Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	G. Gürdal, E. A. Mccutchan	NDS 136, 1 (2016)	1-Jul-2016

Q(β^-)=−6.22×10^3 *5*; S(n)=11532.5 *16*; S(p)=8523.0 *15*; Q(α)=−4087.7 *11* 2012Wa38
S(2n)=19725.7 *21*; S(2p)=15132.9 *11* (2012Wa38).
α: Additional information 1.

^{70}Ge Levels

Cross Reference (XREF) Flags

A	^{70}Ga β^- decay	J	^{69}Ga(p,γ)	S	^{70}Ge(p,p′),(pol p,p′)
B	^{70}As ε decay	K	^{69}Ga(d,n)	T	^{70}Ge(d,d′)
C	^{70}Zn 2β^- decay	L	^{69}Ga(α,t)	U	^{70}Ge(^{6}Li,^{6}Li′)
D	^{12}C(^{66}Zn,^{8}Beγ)	M	^{69}Ga(^{3}He,d)	V	^{70}Ge(α,α′)
E	^{46}Ti(^{28}Si,4pγ)	N	Coulomb excitation	W	^{70}Ge(e,e′)
F	^{64}Ni(^{12}C,α2nγ)	O	^{70}Ge(γ,γ′)	X	^{72}Ge(p,t)
G	^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ)	P	^{70}Ge(pol γ,γ′)	Y	^{74}Se(d,^{6}Li)
H	^{66}Zn(^{6}Li,d)	Q	^{70}Ge(n,n′γ)		
I	^{68}Zn(α,2nγ), ^{67}Zn(α,nγ)	R	^{70}Ge(p,p′γ)		

E(level)[†]	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0[b]	0$^+$	stable	ABCDEFGHIJKLMNOPQRSTUVWXY	R=4.055 fm *8*; where R is the rms value of charge distribution from (e,e′).
1039.506[b] *9*	2$^+$	1.31 ps *2*	AB DEFG IJ LMN QRSTUVWXY	Q=+0.04 *3* (2003Su01); μ=+0.91 *5* T$_{1/2}$: from B(E2)=0.179 *3* in Coulomb excitation. Others: 1.38 ps *8* from B(E2)=0.169 *10* from (e,e′), 1.32 ps *14* from DSAM in ^{12}C(^{66}Zn, ^{8}Be), 1.3 ps *3* from DSAM in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and >5 ps in (^{7}Li,2nγ). J$^\pi$: from 1039.49γ E2 to 0$^+$. Q: from multiple Coulomb Excitation (2003Su01). μ: from weighted average of 0.88 *8* (2013Gu23, from g-factor using TF), 0.90 *16* (2007Bo41, from g-factor using TF), 0.86 *24* (2006Le24, from g-factor using TF), 0.740 *178* (1987La20, from g-factor using TF), 0.94 *52* (1984Pa20, from g-factor using TF), 0.94 *20* (1977Fa07, from g-factor using IMPAC). Others: 0.76 *16* (1977Fa07), 1.18 *58* (1969He11); the same data reanalyzed by 1974Hu01 gave μ=1.76 *42*; the same data reanalyzed by 1977Fa07 according to the latest understanding of the experiment and corrections μ = 0.94 *20* (from g=0.47 *10*) (this value is included in the weighted average).
1215.621[e] *15*	0$^+$	3.7 ns *2*	AB DE GHIJKLMN QRSTUV XY	T$_{1/2}$: from electron spectrometer measurement with pulsed-cyclotron beam in (p,p′γ). Others: 2.9 ns *4* from ^{70}Ga β^- decay; 4.8 ns *7* from B(E2) in Coulomb excitation. J$^\pi$: L=0 from ^{72}Ge(p,t) and ^{66}Zn(^{6}Li,d); E0 transition to g.s.. The level interpreted as deformed-intruder state (2003Su01).
1707.689[c] *14*	2$^+$	1.94 ps *28*	B DEFG IJ LMN QRSTUV X	Q=−0.07 *4* (2003Su01); μ=+1.3 *7* (2013Gu23) J$^\pi$: from 1708γ E2 transition to g.s. T$_{1/2}$: from DSAM in ^{12}C(^{66}Zn, ^{8}Be). Other: 1.1 ps *+10−4* from (α,2nγ), (α,nγ), 4.2 ps *+26−14* from Coulomb

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Adopted Levels, Gammas (continued)

^{70}Ge Levels (continued)

E(level)[†]	J^π	$T_{1/2}$	XREF	Comments
				excitation and > 7 ps in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C,2pγ). Q: from multiple Coulomb Excitation. μ: from g-factor measurements using TF in Coulomb excitation. Other: 0.8 *12* from ^{12}C(^{66}Zn, ^{8}Be) using TF.
2153.084[b] *20*	4^+	0.76 ps *14*	B DEFG IJ L N QR UV X	Q=+0.22 *5* (2003Su01); μ=+1.7 *8* $T_{1/2}$: from DSAM in ^{12}C(^{66}Zn,^{8}Be). Others: 4 ps *1* from DSAM in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ) and 1.7 ps *4* from Coulomb excitation and 0.8 ps *2* from DSAM in ^{68}Zn(α.2nγ),^{67}Zn(α,nγ). J^π: from 1113.60γ E2 to 2^+; assumed E2 cascade member. Q: from multiple Coulomb Excitation (2003Su01). μ: from g-factor measurements using TF in Coulomb excitation (2013Gu23,2007Bo41).
2156.744[e] *21*	2^+		B D G J MN QRS	Q=+0.26 *10* (2003Su01) J^π: 941.10γ E2 to 0^+. Q: from multiple Coulomb Excitation.
2160			ST	
2307.0 *5*	0^+	≤40 ps	J LM QRS X	$T_{1/2}$: centroid-shift time measurement in (p,p′γ). J^π: E0 transition to g.s.
2451.313[c] *21*	3^+	1.7[#] ps *+10−3*	B D FG IJ LM QRS	J^π: from 743.62γ M1(+E2) to 2^+; J = 3 from angular distribution and yield function in (α,2nγ).
2534.95 *4*	2^+	0.6[#] ps *2*	B D IJ LM QRS X	J^π: L(p,t)=2; J^π not consistent with observed log *ft*=7.8 from 4^+. $T_{1/2}$: Other: >0.4 ps from DSAM in (n,n′γ).
2562.049[d] *20*	3^-	0.50 ps *7*	B DE G I LMN QRSTUVWX	μ=0.3 *9* (2007Bo41) $T_{1/2}$: weighted average of 0.55 ps *7* in ^{12}C(^{66}Zn, ^{8}Beγ) (from DSAM) and 0.4 ps *1* in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ) (from DSAM). Others: 2.3 ps *5* from ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ). J^π: L(p,t)=3. B(E3)=0.073 *10* in ^{70}Ge(e,e′); 0.068 from Coulomb excitation. μ: from transient field method in Coulomb excitation (2007Bo04).
2806.25[c] *3*	4^+	0.6[#] ps *2*	B DEFG IJ LM QRS V X	J^π: L(p,t)=4; 1098.54γ E2 to 2^+. Discrepant with L(α,α')=3 for E=2800 keV *10* which may be a different level.
2887.4 *7*	0^+		LM QRS X	J^π: from L(p,t)=0.
2945.0 *10*	2^+		J LM QRS V X	J^π: from L(p,t)=2.
3046.439 *20*	3^+		B lM QRS U X	J^π: from 889.72γ D+Q to 2^+; 893.59γ D+Q to 4^+, log *ft*=5.75 from 4^+ parent.
3058.695[e] *16*	4^+	1.4[#] ps *3*	B DE G I m QRST V	$T_{1/2}$: other: 1.0 ps *5* from DSAM in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ). J^π: L(p,t)=4.
3105.7 *7*	(0^+)		M QRS X	J^π: from excitation function in (p,p′γ).
3130 *10*			V	
3180.6 *10*	2^+	0.015 ps *6*	M QRS UV X	J^π: L(p,t)=2. $T_{1/2}$: from DSAM in (n,n′γ).
3194.2 *6*	4^+		L S V X	J^π: L(p,t)=4; discrepant with L(α,α')=(5) for E=3200 keV *10*. Also, L(p,p′)=4.

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Adopted Levels, Gammas (continued)

^{70}Ge Levels (continued)

