^{56}Zn εp decay (32.9 ms) 2014Or04,2016Or03

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	30-Apr-2022

Parent: ^{56}Zn: E=0.0; $J^{\pi}=0^+$; $T_{1/2}$=32.9 ms *8*; Q(εp)=12660 *SY*; %εp decay=88.0 *26*

^{56}Zn-T=2; $T_z=-2$.

^{56}Zn-$T_{1/2}$: From proton-decay curve correlated with ^{56}Zn implants (2014Or04). Other: 27 ms *8* from 1834.5γ decay curve (2014Or04).

^{56}Zn-Q(εp): 12660 *400* (syst, 2021Wa16).

^{56}Zn-%εp decay: Weighted average of %β^+p=88.5 *26* (2014Or04, from number of implantation of ^{56}Zn and proton intensities); 86 *5* (2007Do17). Missing 11.5% *26* branching is attributed by 2014Or04 to γ decay from 1691 level in ^{56}Cu in analogy with decay of a level in mirror nucleus ^{56}Co.

2016Or03, 2014Or04 (also 2016Ru04, 2015Or02, 2014Or03, 2014Ru08 conference reports): ^{56}Zn produced in fragmentation of 74.5 MeV/nucleon ^{58}Ni beam on a 200 μm thick natural Ni target using LISE3 separator at GANIL. Selected fragments were implanted into a double-sided silicon strip detector (DSSSD), surrounded by four EXOGAM Ge clovers for γ ray detection. An implantation was recorded by simultaneous signals in both the ΔE and DSSSD detectors and identified by combining energy loss ΔE and time-of-flight. Measured E(p), I(p), half-life of ^{56}Zn decay, proton decay branch. FWHM=70 keV for protons. A total of 8900, ^{56}Zn nuclei was implanted. Three γ-proton sequences were observed for the first time in *fp* shell.

From IMME analysis for T=2 multiplet using mass excess of ^{56}Fe, and those for the IAS in ^{56}Ni, ^{56}Co and ^{56}Cu, the last determined from the present work, 2014Or04 and 2016Or03 conclude that IMME deduced mass excess of ^{56}Zn=−25911 *20* agrees better with −25730 *260* in 2003Au03 than with −25580 *500* from 2012Wa38. For this reason 2016Or03 use Q(ε) and S(p)(^{56}Cu) value from 2003Au03. In 2021Wa16, mass excess of ^{56}Zn is −25390 *400*, even lower than that in 2012Wa38.

Additional information 1.

2007Do17: ^{56}Zn produced in fragmentation reaction at SISSE/LISE3 facility in GANIL. Primary beam: $^{58}Ni^{26+}$ at 74.5 MeV/nucleon; target=natural Ni. Fragment separator=α−LISE3. Fragment identification by energy loss, residual energy and time-of-flight measurements using two micro-channel plate (MCP) detectors and Si detectors. Double-sided silicon-strip detectors (DSSSD) and a thick Si(Li) detector were used to detect implanted events, charged particles and β particles. The γ rays were detected by four Ge detectors. Coincidences measured between charged particles and γ rays. $T_{1/2}$ measured by time correlation of implantation events due to ^{56}Zn and subsequent emission of protons and γ rays. Total proton branching ratio is from time spectrum of events with energy >900 keV in the charged-particle spectrum.

2016Sm01: analysis of ^{56}Zn εp decay. Discussed IAS in ^{56}Cu.

^{55}Ni Levels

E(level)	Comments
0.0	$T_z=-1/2$.

Delayed Protons (^{55}Ni)

E(p)†	E(^{55}Ni)	I(p)#	E(^{56}Cu)‡	Comments
831 *10*	0.0	3.0 *4*	1414	
1131 *10*	0.0	23.8 *11*	1714	Other: E(p)=1168 *33* with I(p)=8 *4* (2007Do17, unplaced).
1977 *10*	0.0	4.6 *8*	2560	
2101 *10*	0.0	17.1 *9*	2684	Other: E(p)=2120 *40* with I(p)=9 *4* (2007Do17, unplaced).
2863 *10*	0.0	21.2 *10*	3446	
2948 *10*	0.0	18.8 *10*	3531	Other: E(p)=2929 *31* with I(p)=20 *5* (2007Do17, unplaced). E(^{56}Cu): T=2, $J^{\pi}=0^+$, IAS of ^{56}Zn g.s.

