Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Alan L. Nichols, Balraj Singh, Jagdish K. Tuli	NDS 113,973 (2012)	15-Apr-2012

Q(β^-)=−3958.9 *5*; S(n)=10595.9 *4*; S(p)=11137.2 *8*; Q(α)=−7016.3 *5* 2012Wa38
Note: Current evaluation has used the following Q record −3958.90 4810595.8 *3* 11137.2 *7* −7016.3 *4* 2011AuZZ.
S(2n)=18415.95 *31*, S(2p)=19910.9 *34* (2011AuZZ).
Values in 2003Au03: Q(β^-)=−3948 *4*, S(n)=10596.5 *3*, S(p)=11136.6 *7*, Q(α)=7017.6 *6*, S(2n)=18416.7 *3*, S(2p)=19912 *3*.
2001Tr23: measured level widths and shifts in anti-protonic atoms.
2006An27: nuclear structure calculations of first 2^+ and 3^- states.
Other Reactions:
^{63}Cu(γ,p): 1975We11, 1971We06, 1968Ab10; g.s. and first 2^+ levels.
^{65}Zn(n,α): 1984Em01: E=thermal, FWHM=50-60 keV, measured $\sigma(\theta)$ for g.s. and first 2^+ level.
^{66}Zn(d,^{6}Li): 1973Ce02: E=27.25 MeV, Si telescopes, FWHM=400 keV, $\sigma(\theta)$ for g.s. and first 2^+ state.
XREF table: the following levels are populated in reactions labeled with XREF=Y:
^{58}Fe(^{16}O,^{12}C): 0, 1173, 2340, 2890, 3270, 3520, 3750.
^{62}Ni(^{3}He,^{3}He′),(^{3}He,dp): 0, 1173, 2300, 2340, 3750, 4350.
^{63}Cu(n,npγ): 0, 1173, 2302, 2336, 3059.
^{63}Cu(^{6}Li,^{7}Be),(^{9}Be,^{10}B): 0, 1173.
^{64}Zn(^{14}C,^{16}O): 0, 1173.
^{66}Zn(α,2α): 0, 1173, 2360.
^{62}Ni isotope identified in mass spectroscopic data by F.W. Aston, Nature 134, 178 (1934).

^{62}Ni Levels

$T_{1/2}$(first 2^+ level at 1173 keV):
τ=2.09 ps *6* is weighted average of 13 values from different methods listed as comments below. A minimum uncertainty of 5% was assigned, and three methods were employed in the weighted averaging procedures. A value consistent with all the three methods has been adopted (LWM: limitation of statistical weights; NRM: normalized residuals method; RT: Rajeval technique). Reduced χ^2 varies between 1.1 and 2.2 in the three methods. 2001Ra27 evaluation adopted a very similar value of τ=2.07 ps *6* which did not include the 2001Ke08 measurement. Other: $T_{1/2}$=1.24 ps *+60−33* (2011Ch05) in (n,n′γ).
Individual values of mean lifetime τ in ps as used in the averaging procedures are given below:
1. Deduced from BE2↑ measurement in Coulomb excitation: 2.25 *45* (1960An07, earlier value of 1.40 *35* in 1959Al95), 2.23 *22* (1962St02), 2.20 *13* (1969Ha31), 2.05 *6* (1970Le17), 2.09 *7* (1971ChZF).
2. From Γ in (γ,γ′): 2.15 *42* (1981Ca10, also 2.1 ps *5* in 1977Ca14 from the same group as 1981Ca10).
3. From B(E2) in (e,e′): 2.096 *27* (1967Du07), 2.99 *20* (1972Li28), 1.82 *18* (1975DeXW).
4. From DSAM in (α,pγ): 1.55 *25* (1978Ke11), 1.6 *+4−6* (1978Oh04).
5. From DSAM in Coulomb excitation: 2.28 *18* (1965Es01), 2.01 *12* (2001Ke08), uncertainty increased to 0.12 to include 5% systematic uncertainty due to stopping powers, as suggested by one of the authors of 2001Ke08 in an e-mail communication to evaluators, December 2007.

Cross Reference (XREF) Flags

A	^{62}Co β^- decay (1.54 min)	L	^{61}Ni(d,p),(pol d,p)	W	^{64}Ni(p,t)
B	^{62}Co β^- decay (13.86 min)	M	^{62}Ni(γ,γ′)	X	^{65}Cu(p,α)
C	^{62}Cu ε decay (9.67 min)	N	^{62}Ni(e,e′)	Y	^{58}Fe(^{16}O,^{12}C)
D	^{48}Ca(^{18}O,4nγ)	O	^{62}Ni(n,n′γ)	Z	^{62}Ni(^{3}He,^{3}He′),(^{3}He,dp)
E	^{58}Fe(^{6}Li,d)	P	^{62}Ni(p,p′),(pol p,p′)	Others:	
F	^{59}Co(α,pγ)	Q	^{62}Ni(p,p′γ)	AA	^{63}Cu(n,npγ)
G	^{60}Ni(t,p),(pol t,p)	R	^{62}Ni(d,d′),(pol d,d′)	AB	^{63}Cu(^{6}Li,^{7}Be),(^{9}Be,^{10}B)
H	^{60}Ni(α,^{2}He)	S	^{62}Ni(α,α′)	AC	^{64}Zn(^{14}C,^{16}O)
I	^{60}Ni(^{12}C,^{10}C),(^{14}C,^{12}C)	T	Coulomb excitation	AD	^{66}Zn(α,2α)
J	^{61}Ni(n,γ) E=thermal	U	^{63}Cu(n,d)		
K	^{61}Ni(n,γ),(n,n):resonances	V	^{63}Cu(d,^{3}He),(pol d,^{3}He)		

