^{62}Ni(p,nγ),^{61}Ni(d,nγ) 1973Bl07,1984Ch25

History

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

1970Da15: E(p)=4.7-5.9 MeV, γγ(θ), γ(θ) comparison with predictions of the compound-nucleus statistical model.
1972BaUS: E(p)=6.0 MeV, measured Eγ, Iγ in singles mode.
1973Bl07: E(p)=5.8 MeV, ED=6.5 MeV, pulsed beam, delayed coincidences, g factor measurement by time differential perturbed angular distribution technique.
1974Ca14: E(p)=5.32-5.51 MeV, $T_{1/2}$ by DSAM.
1975SeZF: E(p)=6.0 MeV, measured Eγ, Iγ in singles mode.
1977Ch04: E(p)=5.48-7.20 MeV, results agree with those by same authors from ^{59}Co(α,nγ); see relevant data section for their results.
1984Ch25: E(p)=5.5-7.3 MeV, Eγ, γ(θ), γγ coin.
Decay scheme is that suggested by 1973Bl07 and 1984Ch25.
Spin hypotheses and δ from 1984Ch25 are given in comments, as obtained from comparison of γ(θ) with theoretical predictions of compound nucleus statistical model through a least-squares fitting procedure.

^{62}Cu Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0	1^+		
40.86 *4*	2^+	4.6[@] ns *4*	g=+0.661 *12* (1973Bl07)
243.43 *8*	2^+		
287.90 *10*	2^+		
390.18 *9*	4^+	11.1[@] ns *2*	g=+0.667 *40* (1973Bl07) J^π: assignment of 3^+ quoted by 1970Da15 from ^{60}Ni(α,pnγ) data of 1969SuZT is not supported by γγ(θ) of 1973Bl07, which suggests J=4^+. Data on ^{64}Zn(d,α) give L=4 for this level (1973Da28), allowing $J^\pi=(3,4,5)^+$. Measurements by 1976Ch17 from ^{60}Ni(α,pnγ) and other reactions indicate J=4^+.
426.10 *10*	3^+	>0.16[#] ps	
548.32 *18*	1^+	>0.17[#] ps	
637.27 *16*	1^+	0.15[#] ps *+28−8*	
644.8 *3*	(2^+)		J^π: from γ(θ) and lack of feeding in ^{62}Zn decay (1970Da15).
675.00 *17*	3^+		
698.26 *18*	$2^+,3^+$		
727.75 *16*	$2^{(+)}$		
756.01 *24*	(2^+)		
915.32 *19*	2^+		
982.7	3		
1022.2 *7*	2		
1077.23 *18*	1,2		
1141.8 *3*	2,3		
1144.2 *8*			
1286.4 *11*	(2,3)		
1346.4 *3*	(2^+)		E(level): from Adopted Levels data set.
1354.3 *5*			
1374.0 *7*	1,2,3		
1416.1 *5*			
1433.0 *5*	1,2		
1581.6 *6*			
1677.4 *8*			
1679.1 *8*			
1682.1 *8*			
1759.5 *8*			
1843.0 *12*			

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^{62}Ni(p,nγ),^{61}Ni(d,nγ) 1973Bl07,1984Ch25 (continued)

^{62}Cu Levels (continued)

† From least-squares fit to Eγ data (if ΔE not given, 1 keV uncertainty is assigned to Eγ), except as noted.
‡ As proposed in 1984Ch25, 1973Bl07 and 1970Da15.
# From DSAM (1974Ca14).
@ From γγ(t) (1973Bl07).

γ(^{62}Cu)

A_2 and A_4 data are from 1970Da15.