† 2014Or04 interpreted all proton groups to feed the g.s. of ^{55}Ni, and excluded population of excited states in ^{55}Ni considering the measured proton energies and first excited state in ^{55}Ni at 2089 keV. All the values are in the center of mass system.

‡ Uncertainty is quoted as 140 keV by 2014Or04 based on S(p)(^{56}Cu)=560 keV *140* (syst, 2003Au03), but note that S(p)=583 keV

Continued on next page (footnotes at end of table)

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Delayed Protons (^{55}Ni) (continued)

6 in 2021Wa16. All the intermediate level energies have been adjusted accordingly.
Absolute intensity per 100 decays.

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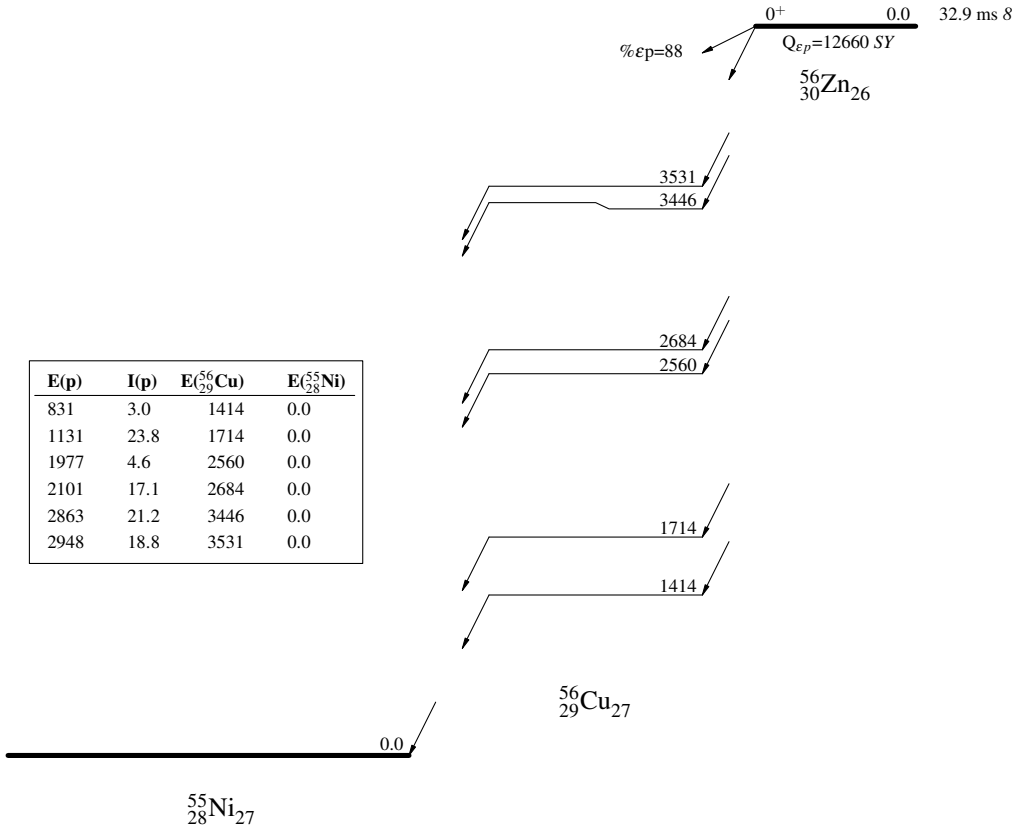
Decay Scheme

I(p) Intensities: I(p) per 100 parent decays



E(p)	I(p)	E($^{56}_{29}$Cu)	E($^{55}_{28}$Ni)
831	3.0	1414	0.0
1131	23.8	1714	0.0
1977	4.6	2560	0.0
2101	17.1	2684	0.0
2863	21.2	3446	0.0
2948	18.8	3531	0.0