E(level)[†]	J^{π}	$T_{1/2}$	XREF	Comments
3240.5 *10*	1^+		LM O RS	J^{π}: 1 from $\gamma(\theta)$ in (γ,γ') and π=+ from L=1 in (^{3}He,d).
3294.79 *8*	$3^+,4^+$		B e QR X	J^{π}: from 1587γ to 2^+ and L(p,p') = 4.
3296.98[b] *3*	6^+	0.5[#] ps *1*	eFG I Q S	$T_{1/2}$: others: 2.6 ps *6* from DSAM in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ). J^{π}: from 1143.89γ E2 to 4^+; band assignment.
3308			X	
3314.5 *7*	1^-		M O QRS UV X	J^{π}: 1 from $\gamma(\theta)$ in (γ,γ'), π=− from L(α,α')=1. B(E1)↑: from ^{70}Ge(γ,γ').
3334.8 *10*	0^+ to 3^+		LM QRS X	J^{π}: from L=1(+3) in (^{3}He,d) and from observed 2295.3γ to 2^+.
3345 *2*			S	
3351 *2*			S	
3371.57 *10*	(3,4)	0.3 ps *2*	B Q	J^{π}: log *ft*=7.7 *1* from 4^+ in ε decay; J=5 unlikely because of 2333γ to 2^+ level. $T_{1/2}$: from DSAM in (n,n'γ).
3416.32[d] *4*	5^-	13.7[@] ps *10*	DE G I M Q S X	J^{π}: L(p,t)=5. $T_{1/2}$: Other: > 14 ps in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C,2pγ).
3423 *2*	(2^+)		V X	J^{π}: from L(p,t)=(2).
3428 *2*	5^-		STU	J^{π}: from L(α,α')=5.
3432 *2*	3^-		M S V X	J^{π}: from L(α,α')=3.
3456 *2*	4^+		S	J^{π}: from L=4 in (p,p') and (^{6}Li,^{6}Li').
3466? *6*			M	
3482.3 *5*	$1^+,2^+,3^+$		M RS X	J^{π}: from L=1+3 in (^{3}He,d).
3488.276 *21*	$(3,4^+)$		B QRS	J^{π}: log *ft*=6.0 *1* from 4^+ in ε decay; J=4^- and 5 unlikely because of 2449γ to 2^+ level.
3517? *6*			M	
3540?			T	
3562.7 *6*			M RS X	
3570.44 *7*	$(3)^-$		B M S UV	J^{π}: from 2531.7γ to 2^+; 1471.24γ to 4^+; L=4(+2) in (^{3}He,d).
3580.7 *10*	4^+	0.6 ps *2*	Q S	J^{π}: L(α,α')=4. $T_{1/2}$: from DSAM in (n,n'γ).
3590.3 *5*			M RS	
3631.5 *10*	$(2)^+$	0.5 ps *1*	LM QRS X	J^{π}: from L(p,t)=(2); π=+ from L(^{3}He,d)=1. $T_{1/2}$: from DSAM in (n,n'γ).
3637 *10*	0^+		V	J^{π}: L(α,α')=0.
3666.78[d] *6*	6^-	35[@] ps *3*	E G I M Q S	J^{π}: J=6 from $\gamma(\theta)$ in ^{46}Ti(^{28}Si,4pγ), π from 250γ M1(+E2) to 5^-. $T_{1/2}$: others: 40 ps *8* in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and 74 ps *6* in (HI,xnγ).
3669.4[c] *10*	(5^+)	1[#] ps *1*	F I M	J^{π}: 1218γ to 3^+; band assignment.
3675.76 *7*	4^+		B L RS V	J^{π}: from L(α,α')=4.
3683 *3*	0^+		X	J^{π}: from L(p,t)=0.
3687 *3*	$1^+,2^+,3^+$		M S	J^{π}: L=1+3 in (^{3}He,d).
3708.5 *9*			M RS	
3733 *3*	$1^+,2^+,3^+$		M	J^{π}: L=1+3 in (^{3}He,d).
3740 *3*	0^+		S X	J^{π}: L(p,t)=0.
3753.2[c] *4*	6^+	1.6[#] ps *5*	EFG I S	J^{π}: from stretched 946.7γ E2 to 4^+, L(p,p')=(6); band assignment.
3776 *2*	3^-		S V X	J^{π}: from L(α,α')=3.
3782 *2*	2^+		M S	XREF: M(3775). J^{π}: from L(p,t)=2.

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Adopted Levels, Gammas (continued)

^{70}Ge Levels (continued)

E(level)[†]	J$^{\pi}$	T$_{1/2}$	XREF	Comments
3850 *3*			LM S	
3856 *2*	(2)$^-$		S	J$^{\pi}$: from L=4+2(+0) in (^{3}He,d).
3870 *2*	3$^-$		S V X	J$^{\pi}$: from L(α,α')=3.
3890 *3*	1$^+$,2$^+$,3$^+$		M S	J$^{\pi}$: from L=1+3 in (^{3}He,d).
3895.2 *10*	1		L O X	J$^{\pi}$: from 3895.1γ D to 0$^+$.
3900.6 *7*	(4$^-$,5,6,7$^-$)		E	J$^{\pi}$: from 234γ to 6$^-$, 484γ to 5$^-$.
3903.9 *7*	+		M RS V	J$^{\pi}$: L=1+3 in (^{3}He,d), L(p,p')=(0). E(level): from (p,p'γ).
3911 *3*			S	
3928 *3*	4$^+$		S X	J$^{\pi}$: from L(p,t)=4.
3941? *10*			S	
3955.11[d] *8*	7$^-$	17.0[@] ps *10*	E G I Q S V	J$^{\pi}$: J=7 from $\gamma(\theta)$ in (α,2nγ), π from 288γ M1+(E2) to 6$^-$.
3964 *3*	(2)$^-$		LM V	J$^{\pi}$: from L=4+2(+0) in (^{3}He,d).
3976 *3*	1$^+$,2$^+$,3$^+$		S	J$^{\pi}$: from L(α,α')=2.
3990 *3*			M S	
4003 *2*			RS V	
4024 *3*	4$^+$		M X	J$^{\pi}$: from L(p,t)=4.
4037 *3*	(4$^+$)		S V	J$^{\pi}$: from L(α,α')=(4).
4053.3 *10*			E	
4054 *3*			M S	
4061 *2*	1$^+$,2$^+$,3$^+$		S	J$^{\pi}$: from L=1+3 in (^{3}He,d).
4080 *3*	1$^+$,2$^+$,3$^+$		M	J$^{\pi}$: from L=1+3 in (^{3}He,d).
4086 *3*	4$^+$		V X	J$^{\pi}$: L(p,t)=4.
4096.1 *20*	3$^-$		RS	J$^{\pi}$: from L(α,α')=3.
4101.45 *5*	3$^-$,4$^-$		B S	J$^{\pi}$: from 688γ to 5$^-$ and L(p,p')=3.
4103.5[‡e] *5*	6$^+$		G	J$^{\pi}$: 1295γ Q to 4$^+$; band assignment in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ) (2010Su05).
4119 *3*			M S	
4131 *2*	2$^-$		M S	J$^{\pi}$: from L=4+2+0 in (^{3}He,d).
4144.7 *20*	1$^-$		RS V	J$^{\pi}$: from L(α,α')=1.
4155 *2*	1$^+$,2$^+$,3$^+$		M S	J$^{\pi}$: L=1+3 in (^{3}He,d).
4166 *3*			S	
4180 *3*	2$^+$		S X	J$^{\pi}$: L(p,t)=2.
4203.5[b] *4*	8$^+$	8[@] ps *2*	EFG I M S	J$^{\pi}$: from 906.6γ E2 to 6$^+$; band assignment.
4212 *3*	3$^+$,4$^+$,5$^+$		M S	J$^{\pi}$: from L(p,p')=4.
4226 *3*	2$^+$		S X	J$^{\pi}$: from L(p,t)=2.
4238 *3*	1$^+$,2$^+$,3$^+$		M S X	J$^{\pi}$: from L=1+3 in (^{3}He,d).
4243.11 *15*			B	
4261 *10*	2$^+$		S X	J$^{\pi}$: from L(p,t)=2.
4268 *10*	5$^-$		V	J$^{\pi}$: from L(α,α')=5.
4282 *10*	3$^+$,4$^+$,5$^+$		S	J$^{\pi}$: from L(p,p')=4.
4287 *3*	1$^+$,2$^+$,3$^+$		M	J$^{\pi}$: from L(^{3}He,d)=1+3.
4299.3 *3*	7$^-$	3[@] ps *1*	E G I S V	J$^{\pi}$: from L(α,α')=7.
4330 *3*			LM S V X	L=4+2(+0) in (^{3}He,d); L(α,α')=(3+5), L(p,t)=0.
4352 *3*	(2)$^-$		M P X	J$^{\pi}$: from L=4+2(+0) in (^{3}He,d).
4356.7 *7*	1$^{(-)}$[&]		P	B(E1)↑=0.0023 *4* B(E1) from ^{70}Ge(pol γ, γ').
4357 *10*	+		S X	L(p,t)=2 at 4357 *20*; L(p,p')=4 at 4357 *10*.
4365 *10*	(3$^-$)		S V	J$^{\pi}$: from L(α,α')=(3) for 4373 *10*.
4378 *10*			S	
4391 *3*	1$^+$,2$^+$,3$^+$		M S	J$^{\pi}$: from L(^{3}He,d)=1+3.
4409 *10*	4$^+$		S V	J$^{\pi}$: from L(α,α')=4.
4419 *3*	2$^-$,3$^-$,4$^-$		M S	J$^{\pi}$: from L(^{3}He,d)=4+2.

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Adopted Levels, Gammas (continued)

^{70}Ge Levels (continued)

E(level)[†]	J^π	$T_{1/2}$	XREF	Comments
4431.4 *4*	8^+	0.4[#] ps *2*	EFG I	J^π: from 1134.6γ E2 to 6^+ and yield function in ^{68}Zn(α,2nγ).
4447.5 *8*	1^-[&]		M P	B(E1)↑=0.0036 *7* B(E1) from ^{70}Ge(pol γ, γ').
4448 *2*	2^+		S V X	J^π: from L(p,t)=2.
4473 *2*	4^+		M S V X	J^π: from L(p,t)=4. Other: L(α,α')=(3+5) is discrepant.
4520 *3*	$2^-,3^-,4^-$		M S	J^π: from L(^{3}He,d)=4+2.
4520.9 *8*	1^-		P	B(E1)↑<0.0005 B(E1) from ^{70}Ge(pol γ, γ').
4534 *10*	(4^+)		S V	J^π: from L(α,α')=(4).
4539 *3*	0^+		X	J^π: from L(p,t)=0.
4546 *10*			S	
4552.1 *10*	(8)	104[@] ps *+70−35*	I	J^π: from 253γ to 7^+ and 1253.2γ to 6^+.
4555 *3*			M S	
4574 *3*			M	
4577.18 *15*	$(3,4^+)$		B S	J^π: log *ft*=6.4 from 4^+ in ε decay; J=5 unlikely because of 2421γ to 2^+ level.
4606 *10*			S	
4613 *3*	$1^+,2^+,3^+$		M S	J^π: from L(^{3}He,d)=1+3.
4629 *3*	(4^+)		S V X	J^π: L(α,α')=(4).
4642 *3*	$(2)^-$		M S	J^π: L(^{3}He,d)=4+2(+0).
4657 *10*			V	E(level): multiplet.
4675.39 *21*	$(3,4^+)$		B S	J^π: log *ft*=6.2 *2* from 4^+ in ε decay; J=5 or 4^- are unlikely because of 2968.1γ to 2^+ level.
4687 *2*	$(2)^-$		LM S	J^π: L=4+2(+0) in (^{3}He,d).
4707 *10*			S X	
4716 *10*	(2^+)		S V	J^π: from L(p,t)=(2).
4727 *10*			S	
4736 *3*			M	
4768 *3*	$(2)^-$		M	J^π: L(^{3}He,d)=4+2(+0).
4775 *10*	(4^+)		V	J^π: from L(α,α')=(4).
4790.6 *19*	$1^{(-)}$[&]		P	
4810 *10*	3^-		V	J^π: from L(α,α')=3.
4820.2[c] *11*	(8^+)		F	J^π: 1067γ to 6^+; band assignment.
4851.9 *4*	(8^-)[a]	>3[#] ps	E G I M	J^π: from (M1+E2) γ to 7^-.
4877 *3*	2^-		M	J^π: L=4+2+0 in (^{3}He,d).
4886.6 *13*	1[&]		P	
4905 *3*	3^-		M	J^π: from L(α,α')=3.
4908.1[d] *10*	(9^-)[a]		E	
4915 *10*			V	
4935 *3*	1^-		X	J^π: from L(p,t)=1.
4940 *10*	3^-		V	J^π: from L(α,α')=3.
4943 *3*	$(2)^-$		M	J^π: L(^{3}He,d)=4+2(+0).
4979 *3*	$(2)^-$		M	J^π: L=4+2(+0) in (^{3}He,d).
4985.0 *10*			I	
5008 *3*	2^-		M V	J^π: from L=4+2+0 in (^{3}He,d); L(α,α')=(3).
5024 *3*	2^+		X	J^π: from L(p,t)=2.
5040 *10*	(3^-)		I M V	J^π: L(α,α')=(3).
5048.4 *10*	(4^-)		I M	J^π: from L(^{3}He,d)=4+2+0; 1381.gγ to 2^-.
5050 *3*	0^+		L X	J^π: from L(p,t)=0.
5078 *3*	$1^+,2^+,3^+$		M V	J^π: L=1+3 in (^{3}He,d).
5102 *3*	$1^+,2^+,3^+$		M	J^π: L=1+3 in (^{3}He,d).
5113 *10*	(3^-)		V	J^π: L(α,α')=(3).