E(level)[†]	J^π	$T_{1/2}$[&]	XREF	Comments
0.0	0^+	stable	ABCDEFGHIJ LMNOPQRSTUVWXYZ	XREF: Others: AA, AB, AC, AD $(<r^2>)^{1/2}$=3.8406 fm *21* (2004An14 evaluation, and 2008 update available on http://cdfe.sinp.msu.ru). 2012Sc01 deduced valence orbit neutron occupancy as follows from summed experimental spectroscopic factors in their study of ^{62}Ni(p,d) reaction: 2.31 each for $1p_{3/2}$ and $0f_{5/2}$, 0.93 for $1p_{1/2}$, 0.34 for $0g_{9/2}$ with a total of 5.89.
1172.98 *10*	2^+	1.45 ps *4*	ABCDEFGHIJ LMNOPQRSTUVWXYZ	XREF: Others: AA, AB, AC, AD μ=+0.33 *5* (2001Ke02,2011StZZ) Q=+0.05 *12* (1974Le13,1989Ra17,2011StZZ) B(E2)↑=0.0881 *25* μ: transient-field integral PAC (2001Ke02). Others: μ=+0.68 *14* (1988Sp04), +0.64 *22* (1978Ha13). Q: reorientation in Coul. ex. (1974Le13,1989Ra17). J^π: from E2 Coul. ex. from 0^+ g.s.; L(p,t)=L(t,p)=2. B(E2)↑: from adopted lifetime.
2048.68 *12*	0^+	0.76[a] ps *+76−28*	C EFG J LM OPQRS WX	J^π: L(t,p)=L(p,t)=0. $T_{1/2}$: Other: 1.8 ps *+19−6* (2011Ch05) in (n,n′γ).
2301.84 *13*	2^+	0.58[a] ps *+16−9*	ABC EFG J LMNOPQ S WX Z	XREF: Others: AA, AD J^π: L(p,t)=L(t,p)=2. $T_{1/2}$: Other: 0.67 ps *+20−14* in (n,n′γ).
2336.52 *14*	4^+	0.86[a] ps *+24−13*	B DEFG J L OPQRSTUVWXYZ	XREF: Others: AA, AD J^π: L(p,t)=L(t,p)=4. $T_{1/2}$: other: 0.86 ps *+41−22* in (n,n′γ).
2890.63 *20*	0^+	>3.1[a] ps	C EFG J L OPQR WXY	J^π: L(p,t)=0.
3058.76 *17*	3^+	2.3[a] ps *+14−7*	A F J L OPQ WX	XREF: Others: AA J^π: from (n,n′γ). g.s. transition from this level as seen in (n,γ) is disputed. A_2,A_4 measurements indicate ΔJ=1 for all three γ (2011Ch05). L(p,t)=2 is discrepant.
3157.96 *16*	2^+	0.62 ps *+11−10*	A C EFG J M OPQRS U Wx	$T_{1/2}$: from (n,n′γ). Other: 0.69 ps *+55−28* in (α,pγ). J^π: L(p,t)=L(t,p)=2.
3176.7 *3*	4^+	0.73[a] ps *17*	B D F L OP Wx	J^π: L(p,t)=4.
3257.62 *21*	2^+	0.71[a] ps *17*	A C F J L OPQ Wxy	J^π: L(p,t)=2.
3262 *8*	$(2,4)^+$		E G L PQ xy	J^π: from L(^{6}Li,d)=2+4, L(t,p)=(2+4) for unresolved doublet. Also, L(d,p)=1+3. E(level): may include 3270 level.
3269.97 *20*	1^+,2^+[#]	0.125 ps *14*	A C J M O xy	J^π: L(d,p)=1+3 for a level at 3265 *10*. $T_{1/2}$: from (n,n′γ).
3277.69 *23*	4^+	0.195[a] ps *+34−18*	B D FG O RS W y	$T_{1/2}$: other: 0.42 ps *+7−6* in (n,n′γ). J^π: L(p,t)=4 for a level at 3271 *5*; L(α,α′)=4 for a level at 3270; γ decay to 2^+ state is Q.
3369.98 *20*	1^+[#]	0.19[a] ps *9*	A C F J LM OP x	$T_{1/2}$: other: 0.35 ps *+8−6* in (n,n′γ). J^π: earlier suggested as 1^+,2^+. γγ(θ) measurement suggest 3369γ to be stretched dipole (2011Ch05).
3378 *3*			F x	
3462 *3*	1^+ to 4^+		F L PQ VWx	J^π: L=3, dominant J-transfer is 5/2 in (pol d,p).

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Adopted Levels, Gammas (continued)

^{62}Ni Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[&]	XREF	Comments
3486 *3*			F x	
3518.23 *22*	2^+	0.201[a] ps *38*	A FG J LM OPQRS wxy	J^π: J=2,4 from $\gamma\gamma(\theta)$ in ^{61}Ni(n,γ); γ decays to 0^+ levels; L(t,p)=2; L(p,t)=0+2. L=0 component is most likely for 3524 level. $T_{1/2}$: other: 0.62 ps *+12−10* in (n,n′γ).
3522.54 *18*	$2^+,3^+$[@]	0.15[a] ps *+6−5*	F J O xy	$T_{1/2}$: other: 0.61 ps *+30−17* in (n,n′γ).
3524.4 *5*	0^+	0.7[b] ps *+5−2*	E O wxy	XREF: Others: AA, AC XREF: E(3519). J^π: from (n,n′γ); L(^{6}Li,d)=0; L(p,t)=0+2.
3756.5 *3*	3^-	0.149[a] ps *+34−22*	EFG J L NOPQRS W yZ	B(E3)↑=0.020 *3* (1967Du07,2002Ki06) J^π: L(p,t)=L(t,p)=L(p,p′)=3. $T_{1/2}$: other: 0.17 ps *+8−5* in (n,n′γ). B(E3) from (e,e′) (1967Du07).
3849.4 *3*	$0^+,1^+,2^+$		J M PQ	J^π: from (γ,γ′) if γ decay from 7646, 1^- level is E1.
3859.6 *4*	$1^+,2^+$	0.277[a] ps *+17−9*	C FG J LM P R U W	XREF: Others: AC XREF: L(3853). J^π: J=1,2 from γ transitions to 0^+ states, π=+ from log *ft*=5.6 from 1^+; L(d,p)=1; L(p,t)=2 for a doublet.
3967 *3*	+		F L PQ	J^π: L(d,p)=1 for a level at 3965 *10*.
3972.9 *4*	2^+	0.111[a] ps *35*	FG J M W	J^π: L(p,t)=2.
4000.5 *10*	4^+	0.042[a] ps *+28−21*	F P W	J^π: L(p,t)=4.
4011.0 *15*		>0.90[a] ps	F	
4018.88 *25*	$(6)^+$	0.62 ps *28*	D F L OP W	$T_{1/2}$: from DSA and RDM in (^{18}O,4nγ). Other: 0.076 ps *+62−28* in (α,pγ). J^π: E2 γ to 4^+ and intense feeding in (^{18}O,4nγ).
4035 *7*	$(0\text{ to }3)^+$		L PQ	J^π: L(d,p)=1 from $3/2^-$ target.
4055.3 *3*	4^+	0.042[a] ps *+15−10*	B F L P Wx	J^π: L(p,t)=4.
4062.4 *5*	$1^+,2^+$[#]		A FG J M UV x	
4146.0 *8*	(4^+)	0.34[a] ps *+21−11*	F HI l PQ UVw	XREF: Others: AB, AD XREF: I(4200). J^π: L(p,t)=(4) for a doublet at 4154 *6*; L(d,p)=3 for a 4153 *10* level.
4151.4 *3*	$2^+,3^+$[@]	0.034[a] ps *9*	F J l P w	
4154.2 *4*	(4^+)		FG l w	J^π: L(p,t)=(4) for a doublet at 4154 *6*; L(d,p)=3 for a 4153 *10* level.
4161.26 *24*	(5^-)	<1.4 ps	D F S	J^π: L(α,α′)=5 for a level at 4150. J=(5) from (^{18}O,4nγ).
4179 *3*			F P R	
4201.0 *4*	$(3,4)^-$		J L P	J^π: 3^- to 6^- from L=4, dominant J-transfer 9/2 in (pol d,p); γ decay to $2^+,3^+$ state excludes 6.
4208.8 *21*			J	
4230.0 *10*	0^+		J M P R W	J^π: L(p,t)=0.
4317.2 *11*	$1^+,2^+$[#]		G J P W Z	
4393 *7*	$(1\text{ to }5)^+$		L PQ	J^π: L(d,p)=3 from $3/2^-$ target.
4407 *4*	2^+		P W	J^π: L(p,t)=2.
4415.9 *5*	$1^+,2^+$[#]		G J	
4424 *3*			F	
4437 *4*	(3^-)		PQ S W	J^π: L(α,α′)=(3).