E_γ[†]	I_γ[d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	δ[g]	Comments
40.84[@] *4*		40.86	2^+	0	1^+			E_γ: ΔE estimated.
146.81[‡] *10*	1.1	390.18	4^+	243.43	2^+			
159.2 *3*	[e]	915.32	2^+	756.01	(2^+)			Iγ(159): Iγ(489)=3:49 (1970Da15).
243.49[‡] *10*	189	243.43	2^+	0	1^+	D(+Q)	+0.03 *3*	A_2=−0.30 *4*; A_4=−0.05 *6*
246.98 *10*	63	287.90	2^+	40.86	2^+	D+Q	−0.33 *4*	A_2=0.00 *4*; A_4=−0.02 *5*
260.3[@] *3*	1.5	548.32	1^+	287.90	2^+			
272.3 *3*	7.2	698.26	$2^+,3^+$	426.10	3^+	D+Q		A_2=−0.09 *6* E_γ: given as 472 by 1975SeZF. δ: 0.00 *5* if J^π(698)=2^+; −0.60 *10* if J^π(698)=3^+ (1970Da15); +0.035 or −7.12 if J(698)=2; −0.532 if J(698)=3 (1984Ch25).
284 *1*	7	675.00	3^+	390.18	4^+			E_γ: 285.2 (1975SeZF).
304.6 *3*		548.32	1^+	243.43	2^+			
349.2[@] *3*	30	637.27	1^+	287.90	2^+			I_γ: 1970Da15 give Iγ(349)/Iγ(597)=1.4/87.6, which is consistent with data from ^{62}Zn decay.
349.25[‡] *10*	30	390.18	4^+	40.86	2^+			
385.25 *10*	80	426.10	3^+	40.86	2^+	D+Q	−0.12 *2*	A_2=−0.53 *3*; A_4=−0.03 *4*
393.8[@] *3*	3.3	637.27	1^+	243.43	2^+			
431.7 *3*	16.5	675.00	3^+	243.43	2^+	D(+Q)	−0.05 *+4−5*	A_2=−0.41 *8* δ: −2.75 from 1984Ch25.
439[ha]	3.1[h]	1354.3		915.32	2^+			
439.6[a] *3*	3.1	727.75	$2^{(+)}$	287.90	2^+			
455.0 *3*	10	698.26	$2^+,3^+$	243.43	2^+	D+Q		A_2=+0.27 *5* δ: −0.06 *5* if J^π(698)=2^+; +0.35 *4* if J^π(698)=3^+ (1970Da15); −0.07 or +2.48 if J(698)=2; +0.344 if J(698)=3 (1984Ch25).
469.4[&]		1144.2		675.00	3^+			
484.2 *3*	16.2	727.75	$2^{(+)}$	243.43	2^+	D(+Q)	+0.05 *5*	A_2=+0.37 *6*
489.1 *3*	8.3	915.32	2^+	426.10	3^+			
508 *1*	17	548.32	1^+	40.86	2^+			
548.7 *3*	16.7	548.32	1^+	0	1^+			A_2=+0.01 *3*; A_4=+0.01 *4*
556.6[&]		982.7	3	426.10	3^+			
588.1[&]		1286.4	(2,3)	698.26	$2^+,3^+$			
592.5[&]		982.7	3	390.18	4^+			
594 *1*		1141.8	2,3	548.32	1^+			
596.7 *3*	25	637.27	1^+	40.86	2^+			A_2=−0.07 *5*
619.9[&i]		1346.4	(2^+)	727.75	$2^{(+)}$			
634.1 *3*	14	675.00	3^+	40.86	2^+	D+Q	−0.16 *+6−4*	A_2=−0.57 *8* δ: consistent with −0.16 from 1984Ch25.

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^{62}Ni(p,nγ),^{61}Ni(d,nγ) 1973Bl07,1984Ch25 (continued)

γ(^{62}Cu) (continued)