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Adopted Levels, Gammas (continued)

^{70}Ge Levels (continued)

E(level)[†]	J^π	$T_{1/2}$	XREF	Comments
5129.6 *7*	1^{-}[&]		P	B(E1)↑=0.0029 *8* B(E1) from ^{70}Ge(pol γ, γ′).
5145 *3*	(3^-)		M V	J^π: L(α,α′)=(3); discrepant with L(^{3}He,d)=(4+2+0).
5184 *3*	0^+		X	J^π: L(p,t)=0.
5195 *10*	(4^+)		V	J^π: L(α,α′)=(4).
5222.3 *14*			E	
5227 *10*	(3^-)		V	J^π: L(α,α′)=(3).
5242.7[b] *11*	10^+		EFG I	J^π: from 1039.2γ Q to 8^+; band assignment.
5263.4 *8*	$1^{(-)}$[&]		P	B(E1)↑=0.0022 *4* B(E1) from ^{70}Ge(pol γ, γ′).
5265.82 *14*			B	
5290 *3*	0^+		X	J^π: L(p,t)=0.
5299.2 *4*	$9^{(-)}$		E G I	J^π: from 1344.1γ (E2) to 7^-, 1273γ from $11^{(-)}$; inconsistent with (6,7,8) from γ(θ) in (^{7}Li,2nγ).
5338 *3*	0^+		X	J^π: L(p,t)=0.
5370.11 *5*			B	
5403 *3*	0^+		X	J^π: L(p,t)=0.
5410 *3*			X	
5435.5[‡e] *11*	8^+		G	J^π: from 1332γ Q to 6^+; band assignment in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ) (2010Su05).
5441 *3*	(2^+)		X	J^π: L(p,t)=(2).
5465.3 *8*	1^{-}[&]		P	B(E1)↑=0.0023 *4* B(E1) from ^{70}Ge(pol γ, γ′).
5467 *3*	0^+		X	J^π: L(p,t)=0.
5512.5 *10*	$1^{(-)}$[&]		P	B(E1)↑=0.0019 *3* B(E1) from ^{70}Ge(pol γ, γ′).
5539.7 *5*	(10)	5 ns *2*	FG I	$T_{1/2}$: from electronic timing in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ). J^π: $T_{1/2}$ of this level suggests that the 1108γ to 8^+ may be M2, suggesting an assignment of $J^\pi=10^-$. However, level is assigned as side band member based on 8^+ in ^{64}Ni(^{12}C,α2nγ), suggesting an assignment of $J^\pi=10^+$. Other: 9^+ in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ).
5552.5[‡] *5*	$9^{(-)}$		G	J^π: 1253.2γ Q to 7^-.
5876.9 *7*	$1^{(-)}$[&]		P	B(E1)↑=0.0014 *4* B(E1) from ^{70}Ge(pol γ, γ′).
5989.7 *7*	$1^{(+)}$[&]		P	
6006.9 *11*			E	
6160.1[d] *14*	(11^-)[a]		E	
6297.0 *14*	1[&]		P	
6362.8 *8*	1[&]		P	
6549.1 *14*			E	
6572.2 *11*	$11^{(-)}$		G	J^π: from 1273γ Q to $9^{(-)}$.
6587.7 *8*	$1^{(+)}$[&]		P	
6604.2 *11*			E	
6636.6 *15*	1[&]		P	
6702.5 *13*	$1^{(-)}$[&]		P	B(E1)↑=0.0027 *5* B(E1) from ^{70}Ge(pol γ, γ′).
6716.8[b] *15*	12^+		FG	J^π: Q 1474γ to 10^+; band assignment.
6779.7 *11*	(12)		F	
6786.1[d] *17*	(13^-)[a]		E	
7306.3 *8*	$1^{(+)}$[&]		P	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{70}Ge Levels (continued)

E(level)[†]	J$^\pi$	XREF	Comments
7426.0 *8*	$1^{(-)}$[&]	P	B(E1)↑=0.0022 *4* B(E1) from ^{70}Ge(pol γ, γ').
7619.7 *15*	(14)	F	J$^\pi$: Q 840γ to (12).
7753.5 *10*	$1^{(-)}$[&]	P	B(E1)↑=0.0026 *6* B(E1) from ^{70}Ge(pol γ, γ').
7767.8[b] *18*	14^+	F	J$^\pi$: Q 1051γ to 12^+, band assignment.
8058.1[d] *20*	(15^-)[a]	E	
8245.7 *18*	(16)	F	J$^\pi$: Q 626γ to (14).
8283.7 *15*	$1^{(+)}$[&]	P	
8878.5 *14*	1[&]	P	
9423.7 *21*	(18)	F	J$^\pi$: Q 1178γ to (16).
9619.2[d] *22*	(17^-)[a]	E	
10269.7 *23*	(20)	F	J$^\pi$: 846γ to (18).
11336.2[d] *25*	(19^-)[a]	E	
13173[d] *3*	(21^-)[a]	E	

† From a least-squares fit for levels connected by γ's and from reaction data sets for others.
‡ This level was only reported in 2010Su05 in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ).
# From DSAM in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ).
@ From RDM in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) (1982Cl02).
& From mult in (pol γ,γ').
a From (^{28}Si,4pγ) based on DCO, and level cascades.
b Band(A): sequence based on g.s..
c Band(B): sequence based on 2^+, 1707.7 keV level.
d Band(C): sequence based on 3^-, 2562.05 keV level.
e Band(D): sequence based on 0^+, 1215.62 keV level.

$\gamma(^{70}\mathrm{Ge})$

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.	δ	α	$I_{(\gamma+ce)}$	Comments
1039.506	2^+	1039.513 *10*	100	0.0	0^+	E2[d]		3.23×10^{-4}		α(K)=0.000289 *4*; α(L)=2.96×10^{-5} *5*; α(M)=4.41×10^{-6} *7*; α(N)=2.88×10^{-7} *4* B(E2)(W.u.)=20.8 *4* E_γ: from ^{70}Ga β^- decay.
1215.621	0^+	176.115 *13*	100 *9*	1039.506	2^+	E2[f]		0.0894		α(K)=0.0790 *11*; α(L)=0.00902 *13*; α(M)=0.001337 *19*; α(N)=7.73×10^{-5} *11* B(E2)(W.u.)=48 *7* E_γ: from ^{70}Ga β^- decay.
		1215.8[b]		0.0	0^+	E0[f]			1.00 *4*	$I_{(\gamma+ce)}$: for 100 transitions of 176γ from (p,p$'\gamma$) (1985Pa15).
1707.689	2^+	492.09 *5*	4.9 *4*	1215.621	0^+	E2		0.00247		α(K)=0.00220 *3*; α(L)=0.000232 *4*; α(M)=3.45×10^{-5} *5*; α(N)=2.20×10^{-6} *3* B(E2)(W.u.)=16 *3* Mult.: from RUL and decay pattern.
		668.21 *4*	100 *6*	1039.506	2^+	M1+E2	−3.6 *+11−6*	9.80×10^{-4} *2*		α(K)=0.000875 *21*; α(L)=9.08×10^{-5} *22*; α(M)=1.35×10^{-5} *4*; α(N)=8.74×10^{-7} *20* B(E2)(W.u.)=64 *11*; B(M1)(W.u.)=0.0015 *9* Mult.,δ: from RUL, δ and decay pattern. δ as evaluated by 1977Kr17;
		1707.61 *2*	79.2 *23*	0.0	0^+	E2		2.87×10^{-4}		α(K)=0.0001011 *15*; α(L)=1.025×10^{-5} *15*; α(M)=1.529×10^{-6} *22*; α(N)=1.007×10^{-7} *15* B(E2)(W.u.)=0.50 *8* Mult.: from angular distribution in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL.
2153.084	4^+	445.6 *10*	0.7 *4*	1707.689	2^+	[E2]		0.00338 *6*		α(K)=0.00301 *5*; α(L)=0.000318 *5*; α(M)=4.74×10^{-5} *8*; α(N)=3.00×10^{-6} *5* B(E2)(W.u.)=17 *10*
		1113.60 *4*	100 *6*	1039.506	2^+	E2		2.77×10^{-4}		α(K)=0.000247 *4*; α(L)=2.52×10^{-5} *4*; α(M)=3.76×10^{-6} *6*; α(N)=2.46×10^{-7} *4* B(E2)(W.u.)=25 *5* Mult.: from ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL. δ = −0.1 *2* in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) gives a large B(M3) which is excluded by RUL.
2156.744	2^+	450.4 *5*	4.7 *24*	1707.689	2^+	E2		0.00327		α(K)=0.00291 *5*; α(L)=0.000308 *5*; α(M)=4.58×10^{-5} *7*; α(N)=2.90×10^{-6} *5* Mult.: from (p,p$'\gamma$). Other: D from ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ).
		941.10 *4*	62 *3*	1215.621	0^+	E2		4.09×10^{-4}		α(K)=0.000366 *6*; α(L)=3.76×10^{-5} *6*; α(M)=5.60×10^{-6} *8*; α(N)=3.65×10^{-7} *6* Mult.: from (p,p$'\gamma$).
		1117.28 *4*	100 *6*	1039.506	2^+	E2		2.75×10^{-4}		α(K)=0.000245 *4*; α(L)=2.50×10^{-5} *4*;