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Adopted Levels, Gammas (continued)

^{62}Ni Levels (continued)

E(level)†	J^π	$T_{1/2}$&	XREF	Comments
4455 *4*			G L P W	
4503 *4*	$(3)^-$		G L PQ W	J^π: L(p,t)=(3); L(pol d,p)=4 from $3/2^-$ target for a 4500 *25* level.
4623 *5*	0^+		G PQ W	J^π: L(p,t)=L(t,p)=0.
4627.5 *10*	$2^+,3^+$@		J	
4648.9 *3*	(7^-)‡	509 ps *24*	D F HI Q S	J^π: D+Q γ to (6^+) and E2 γ to (5), (^{18}O,4nγ).
4655 *5*	3^-		G P W	J^π: L(p,t)=3.
4704 *7*			PQ x	
4712 *5*	2^+		G L P Wx	J^π: L(p,t)=2.
4719.9 *7*	$(3)^-$		J L Wx	J^π: L=4, dominant J-transfer is 9/2 for a level at 4720 *25*, ^{61}Ni(pol d,p); γ to 2^+.
4781 *5*	2^+		G PQ S U W	J^π: L(p,t)=2.
4835 *7*			P	
4847 *7*	(1 to 5)$^{(+)}$		PQ V	J^π: L(d,^{3}He)=3 from $3/2^-$ target for a 4850 *80* group.
4861 *5*	(2^+)		D x	J^π: L(p,t)=(2).
4863.3 *3*	$5^-,6^-$	8.39 ps *14*	G L PQ Wx	J^π: L=4, dominant J-transfer of $9/2^+$ in (pol d,p) gives 3^- to 6^-. Lifetime and strong feeding in (^{18}O,4nγ) exclude 3 and 4.
4882 *5*	4^+		L P Wx	J^π: L(p,t)=4.
4949 *7*			P	
4967 *7*			P	
4981 *7*	(4^+)		GH P	J^π: from DWBA analysis and proposed configuration=$\nu p_{3/2}\otimes\nu f_{5/2}$ in (α,^{2}He).
4994 *6*	3^-		P W	J^π: L(p,t)=3.
4999.7 *14*	$1^+,2^+$#		G J Q	
5016 *5*	4^+		G L P W	J^π: L(p,t)=4.
5041 *10*	(3^- to 6^-)		P	J^π: L=4, dominant J-transfer is 9/2 in (pol d,p) for a level at 5030 *25*.
5071 *10*			L PQ	
5121 *10*			PQ	
5148 *5*	(2^+)		P W	J^π: L(p,t)=(2).
5154 *10*	$(2^+,4^+)$		G P	J^π: L(t,p)=(2+4).
5203 *5*	2^+		P W	J^π: L(p,t)=2.
5222 *10*			PQ	
5233 *10*			P	
5280 *10*			PQ	
5286 *6*	(2^+)		G P W	J^π: L(p,t)=(2).
5310	2^+		S	J^π: L(α,α')=2.
5331 *10*	$(3)^-$		G i L PQ	J^π: J=(3) from L(t,p)=(3); π=− from L(d,p)=2. Also L=2, dominant J-transfer is 5/2 in (pol d,p).
5355 *5*	4^+		i P W	J^π: L(p,t)=4.
5393 *10*			P	
5420 *5*	(4^+)		G PQ W	J^π: L(p,t)=(4).
5447 *5*	0^+		G P W	J^π: L(p,t)=0.
5465 *6*			P W	
5488 *10*			P	
5511 *10*			L P	
5.53×10^3 *10*	6^+		N	J^π: from form factor in ^{62}Ni(e,e′).
5541 *5*	2^+		G P VW	J^π: L(p,t)=2.
5545 *10*	3^- to 6^-		L P	J^π: L=4, dominant J-transfer is 9/2 in (pol d,p) for a level at 5540 *25*.
5565 *10*			P	
5574 *5*	2^+		G P W	J^π: L(p,t)=2.

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Adopted Levels, Gammas (continued)

^{62}Ni Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[&]	XREF	Comments
5587 *10*			P	
5601 *10*			P	
5628 *6*	3^-		G L P S W	J^π: L(t,p)=3; L(α,α')=3 for a level at 5640 *10*.
5673 *10*	5^-		HI P	
5679 *8*			G P W	
5709 *10*			P	
5739 *10*			P	
5751.2 *3*	(9^-)[‡]	0.55 ps *21*	D	J^π: E2 γ to (7), 4648 level, (^{18}O,4nγ).
5772 *10*			P	
5806.1 *4*	(7,8,9)	<1.4 ps	D	J^π: from lifetime and strong feeding, (^{18}O,4nγ).
5808 *6*	(3^-)		P W	J^π: L(p,t)=(3).
5834 *10*	$^-$		L P	J^π: L(pol d,p)=2 for a level at 5830 *25*.
5846 *10*			P	
5859 *10*			L P	
5870 *10*			P	
5888 *8*	(4^+)		P W	J^π: L(p,t)=(4).
5901 *10*			P	
5912 *8*	4^+		P W	J^π: L(p,t)=4.
5930	2^+		S	J^π: L(α,α')=2.
5961 *10*			P	
5979 *10*			P	
5993 *10*	$(1^-,2^-)$		P V	J^π: L(d,^{3}He)=0 from $3/2^-$ target for a group at 5990 *80*.
6023 *10*			P	
6026 *10*			P	
6047 *8*	(3^-)		P W	J^π: L(p,t)=(3).
6059 *10*	7^-		HI P	E(level),J^π: doublet in (α,^{2}He) with $J^\pi=5^-$ and 7^-.
6073 *8*			P W	
6103 *10*	1^- to 4^-		L P	J^π: L=2, dominant J-transfer is 5/2 in (pol d,p) for a level at 6100 *25*.
6126 *8*			P W	E(level): assumed to be same as 6121 *10* level seen in (p,p$'$).
6133 *10*			P	
6143 *10*			P	
6160 *9*			W	
6170 *10*			P	E(level): same as 6160 level?
6253 *9*	(4^+)		W	J^π: L(p,t)=(4).
6313 *9*	1^- to 4^-		L Q W	J^π: L=2, dominant J-transfer is 5/2 in (pol d,p) for a level at 6320 *25*.
6354 *8*	2^+		W	J^π: L(p,t)=2.
6398 *8*	4^+		L W	J^π: L(p,t)=4.
6454 *8*			W	
6520	3^-		P S	J^π: L(p,p$'$)=L(α,α')=3.
6540 *80*	$1^-,2^-$		L V	J^π: L(d,^{3}He)=0 from $3/2^-$ target.
6647.0 *3*	(9^-)[‡]		D	J^π: E2 γ from 7559 level, J=(11); γ to (7^-) level, (^{18}O,4nγ).
6680			P	
6750 *80*	$1^-,2^-$		L V	J^π: L(d,^{3}He)=L(d,p)=0 from $3/2^-$ targets.
6900 *25*	$(1^-,2^-)$		L	J^π: L(pol d,p)=(0).
7030	3^-		P	J^π: L(p,p$'$)=3.
7080 *30*			L	E(level): seen in (d,p), perhaps same as 7030.
7170	8^+		HI Q	E(level),J^π: doublet at 7190 in (α,^{2}He) with $J^\pi=6^+$ and 8^+.
7260	1^- to 4^-		L P	J^π: L=2, dominant J-transfer is 5/2 in (pol d,p) for a level at 7300 *25*.
7559.4 *4*	(11^-)[‡]	0.83 ps *42*	D	J^π: E2 γ transitions to J=(9^-) levels, (^{18}O,4nγ).

