^{58}Ni(^{58}Ni,p2nγ) 2015Wa02,2003YuZW

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	21-Jan-2015

2015Wa02: E=230 MeV from K130 cyclotron of University of Jyvaskyla accelerator facility. Target=500 μg/cm^2 thick. Recoil products were separated using RITU gas-filled separator, passed through multiwire proportional counters and implanted in double-sided silicon detectors (DSSDs). Measured Eγ, Iγ, Ep, $T_{1/2}$ of ^{113}Cs g.s., $\gamma\gamma$-coin, (recoils)$\gamma\gamma$-coin and (proton)$\gamma\gamma$-coin, γ angular distributions. Deduced high-spin levels, bands, alignments, configurations, Routhians.

2003YuZW: E=230 MeV. Measured Eγ, Iγ, $\gamma\gamma$-coin, (proton)$\gamma\gamma$-coin, recoil-decay tagging method at HRIBF-ORNL and ATLAS-ANL facilities, using Gammasphere at ANL. Two γ cascades identified: 383-596-737-815-745-616-507-616 with proposed J^π=(11/2$^-$) to (43/2$^-$); and 510-657-810-718-609-619-733-792 with proposed J^π=(7/2$^+$) to (39/2$^+$). Low-energy tentative transitions towards the ground state were identified at 72, 74, 92 and 165 keV. The first cascade was associated with $h_{11/2}$ proton band in contrast to $g_{7/2}$ proton orbital assignment in 2015Wa02. Note that the orderings of the two cascades in 2003YuZW is different in 2015Wa02: first cascade is now ordered as 383-596-737-814-508-616-745-819-898-958-1050; and the second is ordered as 511-610-719-811-658-618-735-793-852-951. Low energy transitions of 74, 91, 92 and 166 keV are confirmed in 2015Wa02 but placed differently and connected to the ground state.

1998GrZT (also 1998GrZZ): E=230 MeV, earlier experiments by the same group as 2003YuZW. A total of ten γ rays were reported at 384, 507, 511, 596, 609, 617, 737, 808, 814, and tentative low energy γ rays of 72, 92, 166. A gamma cascade 384-596-737-814 was established which forms the lower section of band 1 in 2015Wa02; the other six γ rays reported by 1998GrZT have also been seen by 2015Wa02.

All data and level scheme here are from 2015Wa02.

^{113}Cs Levels

E(level)[†]	J$^\pi$[‡]	Comments
0.0	(3/2$^+$)	J$^\pi$: from Adopted Levels.
74.1 *3*	(5/2$^+$)	
165.1[#] *4*	(7/2$^+$)	
166.30[@] *20*	(5/2$^+$)	
549.0[#] *5*	(11/2$^+$)	
677.0[@] *4*	(9/2$^+$)	
1145.2[#] *5*	(15/2$^+$)	
1287.0[@] *6*	(13/2$^+$)	
1882.3[#] *6*	(19/2$^+$)	
2005.7[@] *7*	(17/2$^+$)	
2696.0[#] *8*	(23/2$^+$)	
2816.9[@] *8*	(21/2$^+$)	
3204.0[#] *10*	(27/2$^+$)	
3475.3[@] *9*	(25/2$^+$)	
3820.0[#] *11*	(31/2$^+$)	
4093.2[@] *11*	(29/2$^+$)	
4564.8[#] *12*	(35/2$^+$)	
4828.3[@] *13*	(33/2$^+$)	
5384.0[#] *15*	(39/2$^+$)	
5621.6[@] *14*	(37/2$^+$)	
6281.9[#] *17*	(43/2$^+$)	
6473.9[@] *17*	(41/2$^+$)	
7239.9[#] *20*	(47/2$^+$)	
7425[@] *3*	(45/2$^+$)	
8290[#] *3*	(51/2$^+$)	

Continued on next page (footnotes at end of table)

^{58}Ni(^{58}Ni,p2nγ) 2015Wa02,2003YuZW (continued)

^{113}Cs Levels (continued)

† From Eγ data.
‡ From configuration assignments for excited states.
# Band(A): π3/2[422], $g_{7/2}$ orbital. First backbend at $\hbar\omega\approx$0.35 MeV is due to alignment of pair of $h_{11/2}$ neutrons, and the second backbend at $\hbar\omega\approx$0.45 MeV is due to alignment of a pair of $h_{11/2}$ protons. This configuration is in contrast to $\pi h_{11/2}$ proposed in 2003YuZW and 1998GrZT.
@ Band(B): π1/2[420], $d_{5/2}$ orbital First backbend at $\hbar\omega\approx$0.35 MeV is due to alignment of pair of $h_{11/2}$ neutrons, and the second backbend at $\hbar\omega\approx$0.45 MeV is due to alignment of a pair of $h_{11/2}$ protons.

γ(^{113}Cs)

Angular intensity R(θ)=Iγ(72°−107°)/Iγ(133°−157°); expected ratio is ≈0.75 for stretched dipoles and ≈1.20 for stretched quadrupoles.