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Adopted Levels, Gammas (continued)

$\gamma(^{70}$Ge) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	δ	α	$I_{(\gamma+ce)}$	Comments
										α(M)=3.73×10^{-6} *6*; α(N)=2.44×10^{-7} *4* Mult.: from (p,p′γ).
2156.744	2$^+$	2156.65 *6*	17.1 *9*	0.0	0$^+$	[E2]		4.60×10^{-4}		α(K)=6.55×10^{-5} *10*; α(L)=6.62×10^{-6} *10*; α(M)=9.88×10^{-7} *14*; α(N)=6.52×10^{-8} *10*
2307.0	0$^+$	599.1[b]	82[@] *7*	1707.689	2$^+$	E2[b]		1.36×10^{-3}		α(K)=0.001218 *17*; α(L)=0.0001270 *18*; α(M)=1.89×10^{-5} *3*; α(N)=1.216×10^{-6} *17* B(E2)(W.u.)>4.8
		1091.3[b]		1215.621	0$^+$	E0[f]			0.013 *2*	$I_{(\gamma+ce)}$: for 100 transitions of 1268γ from (p,p′γ) (1985Pa15).
		1267.5[b]	100[@] *7*	1039.506	2$^+$	E2[b]		2.28×10^{-4}		α(K)=0.000185 *3*; α(L)=1.89×10^{-5} *3*; α(M)=2.82×10^{-6} *4*; α(N)=1.85×10^{-7} *3* B(E2)(W.u.)>0.14
		2307.1[b]		0.0	0$^+$	E0[f]			0.040 *9*	$I_{(\gamma+ce)}$: for 100 transitions of 1268γ from (p,p′γ) and includes pair production (1985Pa15).
2451.313	3$^+$	294.60 *16*	0.37 *15*	2156.744	2$^+$					
		297.88 *8*	2.4 *4*	2153.084	4$^+$					
		743.62 *4*	100 *7*	1707.689	2$^+$	M1(+E2)	+0.04 *8*	5.78×10^{-4} *9*		α(K)=0.000517 *8*; α(L)=5.28×10^{-5} *8*; α(M)=7.89×10^{-6} *12*; α(N)=5.20×10^{-7} *8* B(E2)(W.u.)<0.5; B(M1)(W.u.)=0.022 *+14−5* Mult.,δ: D+Q from ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ), M1+(E2) from RUL. Other: δ=+3.5 *9* from $\gamma(\theta)$ in (n,n′γ).
		1411.86 *4*	39.3 *23*	1039.506	2$^+$	M1+E2	−2.2 *+5−3*	2.18×10^{-4} *4*		α(K)=0.0001463 *22*; α(L)=1.487×10^{-5} *22*; α(M)=2.22×10^{-6} *4*; α(N)=1.460×10^{-7} *22* B(E2)(W.u.)=0.79 *+48−17*; B(M1)(W.u.)=0.00022 *+15−10* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); M1+E2 from RUL. δ: from $\gamma(\theta)$ in (n,n′γ).
2534.95	2$^+$	827.24 *10*	32 *4*	1707.689	2$^+$					
		1319.6	9.5 *10*	1215.621	0$^+$					I_γ: from (n,n′γ); Iγ(827)/Iγ(1495)=76 *10*/100 *10*, in (n,n′γ) which ratio is different from the adopted Iγ from ^{70}As ε decay.
		1495.43 *5*	100 *8*	1039.506	2$^+$	M1+E2	−0.75	2.15×10^{-4}		α(K)=0.0001274 *18*; α(L)=1.291×10^{-5} *18*; α(M)=1.93×10^{-6} *3*; α(N)=1.273×10^{-7} *18* B(E2)(W.u.)=1.9 *7*; B(M1)(W.u.)=0.0050 *18* Mult.,δ: D+Q from $\gamma(\theta)$ in (n,n′γ); M1+E2 from RUL.
2562.049	3$^-$	1522.55 *2*	100	1039.506	2$^+$	E1+M2[d]	−0.11[d] *10*	3.42×10^{-4}		α(K)=6.7×10^{-5} *6*; α(L)=6.8×10^{-6} *6*; α(M)=1.01×10^{-6} *8*; α(N)=6.6×10^{-8} *6*

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γ(^{70}Ge) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.	α	Comments
								B(E1)(W.u.)=0.00022 *4* δ: other: −0.11 *4* from $\gamma(\theta)$ in (n,n′γ); 0.02 *5* from ^{65}Cu(^{7}Li,2nγ).
2806.25	4$^+$	653.15 *6*	11.8 *14*	2153.084	4$^+$	(M1)	7.66×10^{-4}	α(K)=0.000685 *10*; α(L)=7.01×10^{-5} *10*; α(M)=1.048×10^{-5} *15*; α(N)=6.90×10^{-7} *10* B(M1)(W.u.)=0.014 *5* Mult.: D from ^{65}Cu(^{7}Li,2pγ), ^{60}Ni(^{12}C,2pγ) based on ΔJ = 0 dipole transition; Δπ=no from level scheme.
		1098.54 *4*	100 *6*	1707.689	2$^+$	E2	2.84×10^{-4}	α(K)=0.000254 *4*; α(L)=2.60×10^{-5} *4*; α(M)=3.88×10^{-6} *6*; α(N)=2.54×10^{-7} *4* B(E2)(W.u.)=31 *11* Mult.: from ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL; δ=−0.2 *2* in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) gives a large B(M3) which is excluded by RUL.
2887.4	0$^+$	730.8‡	100‡ *10*	2156.744	2$^+$			
		1179.5‡	100‡ *15*	1707.689	2$^+$			
2945.0	2$^+$	1237.3[b]	100[b]	1707.689	2$^+$			
3046.439	3$^+$	239.90 *10*	1.1 *3*	2806.25	4$^+$			
		595.11 *4*	100 *6*	2451.313	3$^+$	[M1+E2]		
		889.72 *4*	14.0 *9*	2156.744	2$^+$	M1+E2[h]		
		893.50 *4*	10.0 *5*	2153.084	4$^+$	M1+E2[h]		
		1338.76 *4*	48 *3*	1707.689	2$^+$	M1+E2[h]		
		2006.87 *3*	14.8 *5*	1039.506	2$^+$	M1+E2[h]		
3058.695	4$^+$	252.46 *4*	16.3 *10*	2806.25	4$^+$	[M1+E2]		
		496.74 *4*	15.3 *10*	2562.049	3$^-$	[E1]	7.15×10^{-4}	α(K)=0.000639 *9*; α(L)=6.52×10^{-5} *10*; α(M)=9.72×10^{-6} *14*; α(N)=6.31×10^{-7} *9* B(E1)(W.u.)=0.00015 *4* Mult.: D from $\gamma(\theta)$ in ^{65}Cu(^{7}Li,2pγ), ^{60}Ni(^{12}C,2pγ).
		607.34 *4*	26.2 *15*	2451.313	3$^+$	M1+(E2)[h]		
		901.95 *5*	5.9 *4*	2156.744	2$^+$	[E2]	4.54×10^{-4}	α(K)=0.000406 *6*; α(L)=4.17×10^{-5} *6*; α(M)=6.22×10^{-6} *9*; α(N)=4.05×10^{-7} *6* B(E2)(W.u.)=1.00 *23*
		905.61 *2*	67 *4*	2153.084	4$^+$	[M1+E2]		
		1350.90 *6*	2.8 *3*	1707.689	2$^+$	[E2]	2.21×10^{-4}	α(K)=0.0001618 *23*; α(L)=1.647×10^{-5} *23*; α(M)=2.46×10^{-6} *4*; α(N)=1.614×10^{-7} *23* B(E2)(W.u.)=0.063 *16*
		2019.16 *2*	100.0 *25*	1039.506	2$^+$	E2	4.02×10^{-4}	α(K)=7.38×10^{-5} *11*; α(L)=7.46×10^{-6} *11*; α(M)=1.114×10^{-6} *16*; α(N)=7.35×10^{-8} *11* B(E2)(W.u.)=0.30 *7* Mult.: from ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL. M3 is ruled out because δ=+0.2 *2* from ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) gives a large B(M3).
3105.7	(0$^+$)	1397.9‡	33‡ *10*	1707.689	2$^+$			
		2066.3‡	100‡ *7*	1039.506	2$^+$			
3180.6	2$^+$	2141.1‡	100	1039.506	2$^+$			

