}He,$\alpha\gamma$).
[@] From (α,nγ). Multipolarity and δ based on $\gamma(\theta)$, Γ_γ, and ΔJ^π.
[&] Placement of transition in the level scheme is uncertain.

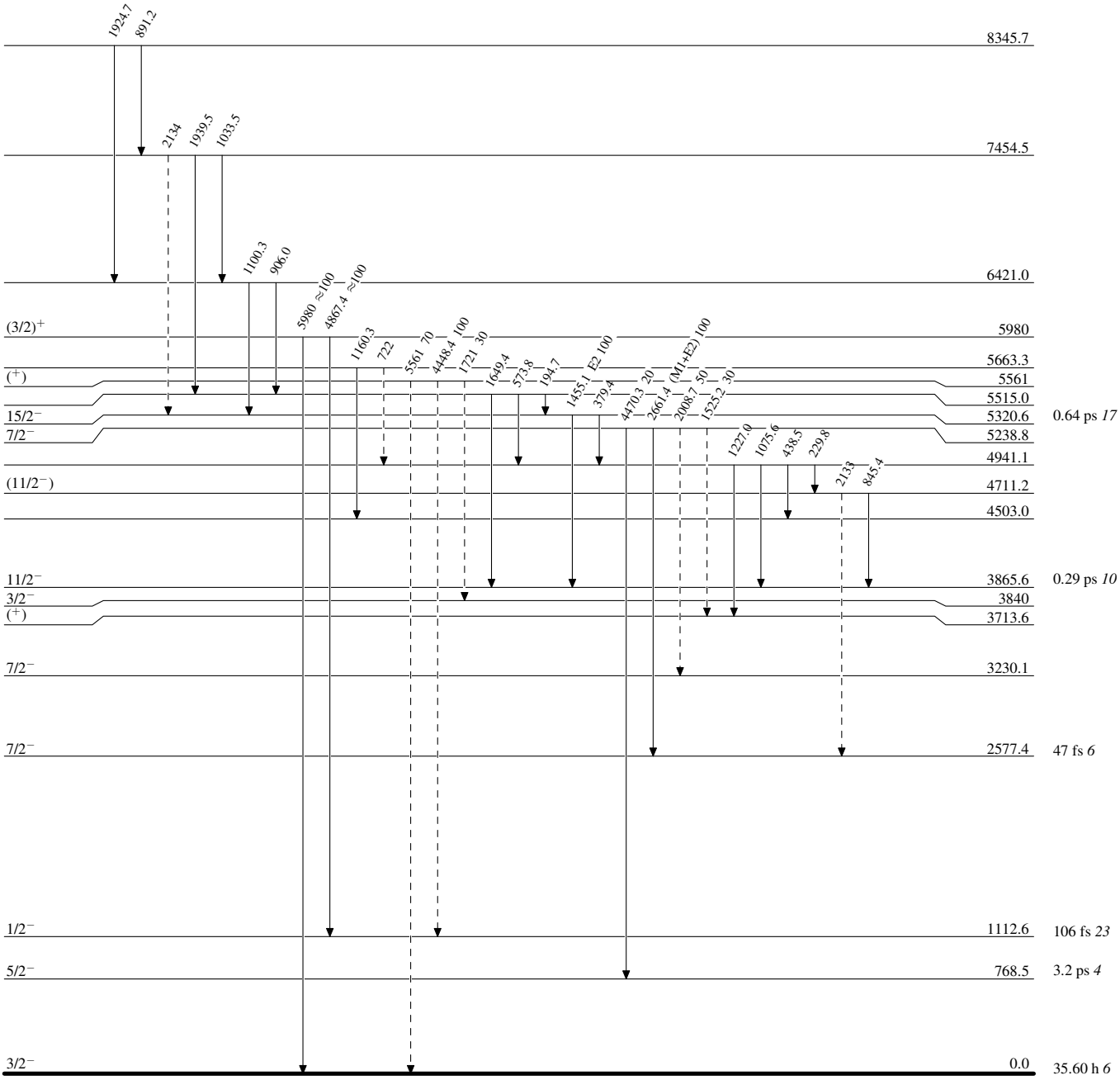
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{57}_{28}Ni_{29}$