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Adopted Levels, Gammas (continued)

^{62}Ni Levels (continued)

E(level)[†]	J^π	XREF	Comments
7620	6^+	HI PQ	
7645.6 *4*	1^-	M	E(level): differs from Eγ of capture γ from Fe(n,γ) by 14.35 eV *15*. J^π: E1 γ to g.s., ^{62}Ni(γ,γ′).
7700?		Q	
7800 *25*	1^- to 4^-	L	J^π: L=2, dominant J-transfer is 5/2 in (pol d,p).
8130 *25*	(1^- to 4^-)	L Q	J^π: L=(2), dominant J-transfer is (5/2) in (pol d,p).
8460 *25*	(2^- to 5^-)	L	J^π: L=(4), dominant J-transfer is (7/2) in (pol d,p).
(10596.1 *4*)	$1^-,2^-$	J	
10597.1[c] *3*	1^-[c]	K	
10598.9[c] *3*	1^+[c]	K	
10599.0[c] *3*	2^-[c]	K	
10602.0[c] *3*	1^+[c]	K	
10602.2[c] *3*	1^+[c]	K	
10602.8[c] *3*	1^-[c]	K	
10603.2[c] *3*	2^-[c]	K	
10604.1[c] *3*	2^-[c]	K	
10605.7[c] *3*	1^+[c]	K	
10608.2[c] *3*	2^-[c]	K	
10608.9[c] *3*	1^+[c]	K	
10609.2[c] *3*	2^-[c]	K	
10609.5[c] *3*	2^+[c]	K	
10609.9[c] *3*	1^+[c]	K	
10612.1[c] *3*	1^-[c]	K	
10613.3[c] *3*	1^-[c]	K	
10614.3[c] *3*	2^-[c]	K	
10616.8[c] *3*	2^-[c]	K	
10616.9[c] *3*	1^+[c]	K	
10619.9[c] *3*	1^-[c]	K	
10623.5[c] *3*	2^-[c]	K	
10624.3[c] *3*	1^-[c]	K	
10624.4[c] *3*	2^-[c]	K	
10625.8[c] *3*	2^-[c]	K	
10626.3[c] *3*	1^-[c]	K	
10627.0[c] *3*	2^-[c]	K	
10627.9[c] *3*	2^-[c]	K	
10628.8[c] *3*	1^-[c]	K	
10629.8[c] *3*	1^+[c]	K	
10632.2[c] *3*	1^-[c]	K	
10632.2[c] *3*	2^-[c]	K	
10632.5[c] *3*	1^+[c]	K	
10636.4[c] *3*	1^-[c]	K	
10638.6[c] *3*	2^-[c]	K	
10640.4[c] *3*	1^-[c]	K	
10640.4[c] *3*	2^+[c]	K	
10641.1[c] *3*	1^-[c]	K	
10641.6[c] *3*	1^-[c]	K	
10645.3[c] *3*	2^-[c]	K	
10645.6[c] *3*	2^-[c]	K	
10646.2[c] *3*	1^+[c]	K	
10646.4[c] *3*	1^+[c]	K	
10647.3[c] *3*	1^+[c]	K	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{62}Ni Levels (continued)

E(level)[†]	J$^{\pi}$	XREF
10648.1[c] 3	2−[c]	K
10649.6[c] 3	1−[c]	K
10651.3[c] 3	2−[c]	K
10652.8[c] 3	2−[c]	K
10653.0[c] 3	2−[c]	K
10654.1[c] 3	1+[c]	K
10655.5[c] 3	2−[c]	K
10655.6[c] 3	2−[c]	K
10658.0[c] 3	1+[c]	K
10658.4[c] 3	1+[c]	K
10658.7[c] 3	2−[c]	K
10660.4[c] 3	2−[c]	K
10663.0[c] 3	2−[c]	K
10664.3[c] 3	2−[c]	K
10664.3[c] 3	1−[c]	K
10665.3[c] 3	1+[c]	K
10667.5[c] 3	2−[c]	K
10671.8[c] 3	2−[c]	K
10671.8[c] 3	1−[c]	K
10673.4[c] 3	1+[c]	K
10673.5[c] 3	2−[c]	K
10674.9[c] 3	2−[c]	K
10677.3[c] 3	1−[c]	K
10677.6[c] 3	1−[c]	K
10678.4[c] 3	2−[c]	K
10681.1[c] 3	1+[c]	K
10682.8[c] 3	1−[c]	K
10688.3[c] 3	2−[c]	K
10690.6[c] 3	1−[c]	K
10690.9[c] 3	2+[c]	K
10691.2[c] 3	1+[c]	K
10692.2[c] 3	1−[c]	K
10692.5[c] 3	2−[c]	K
10695.7[c] 3	2−[c]	K
10698.7[c] 3	1−[c]	K
10699.2[c] 3	2−[c]	K
10700.0[c] 3	1−[c]	K
10702.2[c] 3	2−[c]	K
10703.3[c] 3	1+[c]	K
10703.5[c] 3	2−[c]	K
10704.0[c] 3	1+[c]	K
10704.7[c] 3	1+[c]	K
10706.2[c] 3	2−[c]	K
10708.4[c] 3	2−[c]	K
10711.2[c] 3	2−[c]	K
10712.1[c] 3	1−[c]	K
10712.8[c] 3	2−[c]	K
10714.3[c] 3	2−[c]	K
10715.0[c] 3	2−[c]	K
10716.6[c] 3	2−[c]	K
10719.2[c] 3	2−[c]	K
10720.7[c] 3	2−[c]	K
10721.1[c] 3	1−[c]	K
10721.8[c] 3	2−[c]	K
10723.8[c] 3	1−[c]	K
10724.4[c] 3	1−[c]	K
10724.8[c] 3	2−[c]	K
10729.7[c] 3	2−[c]	K
10730.7[c] 3	2−[c]	K
10731.7[c] 3	2−[c]	K
10734.2[c] 3	2−[c]	K
10735.4[c] 3	1−[c]	K
10736.1[c] 3	2−[c]	K
10736.8[c] 3	2−[c]	K
10738.6[c] 3	2−[c]	K
10740.7[c] 3	1+[c]	K
10741.2[c] 3	2−[c]	K
10742.7[c] 3	2−[c]	K
10746.3[c] 3	2−[c]	K
10747.1[c] 3	1−[c]	K
10748.0[c] 3	2−[c]	K
10748.5[c] 3	2−[c]	K
10749.7[c] 3	1−[c]	K
10752.3[c] 3	1−[c]	K
10753.1[c] 3	2−[c]	K
10754.9[c] 3	2−[c]	K
10757.8[c] 3	1−[c]	K
10759.7[c] 3	1−[c]	K
10760.6[c] 3	2−[c]	K
10763.7[c] 3	2−[c]	K
10766.1[c] 3	2−[c]	K
10767.0[c] 3	1−[c]	K
10769.8[c] 3	1−[c]	K
10772.4[c] 3	2−[c]	K
10774.7[c] 3	2−[c]	K
10776.5[c] 3	2−[c]	K
10778.3[c] 3	1−[c]	K
10781.5[c] 3	2−[c]	K
10786.5[c] 3	1−[c]	K
10787.8[c] 3	2−[c]	K
10790.9[c] 3	2−[c]	K
10793.3[c] 3	1−[c]	K
10796.0[c] 3	2−[c]	K
10798.5[c] 3	1+[c]	K
10799.1[c] 3	1−[c]	K
10800.6[c] 3	1+[c]	K
10802.2[c] 3	3+[c]	K
10803.0[c] 3	2−[c]	K
10804.6[c] 3	3+[c]	K
10805.9[c] 3	1+[c]	K
10807.1[c] 3	2−[c]	K
10810.3[c] 3	2−[c]	K