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$\gamma(^{70}Ge)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.	δ	α	Comments
3240.5	1^+	3240.4	100	0.0	0^+	M1		8.29×10^{-4}	α(K)=3.21×10^{-5} *5*; α(L)=3.23×10^{-6} *5*; α(M)=4.82×10^{-7} *7*; α(N)=3.19×10^{-8} *5* E_γ: from (γ,γ'). Mult.: D from $\gamma(\theta)$ in (γ,γ'), $\Delta\pi$=yes from level scheme.
3294.79	$3^+,4^+$	760.2 *5*	$8.\times10^{1}$ *4*	2534.95	2^+				
		1587.17 *12*	100 *13*	1707.689	2^+				
		2255.16 *11*	44 *6*	1039.506	2^+				
3296.98	6^+	490[g]	0.80[g] *20*	2806.25	4^+	[E2]			
		1143.89[&] *2*	100[g]	2153.084	4^+	E2		2.62×10^{-4}	α(K)=0.000232 *4*; α(L)=2.37×10^{-5} *4*; α(M)=3.53×10^{-6} *5*; α(N)=2.31×10^{-7} *4* B(E2)(W.u.)=34 *7* Mult.: From angular distribution in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL. δ = 0.0 *2* from $\gamma(\theta)$.
3314.5	1^-	2274.6‡		1039.506	2^+				
		3314.8		0.0	0^+	E1		1.41×10^{-3}	α(K)=2.09×10^{-5} *3*; α(L)=2.10×10^{-6} *3*; α(M)=3.14×10^{-7} *5*; α(N)=2.07×10^{-8} *3* E_γ: from (γ,γ'). Mult.: D from $\gamma(\theta)$ in (γ,γ'), $\Delta\pi$=yes from level scheme.
3334.8	0^+ to 3^+	2295.3‡	100	1039.506	2^+				
3371.57	(3,4)	1218.57 *11*	100 *21*	2153.084	4^+				
		2331.59 *24*	26 *6*	1039.506	2^+				
3416.32	5^-	357.72 *5*	59 *4*	3058.695	4^+	E1[d]		1.68×10^{-3}	α(K)=0.001499 *21*; α(L)=0.0001533 *22*; α(M)=2.28×10^{-5} *4*; α(N)=1.475×10^{-6} *21* B(E1)(W.u.)=0.000146 *16* Mult.: From ^{68}Zn(α,2nγ), ^{67}Zn(α, nγ) and RUL. δ =−0.06 *3* in ^{68}Zn(α,2nγ), ^{67}Zn(α, nγ) gives a large B(M2). δ: Other: 0.00 *4* in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ).
		854.6 *4*	97 *6*	2562.049	3^-	E2		5.20×10^{-4}	α(K)=0.000464 *7*; α(L)=4.78×10^{-5} *7*; α(M)=7.13×10^{-6} *10*; α(N)=4.64×10^{-7} *7* B(E2)(W.u.)=2.00 *21* Mult.: From ^{68}Zn(α,2nγ), ^{67}Zn(α, nγ) and RUL. δ =0.02 *5* in ^{68}Zn(α,2nγ), ^{67}Zn(α, nγ) gives a large B(M3).
		1263.09[&] *6*	100 *6*	2153.084	4^+	E1(+M2)[d]	−0.05[d] *5*	1.90×10^{-4} *4*	α(K)=8.98×10^{-5} *24*; α(L)=9.07×10^{-6} *25*; α(M)=1.35×10^{-6} *4*; α(N)=8.90×10^{-8} *25* B(E1)(W.u.)=5.5×10^{-6} *6*; B(M2)(W.u.)=0.040 *4*
3488.276	$(3,4^+)$	953.30 *7*	11.3 *11*	2534.95	2^+				
		1036.99 *4*	64 *5*	2451.313	3^+				

From ENSDF

Adopted Levels, Gammas (continued)

$\gamma(^{70}\mathrm{Ge})$ (continued)

E_i(level)	J^{π}_i	E_{γ}†	I_{γ}†	E_f	J^{π}_f	Mult.	δ	α	Comments
3488.276	(3,4$^+$)	1331.58 *7*	10.0 *9*	2156.744	2$^+$				
		1335.28 *10*	8.1 *9*	2153.084	4$^+$				
		1780.52 *2*	100.0 *22*	1707.689	2$^+$				
		2448.82 *9*	7.7 *5*	1039.506	2$^+$				
3570.44	(3)$^-$	1417.24 *7*	100 *10*	2153.084	4$^+$				
		2531.7 *2*	6.0 *20*	1039.506	2$^+$				
3580.7	4$^+$	1427.6‡	100	2153.084	4$^+$				
3631.5	(2)$^+$	2591.9‡	100	1039.506	2$^+$				
3666.78	6$^-$	250.46$^{\&}$ *5*	100	3416.32	5$^-$	M1(+E2)^{d}	0.03^{d} *+2−5*	0.00727	α(K)=0.00648 *10*; α(L)=0.000678 *10*; α(M)=0.0001013 *15*; α(N)=6.62×10^{-6} *10* B(E2)(W.u.)=0.85 *7*; B(M1)(W.u.)=0.040 *3* δ: Other: +0.05 *2* in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ).
3669.4	(5$^+$)	1218.1$^{\&}$	100	2451.313	3$^+$				
3675.76	4$^+$	1523.2 *7*	100 *19*	2153.084	4$^+$				
		2636.20 *7*	43.6 *19*	1039.506	2$^+$				
3753.2	6$^+$	946.7$^{\#}$ *4*	100$^{\#}$	2806.25	4$^+$	E2		4.03×10^{-4}	α(K)=0.000360 *5*; α(L)=3.70×10^{-5} *6*; α(M)=5.52×10^{-6} *8*; α(N)=3.60×10^{-7} *5* B(E2)(W.u.)=27 *9* Mult.: Q from $\gamma(\theta)$ in (α,2nγ), M2 excluded by comparison to RUL.
3895.2	1	3895.1	100	0.0	0$^+$	D		1.07×10^{-3}	α(K)=2.40×10^{-5} *4*; α(L)=2.41×10^{-6} *4*; α(M)=3.60×10^{-7} *5*; α(N)=2.39×10^{-8} *4* E_{γ}: from (γ,γ'). Mult.: from $\gamma(\theta)$ in (γ,γ').
3900.6	(4$^-$,5,6,7$^-$)	234		3666.78	6$^-$				E_{γ}: From ^{46}Ti(^{28}Si, 4pγ).
		484		3416.32	5$^-$				E_{γ}: From ^{46}Ti(^{28}Si, 4pγ).
3955.11	7$^-$	288.33$^{\&}$ *5*	100$^{\&}$ *10*	3666.78	6$^-$	M1(+E2)^{d}	0.01^{d} *3*	0.00512	α(K)=0.00457 *7*; α(L)=0.000476 *7*; α(M)=7.12×10^{-5} *11*; α(N)=4.66×10^{-6} *7* B(E2)(W.u.)=0.081 *12*; B(M1)(W.u.)=0.045 *7*
		658.1$^{\&}$ *4*	19$^{\&}$ *4*	3296.98	6$^+$	E1(+M2)	+0.02 *5*	3.67×10^{-4} *10*	α(K)=0.000329 *9*; α(L)=3.34×10^{-5} *9*; α(M)=4.98×10^{-6} *13*; α(N)=3.25×10^{-7} *9* B(E1)(W.u.)=1.3×10^{-5} *3*; B(M2)(W.u.)=0.056 *13* Mult.,δ: D+Q from ^{65}Cu(^{7}Li,2nγ), $\Delta\pi$= yes from level scheme.
4053.3		1247$^{\#}$	100$^{\#}$	2806.25	4$^+$				
4101.45	3$^-$,4$^-$	688$^{@}$		3416.32	5$^-$				
		1045$^{@}$		3058.695	4$^+$				
		1295.24 *6*	100 *11*	2806.25	4$^+$	Q			Mult.: Q from $\gamma(\theta)$ in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ).

$\gamma(^{70}Ge)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	δ	α	Comments
4101.45	$3^-,4^-$	1539.29 20	31 9	2562.049	3^-				
		1944.21 16	25 4	2156.744	2^+				
		1948.35 11	59 5	2153.084	4^+				
4103.5	6^+	688[c]	7.3[c] 6	3416.32	5^-				
		1045[c]	100[c] 9	3058.695	4^+				
		1295[c]	14.8[c] 13	2806.25	4^+	Q			Mult.: from angular distribution of oriented nuclei (ADO) radios in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ) (2010Su05).
		1948[c]	5.5[c] 6	2156.744	2^+				E_γ: 1948γ populates 2^+ state according to level scheme given in 2010Su05. Placement of 1948γ is questionable due to ΔJ.
4203.5	8^+	450[g]	2.9[g] 6	3753.2	6^+	[E2]			
		906.6[@] 4	100[g] 10	3296.98	6^+	E2		4.48×10^{-4}	α(K)=0.000401 6; α(L)=4.12×10^{-5} 6; α(M)=6.14×10^{-6} 9; α(N)=4.00×10^{-7} 6 B(E2)(W.u.)=6.7 17 Mult.: from angular distribution and linear-polarization data in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL. δ=−0.2 2 is ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) gives a large B(M3) value, M3 is not possible because of RUL.
4243.11		1196.66 15	100	3046.439	3^+				
4299.3	7^-	344.1[&] 4	73[&] 15	3955.11	7^-	M1(+E2)	0.1 3	0.0034 6	α(K)=0.0030 6; α(L)=0.00031 6; α(M)=4.7×10^{-5} 9; α(N)=3.1×10^{-6} 6 B(E2)(W.u.)=10 4; B(M1)(W.u.)=0.08 3 Mult.,δ: D+Q from angular distribution data in ^{65}Cu(^{7}Li,2nγ), $\Delta\pi$ = no from level scheme.
		1002.4[&] 4	100[&] 20	3296.98	6^+	E1+M2	0.11 2	1.59×10^{-4} 4	α(K)=0.000142 3; α(L)=1.44×10^{-5} 4; α(M)=2.15×10^{-6} 5; α(N)=1.41×10^{-7} 3 B(E1)(W.u.)=8.E−5 4 Mult.,δ: D+Q from angular distribution data in ^{65}Cu(^{7}Li,2nγ), $\Delta\pi$ = yes from level scheme.
4356.7	$1^{(-)}$	4356.6[a] 7	100	0.0	0^+	E1[a]		0.00182	α(K)=1.480×10^{-5} 21; α(L)=1.483×10^{-6} 21; α(M)=2.21×10^{-7} 3; α(N)=1.463×10^{-8} 21
4431.4	8^+	677	3.4 10	3753.2	6^+	[E2]			
		1134.6[@] 4	100 9	3296.98	6^+	E2		2.66×10^{-4}	α(K)=0.000236 4; α(L)=2.42×10^{-5} 4; α(M)=3.60×10^{-6} 5; α(N)=2.36×10^{-7} 4 B(E2)(W.u.)=44 22 Mult.: from angular distribution in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL. δ=−0.1 2 in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) gives large B(M3). RUL rules out M3.
4447.5	1^-	4447.3[a] 8	100	0.0	0^+	E1[a]		0.00185	α(K)=1.443×10^{-5} 21; α(L)=1.446×10^{-6} 21; α(M)=2.16×10^{-7} 3; α(N)=1.426×10^{-8} 20
4520.9	1^-	4520.7[a] 8	100	0.0	0^+	E1[a]		0.00188	α(K)=1.414×10^{-5} 20; α(L)=1.417×10^{-6} 20; α(M)=2.11×10^{-7} 3; α(N)=1.398×10^{-8} 20

