Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	31-Jul-2014

S(n)=17820 *SY*; S(p)=2280 *50*; Q(α)=−5510 *70* 2012Wa38
Estimated uncertainty=210 in S(n) (2012Wa38).
Q(εp)=6500 *50*, S(2n)=32860 *510* (syst), S(2p)=2970 *50* (2012Wa38).
^{58}Zn nucleus is of astrophysical interest since it is deemed as a waiting-point nucleus in *rp* process in X-ray bursts.
1998Jo18 (also 2000Oi04): ^{58}Zn produced and identified in Nb(p,X) E=1 GeV at ISOLDE at CERN using selective laser-ion source. Measured Eγ, Iγ, βγ coin, isotopic half-life.
2002Lo13 (also 2002Bl17): ^{58}Zn obtained from fragmentation of ^{78}Kr beam at 73 MeV/nucleon at GANIL using LISE spectrometer. Measured isotopic half-life.
2005Ka46: ^{58}Zn produced and identified in Nb(p,X) E=1.4 GeV at ISOLDE at CERN using selective laser-ion source. Measured Eγ, Iγ, βγ coin, isotopic half-life. No delayed protons were observed from ^{58}Zn isotope. The authors state that analysis of ^{58}Ni(^{3}He,3n) (same reaction as was used by 1983HoZY) experiment is in progress to detect protons.
2007Bl09: fragmentation of ^{70}Ge beam at 71.6 MeV/nucleon with Ni target. Measured production cross section.
2009Fu15: fragmentation of ^{64}Zn^{+29} beam at 79 MeV/nucleon with natural Ni target at LISE3, GANIL facility. Measured half-life by measuring β-delayed γ-ray activity.
2012OrZY: ^{58}Zn produced in Ni(^{58}Ni,X),E=74.5 MeV/nucleon using LISE3 facility at GANIL. Detected ^{58}Zn fragments through TOF, E-ΔE measurements followed by detection of β particles. Half-life of ground state was measured from β-decay curve. This is an independent experiment by the same group as 2009Fu15. Through an e-mail communication of July 30, 2014 with Professor B. Rubio at University of Valencia, another experiment had been done for a precise measurement of ground-state half-life, results of which were communicated to the evaluator.
Others:
1983HoZY: possible identification in ^{58}Ni(^{3}He,3n) reaction, claimed to have observed delayed protons. This work remains unpublished.
1994Fo07 (also 1996Fo08,1987Zu03): ^{58}Ni(π^+,π^-) E=120-292 MeV; measured excitation function for double charge exchange reaction on T=1 target: ^{58}Ni(π^+,π^-)^{58}Zn, leading to double isobaric analog states and compared data with theoretical calculations.
1986Se04: ^{58}Ni(π^+,π^-) E=292 MeV, deduced mass excess.
2001Fo07: reaction rates of ^{57}Cu(p,γ)^{58}Zn and levels of ^{58}Zn from shell-model calculations. The first 2^+ state is predicted at 1400.
2006Va21, 2004Va38: Structure calculation for Pseudo-orbital SO(6) symmetry in ^{58}Zn, ^{58}Cu and ^{58}Ni.
Additional information 1.

^{58}Zn Levels

Cross Reference (XREF) Flags

A ^{2}H(^{57}Cu,^{58}Znγ)