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{62}Ni Levels (continued)

E(level)[†]	J^π	XREF
10812.4[c] 3	2−[c]	K
10817.1[c] 3	2−[c]	K
10819.2[c] 3	2−[c]	K
10822.7[c] 3	2−[c]	K
10824.3[c] 4	2−[c]	K
10824.4[c] 5	1−[c]	K
10827.8[c] 3	2−[c]	K
10828.5[c] 3	1−[c]	K
10832.2[c] 3	2−[c]	K
10832.3[c] 5	1−[c]	K
10845.6[c] 3	2−[c]	K
10849.8[c] 3	1−[c]	K
10851.4[c] 3	2−[c]	K
10855.3[c] 3	2−[c]	K
10858.7[c] 3	2−[c]	K
10868.7[c] 3	2−[c]	K
10876.1[c] 3	2−[c]	K
10878.9[c] 3	2−[c]	K
10882.5[c] 3	2−[c]	K
10884.4[c] 3	2−[c]	K
10885.7[c] 3	2−[c]	K
10888.2[c] 3	2−[c]	K
10891.2[c] 3	2−[c]	K
10970[c] 20	2−[c]	K
11010[c] 20	1−[c]	K

† Level energies given with decimals are from a least-squares fit to the adopted Eγ data. Others are from ^{64}Ni(p,t) and ^{62}Ni(p,p′), and from ^{61}Ni(d,p) at the highest energies.

‡ Parity same as that of 4160 level, from ^{48}Ca(^{18}O,4nγ).

From ^{61}Ni(n,γ): $J^\pi=0^+$ to 3^+ from primary E1 transition from $1^-,2^-$ capturing state, γ to 0^+ excludes 0 and 3.

@ From ^{61}Ni(n,γ): $J^\pi=0^+$ to 3^+ from primary E1 transition from $1^-,2^-$ capturing state, γ to 4^+ excludes 0 and 1.

& From ^{48}Ca(^{18}O,4nγ), except as noted.

a From DSAM in ^{59}Co(α,pγ).

b From DSAM in ^{62}Ni(n,n′γ).

c Neutron resonance, J^π from R-matrix analysis (2006Ko28).

Adopted Levels, Gammas (continued)

$\gamma(^{62}Ni)$

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.[@]	δ[@]	Comments
1172.98	2^+	1172.95 *11*	100	0.0	0^+	E2[&]		B(E2)(W.u.)=12.1 *4*
2048.68	0^+	875.69 *7*	100	1172.98	2^+	E2[&]		
		(2048.4)		0.0	0^+	E0		q^2_K(E0/E2)=0.084 *11*, X(E0/E2)=0.031 *4* (2005Ki02). E_γ: a 2048.4-keV E0 transition has been observed (1981Pa10) with B(E0 to g.s.)/B(E2 to 1173)=0.028 *5* from ce(K)(2048γ)/ce(K)(876γ)=0.084 *11*.
2301.84	2^+	1128.82 *14*	80.8 *20*	1172.98	2^+	M1+E2	+3.19 *11*	B(M1)(W.u.)=0.00106 *+18−30*; B(E2)(W.u.)=14.9 *+24−42* Mult.,δ: from ^{62}Ni(p,p′γ) (1972Va01). Other: δ=+3.0 *+7−20* from ^{62}Cu decay (1976Ca31).
		2301.8 *3*	100 *3*	0.0	0^+	E2		B(E2)(W.u.)=0.57 *+10−16*
2336.52	4^+	1163.50 *12*	100	1172.98	2^+	E2[&]		B(E2)(W.u.)=21 *+4−6*
2890.63	0^+	1717.5 *3*	100	1172.98	2^+	E2		B(E2)(W.u.)<0.84 Mult.: δ=−4.1 *+13−30* from (n,γ) (1970Fa06). Known J^π requires pure E2.
3058.76	3^+	722.02 *23*	47 *4*	2336.52	4^+	M1+E2	+1.6 *+3−9*	
		756.85 *20*	100 *6*	2301.84	2^+	(M1+E2)	−0.08 *2*	B(M1)(W.u.)=(0.009 *+3−6*); B(E2)(W.u.)=(0.18 *+11−15*)
		1885.8 *3*	91 *7*	1172.98	2^+	M1(+E2)	−0.03 *+3−2*	B(M1)(W.u.)=(0.00055 *+18−34*) δ: from (n,n′γ). Others: −0.50 *8* (1985KoZM in (n,n′γ), +0.65 *+20−16* (1970Fa06).
3157.96	2^+	856.09 *12*	12.3 *5*	2301.84	2^+	M1+E2		
		1984.9 *3*	100 *4*	1172.98	2^+	(M1+E2)	+0.13 *8*	B(M1)(W.u.)=(0.0026 *5*); B(E2)(W.u.)=(0.020 *+25−20*) δ: from (n,n′γ) (1970Fa06).
		3158.0 *15*	58 *7*	0.0	0^+	E2		B(E2)(W.u.)=0.068 *+14−15*
3176.7	4^+	875.0 *4*	6.9 *10*	2301.84	2^+	[E2]		
		2003.6 *4*	100 *4*	1172.98	2^+	E2[c]		B(E2)(W.u.)=1.5 *4*
3257.62	2^+	955.7 *3*	3.76 *22*	2301.84	2^+	[E2+M1]		
		2084.8 *4*	100 *3*	1172.98	2^+	M1+E2		
		3257.6 *12*	3.3 *4*	0.0	0^+	E2		B(E2)(W.u.)=0.0046 *13*
3269.97	$1^+,2^+$	968.2 *5*	>11.6	2301.84	2^+			
		1221.0 *3*	<97.7	2048.68	0^+			
		2097.2 *3*	100	1172.98	2^+			
		3270.0 *22*	<23.3	0.0	0^+			
3277.69	4^+	2104.5 *3*	100	1172.98	2^+	E2[&]		B(E2)(W.u.)=4.8 *+5−9* E_γ: average of 2103.78 *25* (^{18}O,4nγ) and 2104.6 *3* (^{62}Co β^- decay (13.9-min)), 2104.5 *3* in (α,pγ). B(E2)(W.u.)>0.55.
3369.98	1^+	479.36 *6*	2.8 *5*	2890.63	0^+			
		1067.7 *3*	16.6 *17*	2301.84	2^+	M1+E2	+1.6 *+41−11*	B(M1)(W.u.)=0.003 *+13−3*; B(E2)(W.u.)=13 *+21−13* δ: from (n,n′γ) (2011Ch05).
		1321.1 *3*	12.8 *13*	2048.68	0^+			
		3369.7 *17*	100 *16*	0.0	0^+	D		
3378		2205 *3*	100	1172.98	2^+			