$^{70}_{32}Ge_{38}$-13

Adopted Levels, Gammas (continued)

$\gamma(^{70}Ge)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	δ	α	Comments
4552.1	(8)	252.8[&]	100	4299.3	7^-				
4577.18	$(3,4^+)$	2419.88 *24*	86 *15*	2156.744	2^+				
		2424.41 *20*	100 *15*	2153.084	4^+				
4675.39	$(3,4^+)$	2521.8 *3*	49 *13*	2153.084	4^+				
		2968.1 *3*	100 *15*	1707.689	2^+				
4790.6	$1^{(-)}$	4790.4[a] *19*	100	0.0	0^+	E1[a]		0.00196	α(K)=1.317×10^{-5} *19*; α(L)=1.319×10^{-6} *19*; α(M)=1.97×10^{-7} *3*; α(N)=1.302×10^{-8} *19*
4820.2	(8^+)	1067[g]	100	3753.2	6^+				
4851.9	(8^-)	896.8[&] *4*	100	3955.11	7^-	(M1+E2)[e]	0.4[e] *2*	3.98×10^{-4} *11*	α(K)=0.000356 *10*; α(L)=3.64×10^{-5} *11*; α(M)=5.43×10^{-6} *15*; α(N)=3.58×10^{-7} *10* B(E2)(W.u.)<4.9; B(M1)(W.u.)<0.01 δ: Other: +1.1 *3* in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2nγ).
4886.6	1	4886.4[a] *13*	100	0.0	0^+	D[a]			
4908.1	(9^-)	953[#]	100[#]	3955.11	7^-				
4985.0		1029.9[&]	100	3955.11	7^-				
5048.4	(4^-)	1381.6[&]	100	3666.78	6^-				
5129.6	1^-	5129.4[a] *7*	100	0.0	0^+	E1[a]		0.00207	α(K)=1.212×10^{-5} *17*; α(L)=1.214×10^{-6} *17*; α(M)=1.81×10^{-7} *3*; α(N)=1.198×10^{-8} *17*
5222.3		1169[#]	100[#]	4053.3					
5242.7	10^+	1039.2[&]	100	4203.5	8^+	E2		3.23×10^{-4}	α(K)=0.000289 *4*; α(L)=2.96×10^{-5} *5*; α(M)=4.41×10^{-6} *7*; α(N)=2.88×10^{-7} *4* Mult.: Q from $\gamma(\theta)$ in ^{65}Cu(^{7}Li, 2nγ),^{60}Ni(^{12}C, 2pγ), assumed E2 band member.
5263.4	$1^{(-)}$	5263.2[a] *8*	100	0.0	0^+	E1[a]		0.00211	α(K)=1.175×10^{-5} *17*; α(L)=1.177×10^{-6} *17*; α(M)=1.756×10^{-7} *25*; α(N)=1.162×10^{-8} *17*
5265.82		2219.34 *14*	100	3046.439	3^+				
5299.2	$9^{(-)}$	1344.1[@] *4*	100	3955.11	7^-	(E2)			Mult.: from $\gamma(\theta)$ in ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2nγ).
5370.11		1881.67 *5*	100 *6*	3488.276	$(3,4^+)$				
		2325.42 *18*	21 *2*	3046.439	3^+				
5435.5	8^+	1332[c]	100[c]	4103.5	6^+	Q			Mult.: from angular distribution of oriented nuclei (ADO) radios in ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ) (2010Su05).
5465.3	1^-	5465.1[a] *8*	100	0.0	0^+	E1[a]		0.00216	α(K)=1.124×10^{-5} *16*; α(L)=1.125×10^{-6} *16*; α(M)=1.678×10^{-7} *24*; α(N)=1.111×10^{-8} *16*
5512.5	$1^{(-)}$	5512.3[a] *10*	100	0.0	0^+	E1[a]		0.00217	α(K)=1.112×10^{-5} *16*; α(L)=1.114×10^{-6} *16*; α(M)=1.661×10^{-7} *24*; α(N)=1.099×10^{-8} *16*
5539.7	(10)	1108.3[@] *4*	100[@]	4431.4	8^+	Q[b]		5.54×10^{-4}	α(K)=0.000495 *7*; α(L)=5.10×10^{-5} *8*; α(M)=7.62×10^{-6} *11*; α(N)=5.03×10^{-7} *7* Mult.: from R(DCO) in ^{64}Ni(^{12}C,α2nγ). From $T_{1/2}$

$^{70}_{32}Ge_{38}$-14

$\gamma(^{70}Ge)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.	α	Comments
								considerations, M2 is more likely. However, assignment to a band structure in $^{64}Ni(^{12}C,\alpha 2n\gamma)$ suggests E2 character. Other: D in $^{65}Cu(^{7}Li,2n\gamma)$, $^{60}Ni(^{12}C,2p\gamma)$.
5552.5	$9^{(-)}$	1253.2[@] *4*	100	4299.3	7^-	Q	2.30×10^{-4}	α(K)=0.000190 *3*; α(L)=1.94×10^{-5} *3*; α(M)=2.89×10^{-6} *4*; α(N)=1.89×10^{-7} *3* Mult.: Q from angular distribution of oriented nuclei (ADO) ratio in $^{65}Cu(^{7}Li,2n\gamma)$,$^{60}Ni(^{12}C,2p\gamma)$.
5876.9	$1^{(-)}$	5876.6[a] *7*	100	0.0	0^+	E1[a]	0.00227	α(K)=1.031×10^{-5} *15*; α(L)=1.032×10^{-6} *15*; α(M)=1.540×10^{-7} *22*; α(N)=1.019×10^{-8} *15*
5989.7	$1^{(+)}$	5989.4[a] *7*	100	0.0	0^+	M1[a]	1.66×10^{-3}	α(K)=1.272×10^{-5} *18*; α(L)=1.276×10^{-6} *18*; α(M)=1.90×10^{-7} *3*; α(N)=1.262×10^{-8} *18*
6006.9		1155[#]	100[#]	4851.9	(8^-)			
6160.1	(11^-)	1252[#]	100[#]	4908.1	(9^-)			
6297.0	1	6296.7[a] *14*	100	0.0	0^+	D[a]		
6362.8	1	6362.5[a] *8*	100	0.0	0^+	D[a]		
6549.1		1641[#]	100[#]	4908.1	(9^-)			
6572.2	$11^{(-)}$	1273[@]	100	5299.2	$9^{(-)}$	Q		Mult.: from Angular Distribution of Oriented nuclei (ADO) ratio in $^{65}Cu(^{7}Li,2n\gamma)$, $^{60}Ni(^{12}C,2p\gamma)$ and level scheme.
6587.7	$1^{(+)}$	6587.4[a] *8*	100	0.0	0^+	M1[a]		
6604.2		1305[#]	100[#]	5299.2	$9^{(-)}$			
6636.6	1	6636.3[a] *15*	100	0.0	0^+	D[a]		
6702.5	$1^{(-)}$	6702.2[a] *13*	100	0.0	0^+	E1[a]		
6716.8	12^+	1474[g]	100	5242.7	10^+	E2		Mult.: Q in $^{65}Cu(^{7}Li,2n\gamma)$, $^{60}Ni(^{12}C,2p\gamma)$ and $^{64}Ni(^{12}C,\alpha 2n\gamma)$, assumed E2 from placement in band structure.
6779.7	(12)	1240[g]	100	5539.7	(10)	Q		Mult.: from R(DCO) in $^{64}Ni(^{12}C,\alpha 2n\gamma)$.
6786.1	(13^-)	626[#]	100[#]	6160.1	(11^-)			
7306.3	$1^{(+)}$	7305.9[a] *8*	100	0.0	0^+	M1[a]		
7426.0	$1^{(-)}$	7425.6[a] *8*	100	0.0	0^+	E1[a]		
7619.7	(14)	840[g]	100	6779.7	(12)	Q		Mult.: from R(DCO) in $^{64}Ni(^{12}C,\alpha 2n\gamma)$.
7753.5	$1^{(-)}$	7753.0[a] *10*	100	0.0	0^+	E1[a]		
7767.8	14^+	1051[g]	100	6716.8	12^+	E2		Mult.: Q from R(DCO) in $^{64}Ni(^{12}C,\alpha 2n\gamma)$, E2 from assumed band structure.
8058.1	(15^-)	1272[#]	100[#]	6786.1	(13^-)			
8245.7	(16)	626[g]	100	7619.7	(14)	Q		Mult.: from R(DCO) in $^{64}Ni(^{12}C,\alpha 2n\gamma)$.
8283.7	$1^{(+)}$	8283.2[a] *15*	100	0.0	0^+	M1[a]		
8878.5	1	8877.9[a] *14*	100	0.0	0^+	D[a]		
9423.7	(18)	1178[g]	100	8245.7	(16)	Q		Mult.: from R(DCO) in $^{64}Ni(^{12}C,\alpha 2n\gamma)$.
9619.2	(17^-)	1561[#]	100[#]	8058.1	(15^-)			
10269.7	(20)	846[g]	100	9423.7	(18)			
11336.2	(19^-)	1717[#]	100[#]	9619.2	(17^-)			
13173	(21^-)	1837[#]	100[#]	11336.2	(19^-)			

$^{70}_{32}Ge_{38}$-15

$\gamma(^{70}Ge)$ (continued)