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α @	Comments
74.1 *3*	50 *20*	74.1	(5/2$^+$)	0.0	(3/2$^+$)	(M1) #	2.13 *4*	R(θ)=0.5 *6*.
91.0 *2*	88 *8*	165.1	(7/2$^+$)	74.1	(5/2$^+$)	(M1) #	1.179	R(θ)=1.1 *5*.
92 &		166.30	(5/2$^+$)	74.1	(5/2$^+$)			
166.3 *2*	10 *2*	166.30	(5/2$^+$)	0.0	(3/2$^+$)	(M1) #	0.216	R(θ)=0.9 *6*.
383.9 *2*	100 *4*	549.0	(11/2$^+$)	165.1	(7/2$^+$)	Q		R(θ)=0.97 *7*.
508.0 *5*	60 *6*	3204.0	(27/2$^+$)	2696.0	(23/2$^+$)	(Q)		R(θ)=1.0 *4*.
510.7 *3*	60 *7*	677.0	(9/2$^+$)	166.30	(5/2$^+$)	Q		R(θ)=1.0 *1*.
596.2 *2*	100 *5*	1145.2	(15/2$^+$)	549.0	(11/2$^+$)	Q		R(θ)=1.03 *9*.
610.0 *4*	63 *6*	1287.0	(13/2$^+$)	677.0	(9/2$^+$)	Q		R(θ)=1.5 *3*.
616.0 *4*	51 *11*	3820.0	(31/2$^+$)	3204.0	(27/2$^+$)	Q		R(θ)=1.5 *4*.
617.9 *6*	44 *11*	4093.2	(29/2$^+$)	3475.3	(25/2$^+$)	Q		R(θ)=1.4 *3*.
658.4 *4*	58 *5*	3475.3	(25/2$^+$)	2816.9	(21/2$^+$)	Q		R(θ)=1.4 *1*.
718.7 *4*	80 *6*	2005.7	(17/2$^+$)	1287.0	(13/2$^+$)	(Q)		R(θ)=1.0 *2*.
735.1 *6*	42 *7*	4828.3	(33/2$^+$)	4093.2	(29/2$^+$)	(Q)		R(θ)=1.1 *4*.
737.1 *4*	87 *7*	1882.3	(19/2$^+$)	1145.2	(15/2$^+$)	Q		R(θ)=1.4 *2*.
744.8 *5*	48 *5*	4564.8	(35/2$^+$)	3820.0	(31/2$^+$)	(Q)		R(θ)=0.9 *3*.
793.3 *7*	35 *8*	5621.6	(37/2$^+$)	4828.3	(33/2$^+$)	Q		R(θ)=1.8 *6*.
811.2 *4*	65 *13*	2816.9	(21/2$^+$)	2005.7	(17/2$^+$)	Q		R(θ)=1.2 *3*.
813.7 *5*	65 *14*	2696.0	(23/2$^+$)	1882.3	(19/2$^+$)	Q		R(θ)=1.2 *2*.
819.2 *9*	37 *10*	5384.0	(39/2$^+$)	4564.8	(35/2$^+$)			R(θ)=0.4 *8*.
852.3 *8*	30 *5*	6473.9	(41/2$^+$)	5621.6	(37/2$^+$)	Q		R(θ)=3 *2*.
897.9 *8*	28 *4*	6281.9	(43/2$^+$)	5384.0	(39/2$^+$)	(Q)		R(θ)=1.2 *5*.
951 *2*	17 *6*	7425	(45/2$^+$)	6473.9	(41/2$^+$)			
958 *1*	22 *6*	7239.9	(47/2$^+$)	6281.9	(43/2$^+$)	Q		R(θ)=2 *1*.
1050 *2*	15 *5*	8290	(51/2$^+$)	7239.9	(47/2$^+$)			

† From 2015Wa02.
‡ Angular distributions indicate stretched quadrupole (most likely E2) transition. 2015Wa02 assign E2 in their table 1.
# From transition intensity balance considerations (2015Wa02).
@ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
& Placement of transition in the level scheme is uncertain.