From ENSDF

$^{62}_{28}Ni_{34}$-9

Adopted Levels, Gammas (continued)

γ(^{62}Ni) (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.[@]	δ[@]	α[†]	Comments
3462	1^+ to 4^+	2289 *3*	100	1172.98	2^+				
3486		1184 *3*	100	2301.84	2^+				
3518.23	2^+	360.5 *4*	2.6 *3*	3157.96	2^+				
		459.3 *3*	10.0 *5*	3058.76	3^+				
		1469.9 *5*	13.3 *5*	2048.68	0^+	E2			B(E2)(W.u.)=2.8 *6*
		2345.3 *4*	100 *5*	1172.98	2^+	(M1+E2)[b]	+0.32 *6*		δ: from (n,n′γ) (2011Ch05). Other: +0.44 *9* (from (n,γ), 1970Fa06).
		3519.0 *21*	9.9 *15*	0.0	0^+	E2			B(E2)(W.u.)=0.026 *7*
3522.54	$2^+,3^+$	264.94 *25*	2.0 *4*	3257.62	2^+				I_γ: from (n,γ).
		463.3 *5*	29 *4*	3058.76	3^+				I_γ: from (n,γ).
		1185.94 *18*	49 *8*	2336.52	4^+				I_γ: from (n,γ).
		1221.0 *3*	<100	2301.84	2^+				
3524.4	0^+	2351.4 *4*	100	1172.98	2^+				
3756.5	3^-	1454.5 *3*	92 *8*	2301.84	2^+	[E1]			B(E1)(W.u.)=0.00045 *+9−12*
		2584.1 *5*	100 *8*	1172.98	2^+	(E1)			B(E1)(W.u.)=8.7×10^{-5} *+16−22*
3849.4	$0^+,1^+,2^+$	579.42 *20*	100 *11*	3269.97	$1^+,2^+$				
		1548.0 *5*	91 *4*	2301.84	2^+				
3859.6	$1^+,2^+$	968.2 *4*	33 *9*	2890.63	0^+	[E2]			
		3861.7 *11*	100 *13*	0.0	0^+	[E2]			
3967	+	1665 *3*	100	2301.84	2^+				E_γ: seen in (α,pγ), coincident with 2302γ.
3972.9	2^+	450.4 *7*	2 *1*	3522.54	$2^+,3^+$				
		703.1 *6*	11 *4*	3269.97	$1^+,2^+$				
		2799.4 *5*	100 *39*	1172.98	2^+				E_γ: 2805.2 *18* in (α,pγ).
		3973 *2*	97 *30*	0.0	0^+	[E2]		0.001179 *17*	B(E2)(W.u.)=0.16 *9* α(K)=1.643×10^{-5} *23*; α(L)=1.586×10^{-6} *23*; α(M)=2.23×10^{-7} *4* α(N)=9.73×10^{-9} *14*; α(IPF)=0.001161 *17* I_γ: average of 67 *11* in (n,γ) and 127 *32* in (α,pγ).
4000.5	4^+	1664	100	2336.52	4^+				
4011.0		2837.9 *15*	100	1172.98	2^+				
4018.88	$(6)^+$	1682.34 *21*	100	2336.52	4^+	E2[&]			B(E2)(W.u.)=4.6 *21*
4055.3	4^+	777.5 *3*	26 *3*	3277.69	4^+				
		1718.8 *5*	100 *6*	2336.52	4^+				
		1753.5 *8*	9 *3*	2301.84	2^+	[E2]			B(E2)(W.u.)=3.3 *+14−17*
		2882.3 *4*	16 *1*	1172.98	2^+	[E2]			B(E2)(W.u.)=0.49 *+13−18*
4062.4	$1^+,2^+$	1761.0 *5*	100 *20*	2301.84	2^+				
		4062.4 *10*	90 *10*	0.0	0^+				
4146.0	(4^+)	870[d]		3277.69	4^+				
		1844.1 *8*	100	2301.84	2^+	[E2]			B(E2)(W.u.)=5.4 *+18−33*
4151.4	$2^+,3^+$	1092.50 *25*	100 *22*	3058.76	3^+				