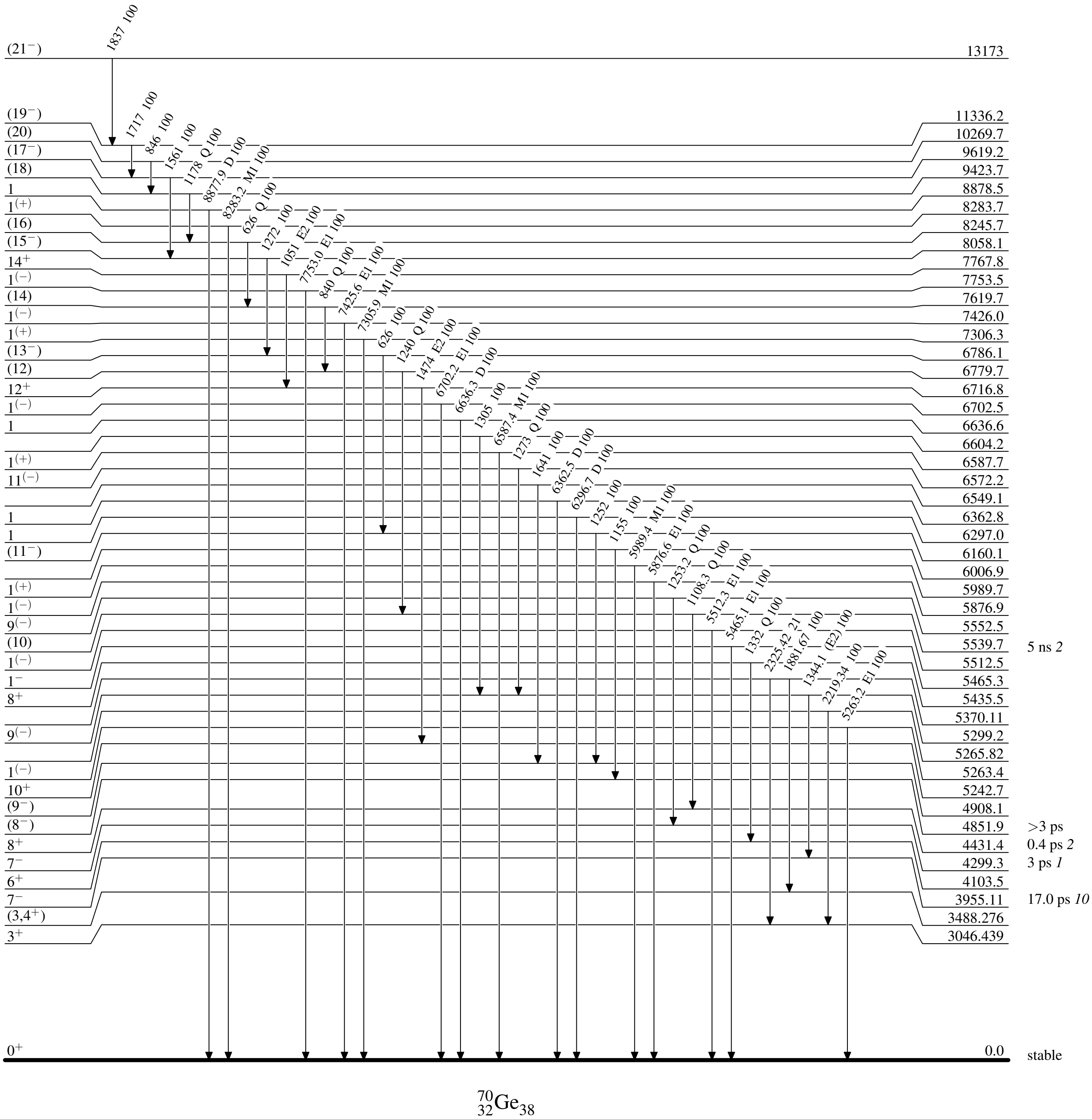
† From ^{72}As ε decay, unless otherwise stated.
‡ From (n,n′γ).
# From ^{46}Ti(^{28}Si, 4pγ).
@ From ^{65}Cu(^{7}Li, 2nγ), ^{60}Ni(^{12}C, 2pγ).
& From ^{68}Zn(α,2nγ), ^{67}Zn(α, nγ).
[a] From ^{70}Ge(pol γ,γ').
[b] From (p,p′γ).
[c] from ^{65}Cu(^{7}Li,2nγ), ^{60}Ni(^{12}C,2pγ) (2010Su05).
[d] From angular distribution and linear-polarization data in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ).
[e] From angular distribution in ^{68}Zn(α,2nγ), ^{67}Zn(α,nγ) and RUL.
[f] From internal conversion data in (p,p′γ).
[g] From ^{64}Ni(^{12}C,α2nγ).
[h] From $\gamma(\theta)$ in ^{70}As ε decay, cases of D+Q with large, non-zero values for δ have been assumed to be M1+E2 in character.

$^{70}_{32}Ge_{38}$-16

Adopted Levels, Gammas

Level Scheme

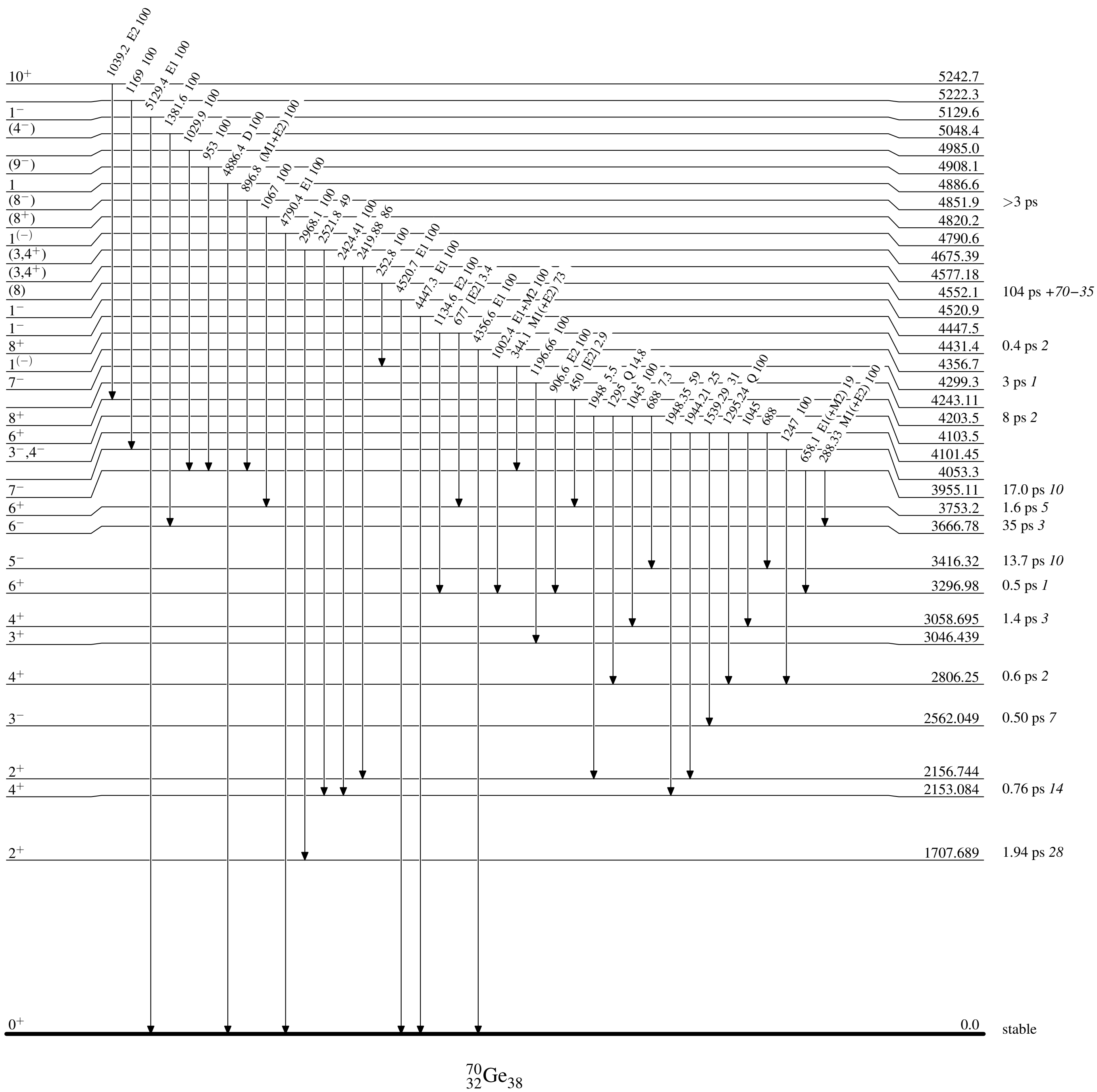
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

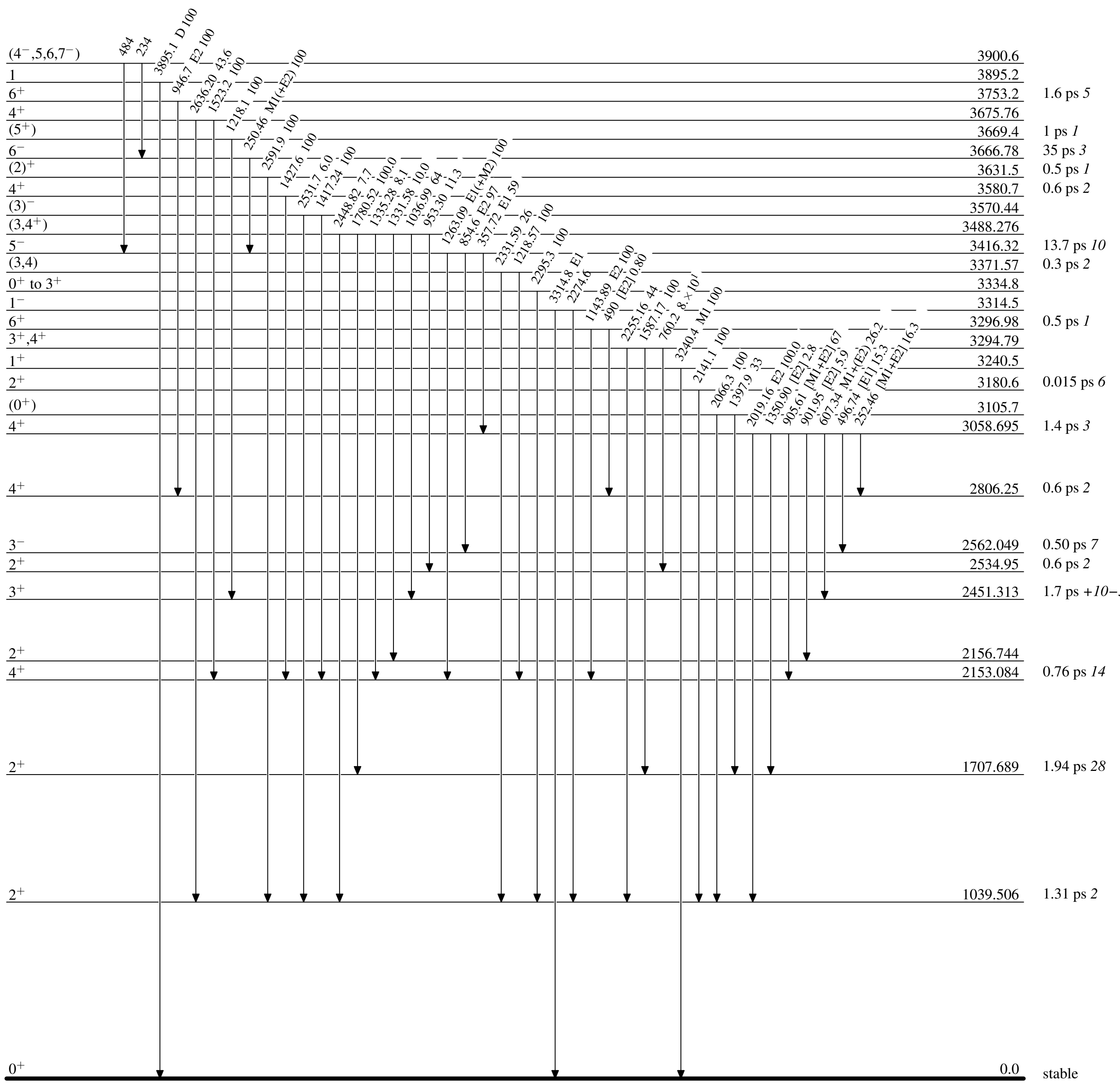
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