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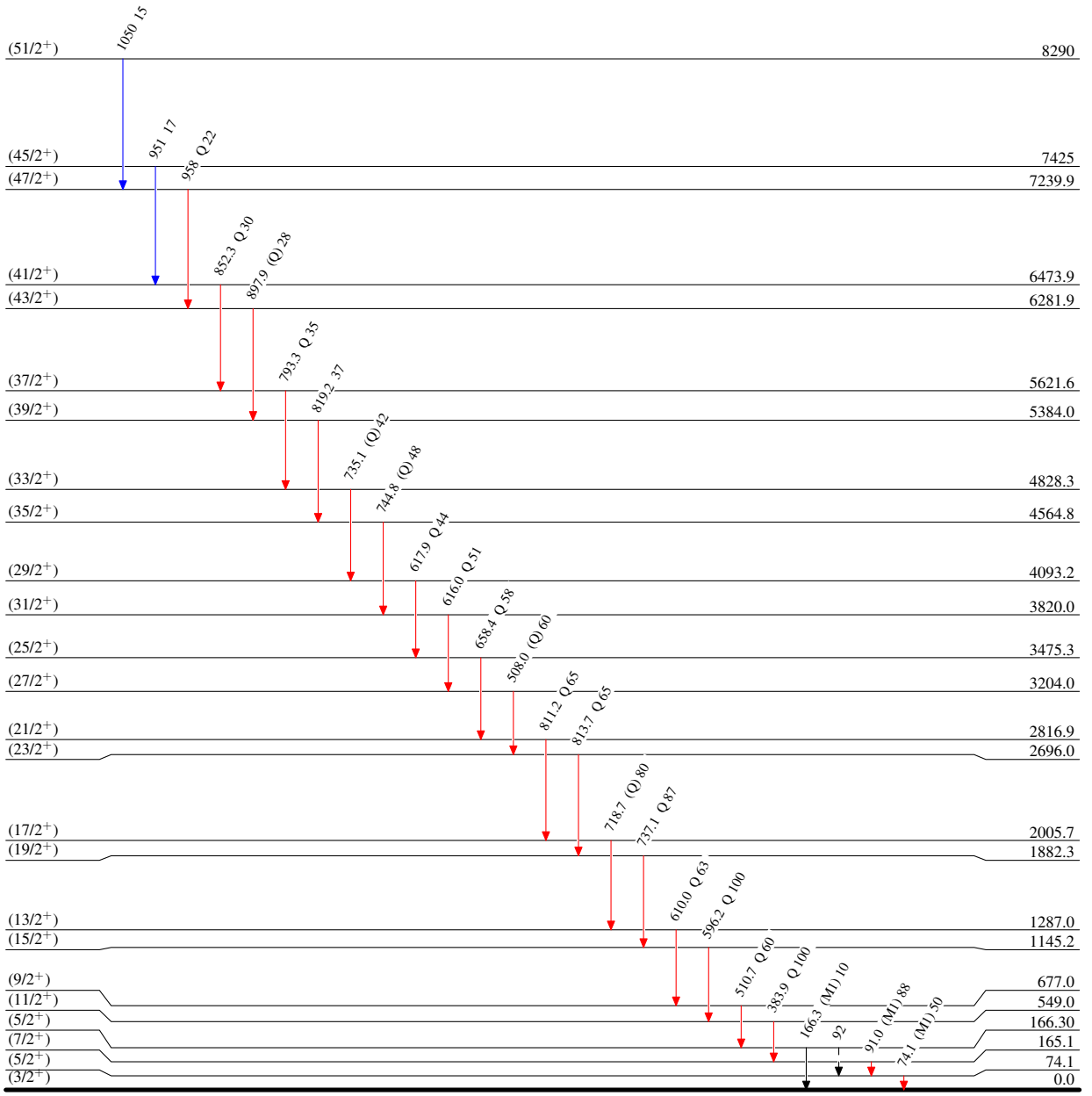
Legend

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

Level Scheme

Intensities: Relative I_γ



$^{113}_{55}Cs_{58}$

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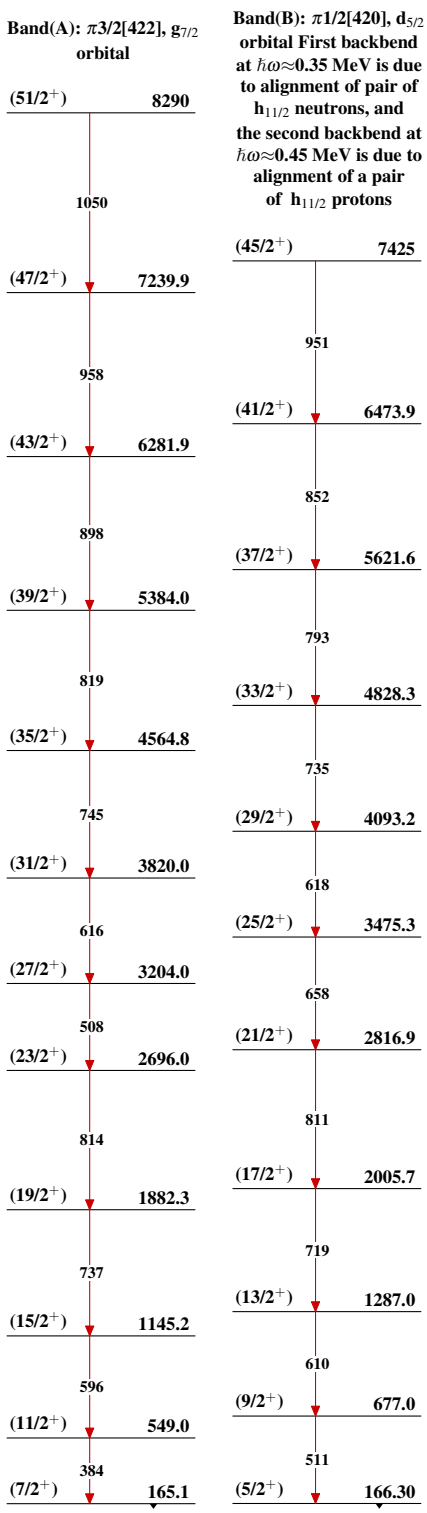

$^{113}_{55}Cs_{58}$