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$\gamma(^{62}Ni)$ (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.[@]	α[†]	Comments
4151.4	$2^+,3^+$	1815.8 *8*	44 *22*	2336.52	4^+			
		1850.0 *7*	66 *22*	2301.84	2^+			
4154.2	(4^+)	1817.7 *3*	100	2336.52	4^+			E_γ: evaluator assumes that 1815.8γ in (n,γ) and 1817.7γ in (α,pγ) are not the same.
4161.26	(5^-)	883.54 *16*	50 *21*	3277.69	4^+	D+Q[a]		I_γ: average of 29 in (^{18}O,4nγ) and 71 in (α,pγ).
								δ: −0.24 *6* or −2.4 *4*, (^{18}O,4nγ). Δπ=yes suggests smaller value more likely. 5^- assignment defines the transition as E1+M2; δ=−0.24 *6* gives B(M2)(W.u.)>20, compared with RUL=1.
		1001	38	3157.96	2^+			Mult.: assignment of 5^- defines the transition as E3 to give B(E3)(W.u.)>7.6×10^5, compared with RUL=100; this transition may be suspect.
		1825.0 *3*	100	2336.52	4^+	D+Q[a]		δ: −0.16 *6* or −3.1 *4*, (^{18}O,4nγ) Δπ=yes suggests smaller solution more likely.
4179		1002 *3*	100	3176.7	4^+			
4201.0	$(3,4)^-$	678.5 *3*	100	3522.54	$2^+,3^+$			
4317.2	$1^+,2^+$	4318 *3*	100	0.0	0^+			
4415.9	$1^+,2^+$	1045.9 *4*	100 *20*	3369.98	1^+			
		4416 *2*	80 *20*	0.0	0^+			
4424		2122 *3*	100	2301.84	2^+			
4627.5	$2^+,3^+$	310.4 *5*	26 *11*	4317.2	$1^+,2^+$			
		2289.7 *15*	80 *43*	2336.52	4^+			
		3456 *3*	100 *29*	1172.98	2^+			
4648.9	(7^-)	487.59 *13*	52	4161.26	(5^-)	E2[&]	0.00179 *3*	B(E2)(W.u.)=0.95 *5*
								α(K)=0.001609 *23*; α(L)=0.0001603 *23*; α(M)=2.25×10^{-5} *4*; α(N)=9.42×10^{-7} *14*
		630.0 *14*	100	4018.88	$(6)^+$	D+Q[a]		E_γ: 628.4 *3* from (α,pγ) not included in average.
								δ: −0.19 *4* or −2.3 *5*, (^{18}O,4nγ).
4719.9	$(3)^-$	1661.3 *7*	100 *50*	3058.76	3^+			
		3546 *2*	88 *25*	1172.98	2^+			
4863.3	$5^-,6^-$	702.02 *14*	100	4179				
4999.7	$1^+,2^+$	3828 *2*	100 *18*	1172.98	2^+			
		4998 *2*	82 *18*	0.0	0^+			
5751.2	(9^-)	1102.41 *17*	100	4648.9	(7^-)	E2[&]		B(E2)(W.u.)=43 *17*
5806.1	(7,8,9)	1157.24 *22*	100	4648.9	(7^-)			
6647.0	(9^-)	895.75 *16*	100	5751.2	(9^-)			
		1997.94 *24*	88	4648.9	(7^-)			
7559.4	(11^-)	912.33 *16*	46	6647.0	(9^-)	E2[&]		B(E2)(W.u.)=23 *12*
		1808.43 *22*	100	5751.2	(9^-)	E2[&]		B(E2)(W.u.)=1.7 *9*
7645.6	1^-	3416	1.9	4230.0	0^+			
		3585	3.3	4062.4	$1^+,2^+$			
		3671	4.9	3972.9	2^+			

Adopted Levels, Gammas (continued)

$\gamma(^{62}Ni)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ#	E_f	J^π_f	Mult.@	Comments
7645.6	1^-	3783	3.3	3859.6	$1^+,2^+$		
		3798	0.6	3849.4	$0^+,1^+,2^+$		
		4129	2.4	3518.23	2^+		
		4273	3.3	3369.98	1^+		
		4375	3.4	3269.97	$1^+,2^+$		
		4487	2.7	3157.96	2^+		
		5597	25.8	2048.68	0^+		
		6473	6.5	1172.98	2^+		
		7646	100	0.0	0^+	E1	B(E1)(W.u.)=6.5×10^{-5} α(IPF)=0.00264 *4* Mult.: from polarization measurement, $^{62}Ni(\gamma,\gamma')$.
(10596.1)	$1^-,2^-$	5596 *4*	3.0 *20*	4999.7	$1^+,2^+$		
		5877 *2*	6.0 *20*	4719.9	$(3)^-$		
		5968 *2*	14.0 *20*	4627.5	$2^+,3^+$		
		6179 *2*	20 *4*	4415.9	$1^+,2^+$		
		6277 *3*	8 *4*	4317.2	$1^+,2^+$		
		6364 *2*	10 *6*	4230.0	0^+		
		6387 *2*	8 *4*	4208.8			
		6395 *2*	10 *6*	4201.0	$(3,4)^-$		
		6445 *2*	24 *4*	4151.4	$2^+,3^+$		
		6623 *2*	34 *6*	3972.9	2^+		
		6840.0 *15*		3756.5	3^-		
		7073 *3*	30 *14*	3522.54	$2^+,3^+$		
		7078.0 *15*	72 *14*	3518.23	2^+		
		7326.0 *15*	96 *8*	3269.97	$1^+,2^+$		
		7338 *2*	28 *6*	3257.62	2^+		
		7436 *2*	40 *6*	3157.96	2^+		
		7537 *2*		3058.76	3^+		
		7703.4 *15*	26 *12*	2890.63	0^+		
		8296 *3*	16 *4*	2301.84	2^+		
		8551.3 *15*	92 *10*	2048.68	0^+		
		9422.3 *5*	100 *10*	1172.98	2^+		
		10594.6 *7*	74 *16*	0.0	0^+		

† Additional information 1.

‡ From (n,n′γ) for E(level) up to 3756.4; for others Eγ are averages from the most precise measurements. The most complete data from $^{61}Ni(n,\gamma)$ tend to have Eγ that are 0.1-0.2 keV lower than other data in the range where comparisons are possible (1-3 MeV).

Primarily based on (n,γ) data.

@ From (n,n′γ) or (n,γ), except as noted.

From ENSDF

$^{62}_{28}Ni_{34}$-12

Adopted Levels, Gammas (continued)