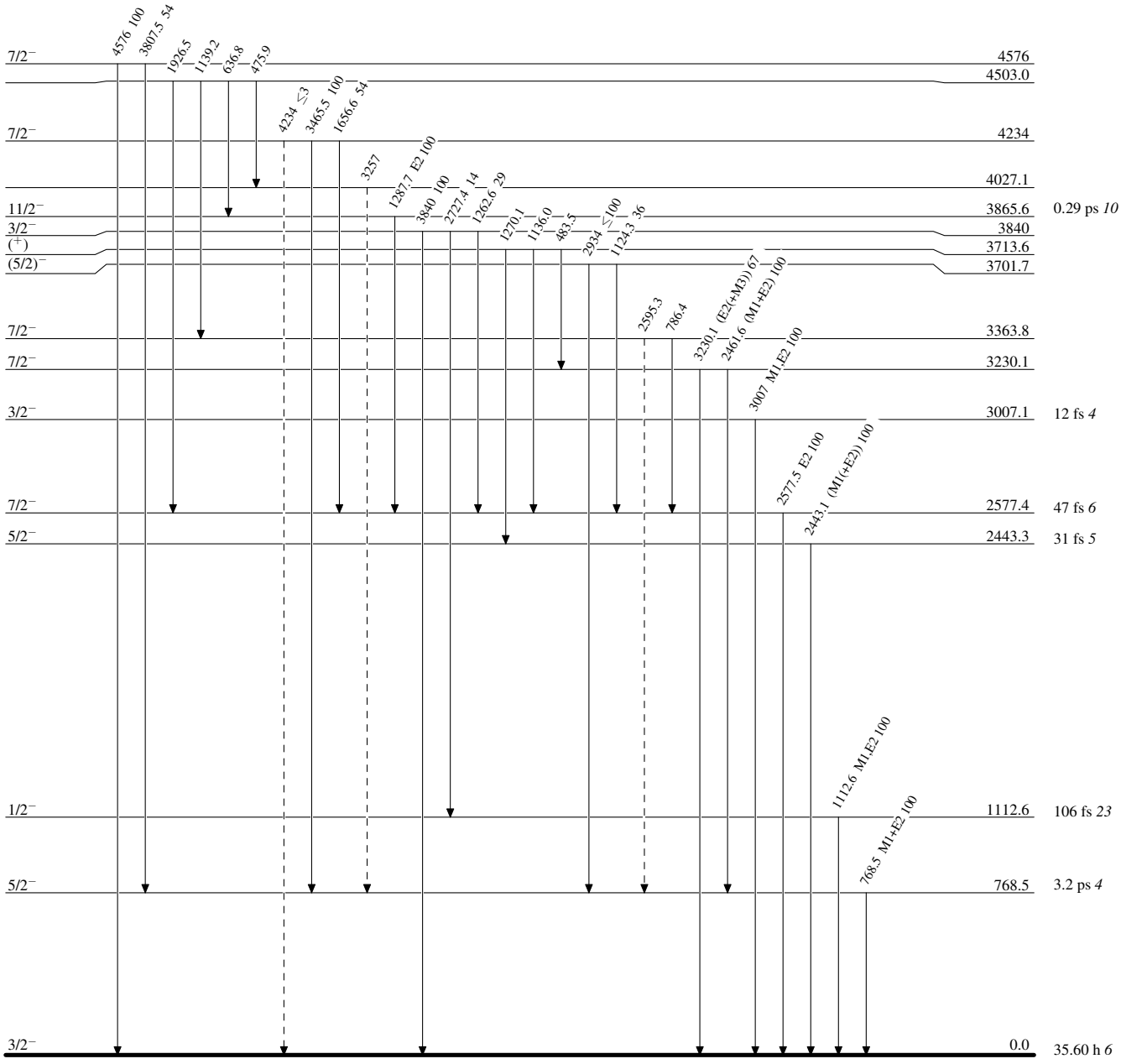
Adopted Levels, Gammas

Legend

Level Scheme (continued)

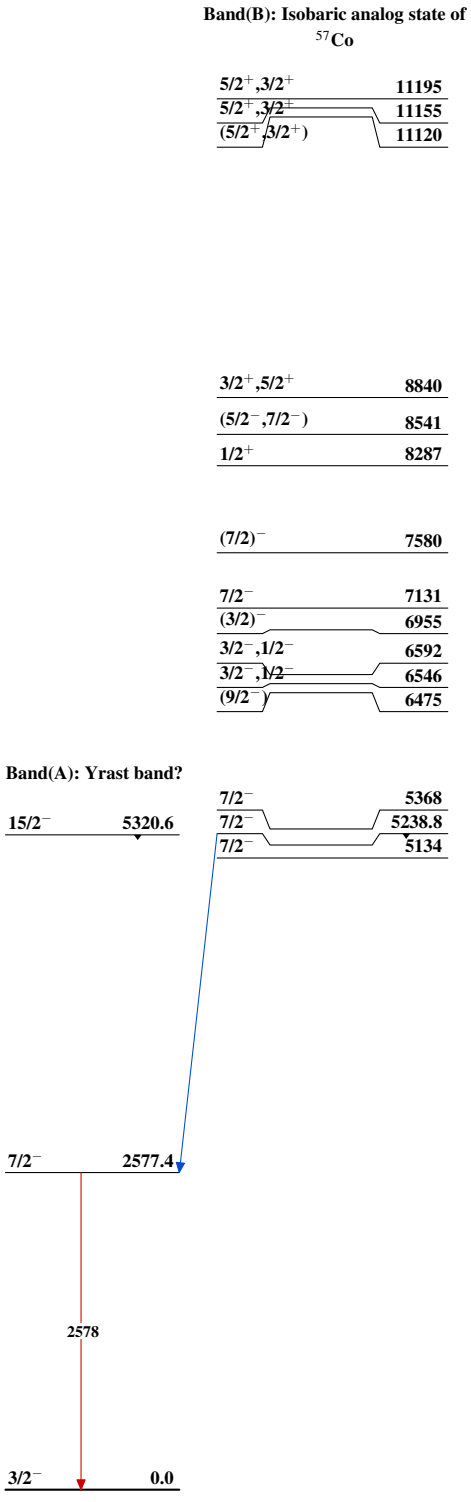
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{57}_{28}Ni_{29}$

Adopted Levels, Gammas



$^{57}_{28}Ni_{29}$