E_γ[†]	I_γ[d]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	δ[g]	Comments
637.2 *3*		637.27	1^+	0	1^+			I_γ: 1970Da15 give Iγ(637)/Iγ(597)=3.0/87.6.
645.0 *3*	18.4	644.8	(2^+)	0	1^+	(D+Q)	+0.22 *+3−2*	A_2=+0.03 *4*
657.0 *3*	11	698.26	$2^+,3^+$	40.86	2^+	D+Q		A_2=−0.25 *5* δ: −0.70 *7* if J^π(698)=2^+; +0.04 *3* if J^π(698)=3^+ (1970Da15); −0.7 or −8.14 if J(698)=2; +0.035 if J(698)=3 (1984Ch25).
672.0 *3*	1.9	915.32	2^+	243.43	2^+			
675.0 *3*		675.00	3^+	0	1^+			
687.0[hb] *3*	10.8[h]	727.75	$2^{(+)}$	40.86	2^+			
687.0[hb] *3*	10.8[h]	1077.23	1,2	390.18	4^+			
688.6[&]		1416.1		727.75	$2^{(+)}$			
698.3[i]		698.26	$2^+,3^+$	0	1^+			
710[#]	3.3	1354.3		644.8	(2^+)			
717 *1*		1141.8	2,3	426.10	3^+	D+Q		δ: +0.73 or +0.21 if J(1142)=3; +0.87 if J(1142)=2 (1984Ch25).
717.9[&]		1416.1		698.26	$2^+,3^+$			
728.0 *3*	[e]	727.75	$2^{(+)}$	0	1^+	D+Q	+0.49 *9*	A_2=+0.36 *10*
735.2[&]		1433.0	1,2	698.26	$2^+,3^+$			
741.1[&]		1416.1		675.00	3^+			
753 *1*		1141.8	2,3	390.18	4^+	D+Q		δ: +9.5 or +0.18 if J(1142)=3; +0.67 or +57.3 if J(1142)=2 (1984Ch25).
753.8[&]		1144.2		390.18	4^+			
755.9 *3*	2.7	756.01	(2^+)	0	1^+			A_2=−0.5 δ: magnitude≤0.3 (1970Da15).
758.0[&]		1433.0	1,2	675.00	3^+			
779[#]	7.6	1022.2	2	243.43	2^+			
789.3[ci]		1077.23	1,2	287.90	2^+	D+Q		δ: +0.34 or −11.43 (1984Ch25).
833.9 *3*		1077.23	1,2	243.43	2^+			
860.3[&]		1843.0		982.7	3			
883[&i]		1581.6		698.26	$2^+,3^+$			
884.5[&]		1433.0	1,2	548.32	1^+			
898.4[c]		1141.8	2,3	243.43	2^+	D+Q		δ: +0.12 or −5.67 if J(1142)=3; −0.42 or +57.3 if J(1142)=2 (1984Ch25).
915.8 *6*	2.4	915.32	2^+	0	1^+	D+Q		δ: −0.45 or −0.93 if J(915)=2 (1984Ch25).
928[#]	2.5	1354.3		426.10	3^+			
941.9[&]		982.7	3	40.86	2^+	D+Q	−0.75	
951.0[&]		1679.1		727.75	$2^{(+)}$			
981.1[&]		1679.1		698.26	$2^+,3^+$			
983.6[&]		1682.1		698.26	$2^+,3^+$			
998.8[&i]		1286.4	(2,3)	287.90	2^+			
1002.4[&]		1677.4		675.00	3^+			
1006.6[&]		1433.0	1,2	426.10	3^+			
1022[#]	8.4	1022.2	2	0	1^+	D+Q		E_γ: given as 1082 by 1975SeZF. δ: −0.25 or −1.23 (1984Ch25).
1036.3 *3*	7.3	1077.23	1,2	40.86	2^+	D+Q		δ: −0.40 or +14.3 (1984Ch25).
1044[&i]		1286.4	(2,3)	243.43	2^+			
1059.9[&]		1759.5		698.26	$2^+,3^+$			
1066[#]	6.4	1354.3		287.90	2^+			
1086.2[&]		1374.0	1,2,3	287.90	2^+			
1100.6 *3*		1141.8	2,3	40.86	2^+			

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^{62}Ni(p,nγ),^{61}Ni(d,nγ) 1973Bl07,1984Ch25 (continued)

γ(^{62}Cu) (continued)

E_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	Comments
1104.0[&i]	1346.4	(2$^+$)	243.43	2$^+$		
1116[&]	1759.5		644.8	(2$^+$)		
1130.4[&]	1374.0	1,2,3	243.43	2$^+$		
1142.3[i] 3	1141.8	2,3	0	1$^+$		Neither evidence for nor against 1142 level with a g.s. branch. 1977Ch04 found a γ ray of appropriate energy in coincidence with the 385γ, but their studies do not rule out a g.s. transition from the 1142 level. The 1142 level does not appear to be excited in $\varepsilon+\beta^+$ decay of ^{62}Zn.
1155.3[&]	1581.6		426.10	3$^+$		
1172.5[&]	1416.1		243.43	2$^+$		
1245.8[&i]	1286.4	(2,3)	40.86	2$^+$	D+Q	δ: −1.48 if J(1285)=(2); −0.12 if J(1285)=3 (1984Ch25).
1294.1[&]	1581.6		287.90	2$^+$		
1307[&i]	1346.4	(2$^+$)	40.86	2$^+$		
1338[&]	1581.6		243.43	2$^+$		
1373.9[c]	1374.0	1,2,3	0	1$^+$		
1375.0[&]	1416.1		40.86	2$^+$		
1394.5[&]	1682.1		287.90	2$^+$		
1433[c]	1433.0	1,2	0	1$^+$	D+Q	δ: −0.09 or −9.51 if J(1433)=1; +0.25 if J(1433)=2 (1984Ch25).
1434.0[&]	1677.4		243.43	2$^+$		

[†] From 1973Bl07, except as noted.
[‡] Seen by 1973Bl07 in delayed spectrum.
[#] From 1975SeZF. Uncertainty: 0.2-1.5 keV.
[@] From 1970Da15.
[&] From 1984Ch25.
[a] Multiple placement by 1975SeZF.
[b] Multiple placement by 1973Bl07.
[c] From difference of level energies (1984Ch25, Table 3).
[d] Relative intensities reported by 1975SeZF. Branching ratios deduced from these Iγ agree in most cases with those from 1970Da15.
[e] Not reported by 1975SeZF, but branching may be found in 1970Da15.
[f] From J^π (or assumed J^π) of connecting states.
[g] From comparison of $\gamma(\theta)$ with predictions of the compound-nucleus statistical model (1970Da15,1984Ch25).
[h] Multiply placed with undivided intensity.
[i] Placement of transition in the level scheme is uncertain.