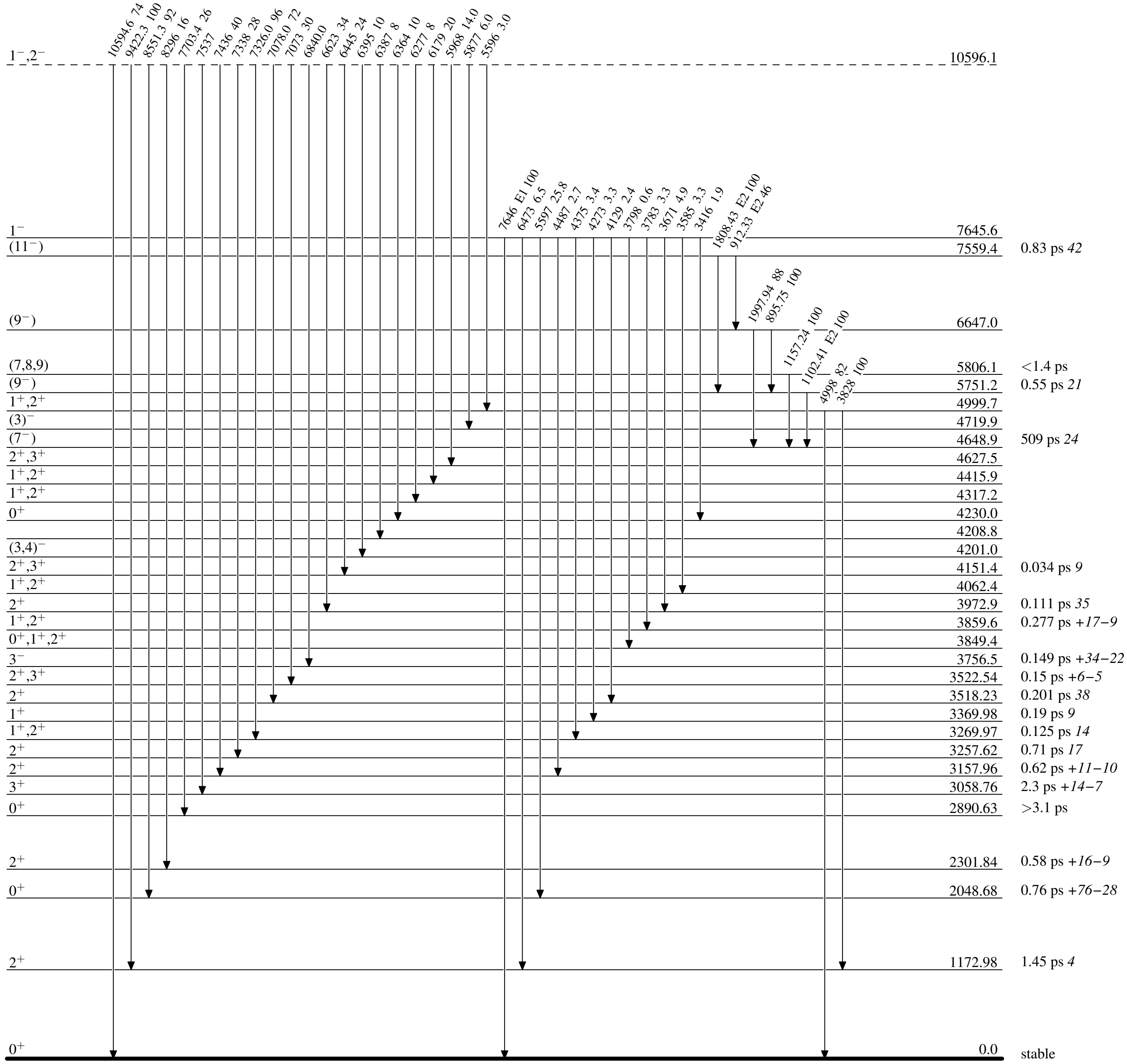
$\gamma(^{62}Ni)$ (continued)

[&] From RUL and $\gamma(\theta)$ in $^{48}Ca(^{18}O,4n\gamma)$.
[a] From $\gamma(\theta)$ in $^{48}Ca(^{18}O,4n\gamma)$.
[b] Mult=D+Q from $\gamma(\theta)$. $\Delta\pi$=no from level scheme.
[c] Mult=Q from $\gamma(\theta)$. $\Delta\pi$=no from level scheme.
[d] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{62}_{28}Ni_{34}$

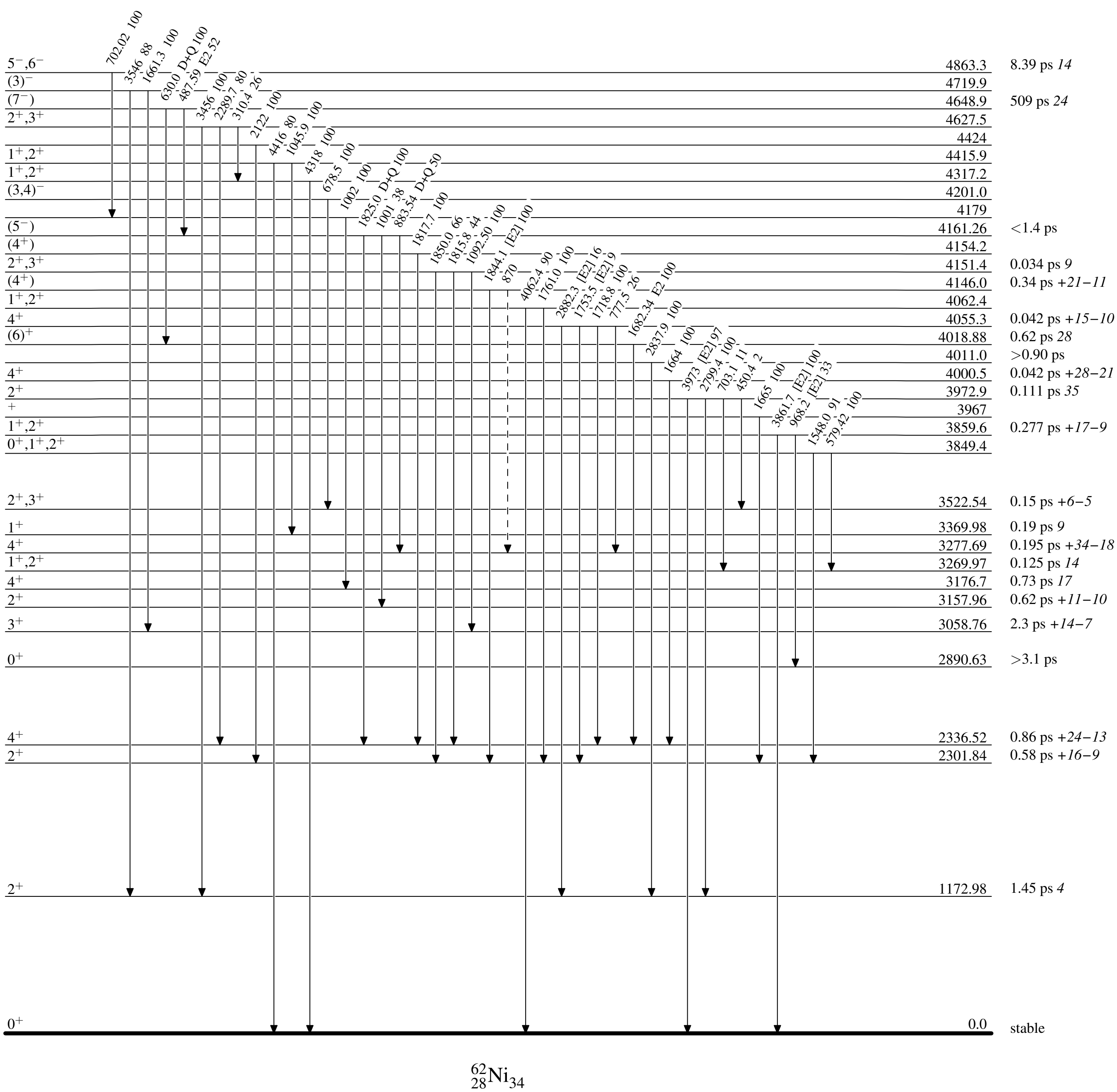
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level