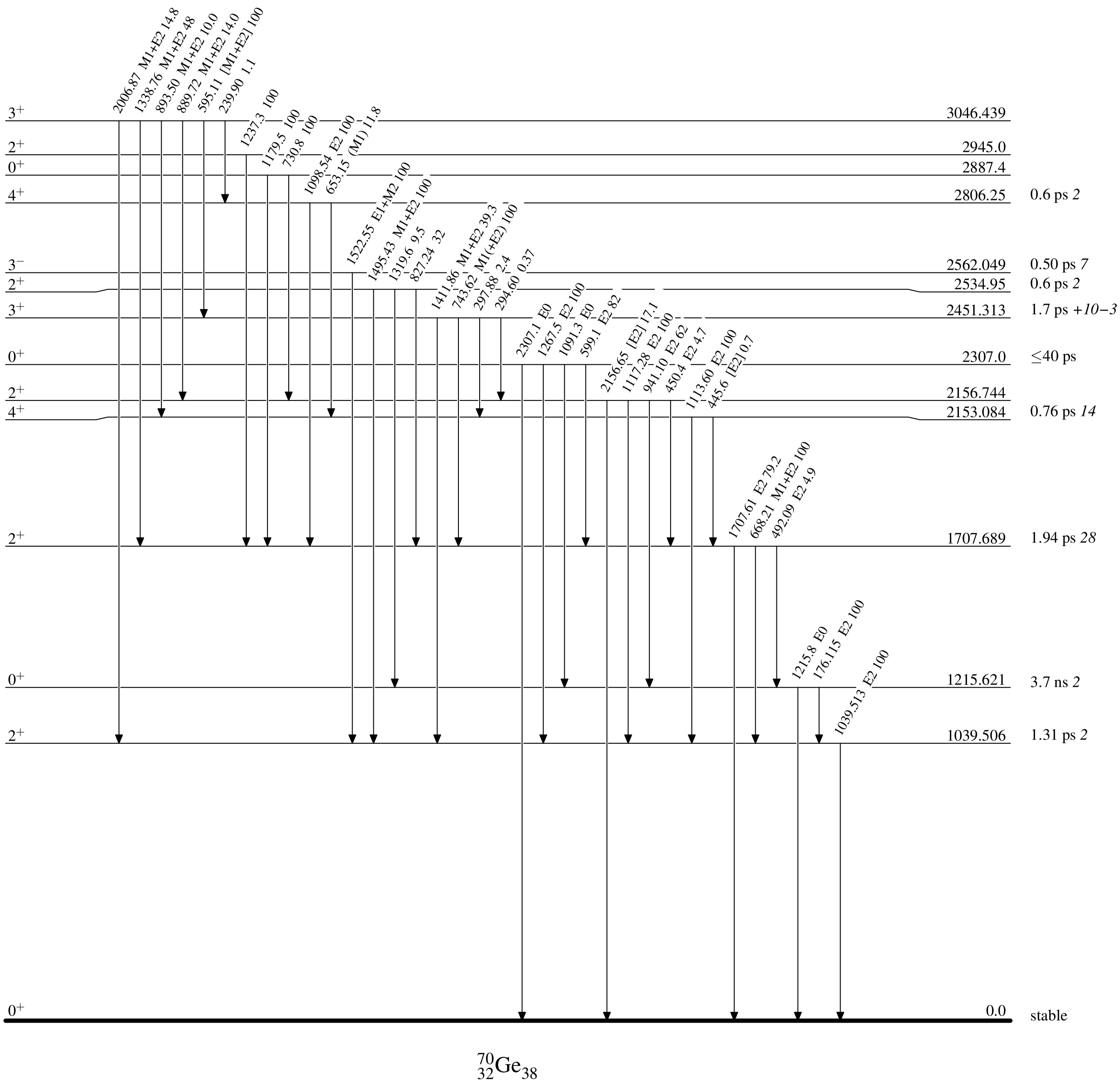


$^{70}_{32}Ge_{38}$

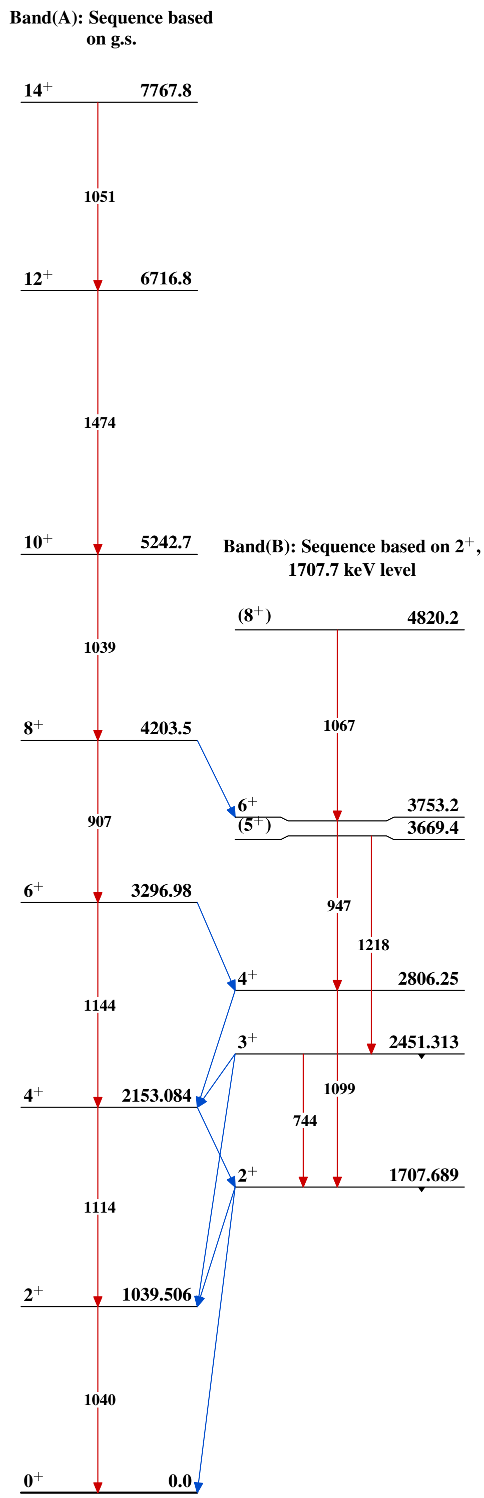
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

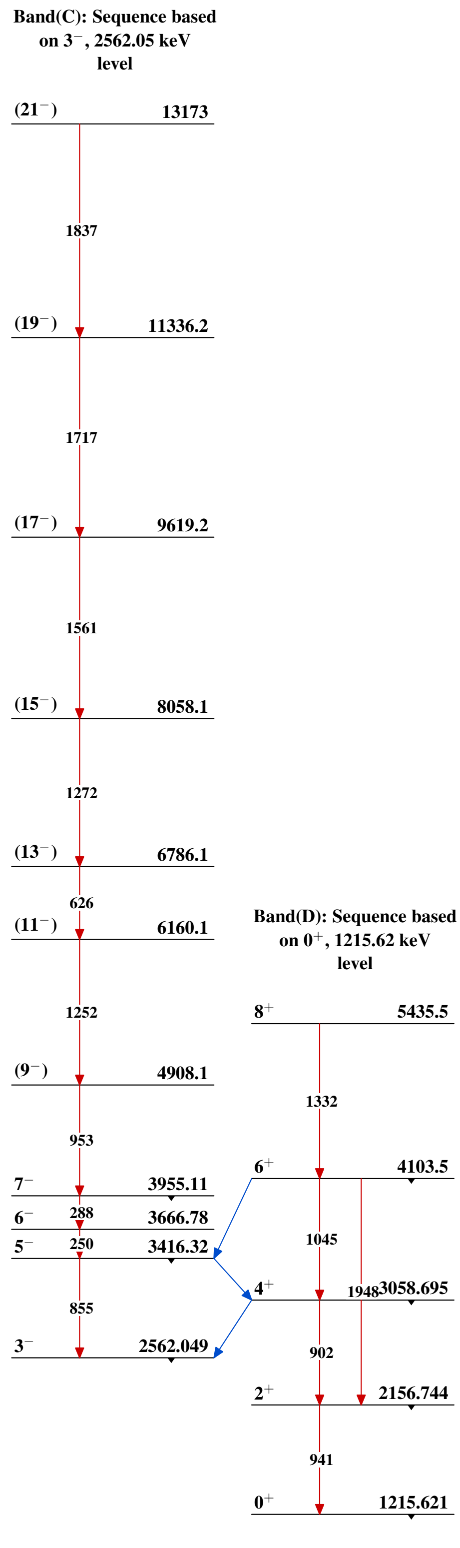


Adopted Levels, Gammas



$^{70}_{32}Ge_{38}$

Adopted Levels, Gammas (continued)



$^{70}_{32}Ge_{38}$