^{62}Ni(p,nγ),^{61}Ni(d,nγ) 1973Bl07,1984Ch25

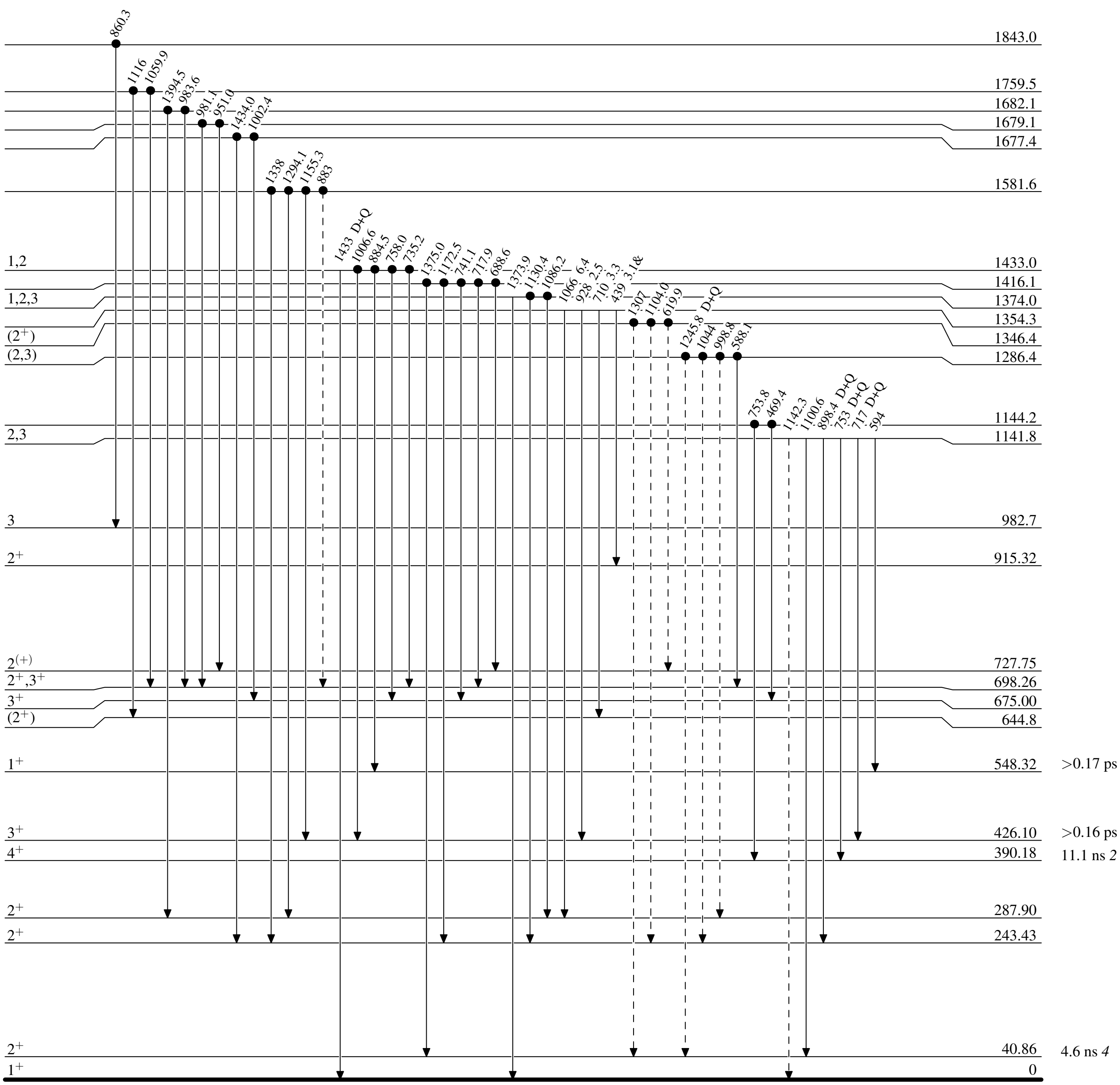
Level Scheme

Intensities: Relative I_γ

& Multiply placed: undivided intensity given

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- ● Coincidence



$^{62}_{29}Cu_{33}$

^{62}Ni(p,nγ),^{61}Ni(d,nγ) 1973Bl07,1984Ch25

Level Scheme (continued)

Intensities: Relative I_γ

& Multiply placed: undivided intensity given