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0.0	0^+	86.7 ms *24*	A	%ε+%β^+=100; %εp<3 (1998Jo18) $T_{1/2}$: weighted average of 86.5 ms *32* (e-mail communication of July 30, 2014 with Professor B. Rubio, University of Valencia), 88 ms *5* (2012OrZY), 90 ms 8 (2009Fu15), 83 ms *10* (2005Ka46), 83 ms *10* (2002Lo13), 86 ms *18* (1998Jo18). Methods: γ decay timing (2009Fu15), β-gated timing (1998Jo18), β(fragment) timing correlations (2002Lo13,2012OrZY). Method not discussed in 2005Ka46. 2012OrZY (and result of new experiment communicated on July 30, 2014), 2009Fu15 and 2002Lo13 are from GANIL; 2005Ka46 and 1998Jo18 are from ISOLDE-CERN. Since all are independent experiments even though some authors are the same on above publications, weighted averaging of all data is justifiable.
1356 *3*	(2^+)		A	
2499 *4*	(4^+)		A	
2609 *6*	(2^+)		A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{58}Zn Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF
2862 *3*	(2$^+$)	A
2902 *3*	(1$^+$)	A
3263 *4*	(2$^+$)	A
3378 *6*	(3$^+$)	A

[†] From least-squares fit to Eγ data. All levels listed here above the first 2$^+$ level at 1356 keV are proton unbound.
[‡] From systematics of even-even nuclei, shell-model predictions, and mirror analogy with ^{58}Ni nucleus.

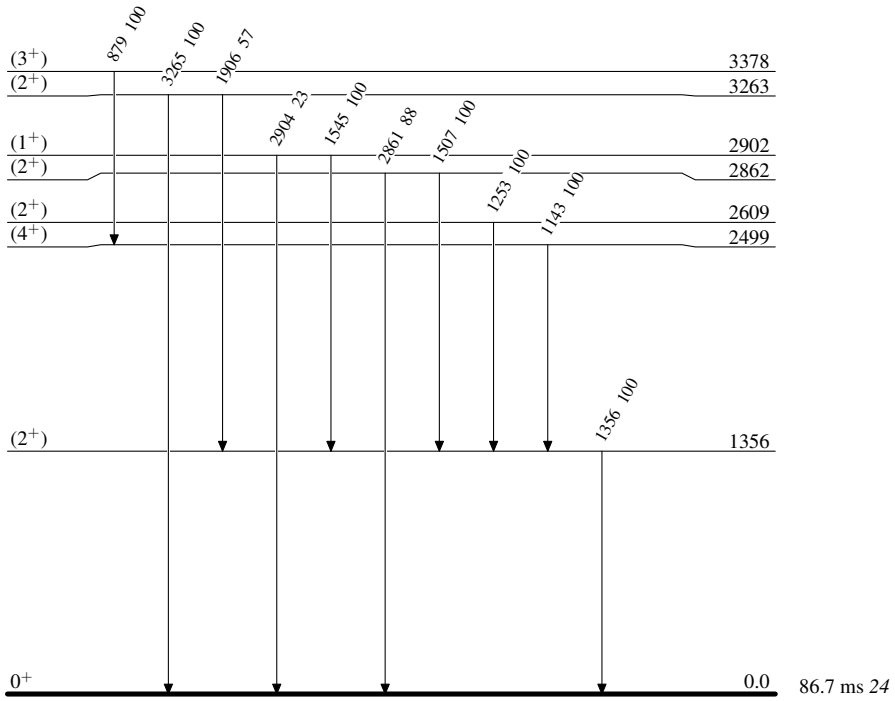
γ(^{58}Zn)

E$_i$(level)	J$_i^{\pi}$	E$_{\gamma}$	I$_{\gamma}$	E$_f$	J$_f^{\pi}$
1356	(2$^+$)	1356 *3*	100	0.0	0$^+$
2499	(4$^+$)	1143 *3*	100	1356	(2$^+$)
2609	(2$^+$)	1253 *5*	100	1356	(2$^+$)
2862	(2$^+$)	1507 *4*	100 *25*	1356	(2$^+$)
		2861 *4*	88 *25*	0.0	0$^+$
2902	(1$^+$)	1545 *3*	100 *15*	1356	(2$^+$)
		2904 *5*	23 *8*	0.0	0$^+$
3263	(2$^+$)	1906 *4*	57 *29*	1356	(2$^+$)
		3265 *6*	100 *29*	0.0	0$^+$
3378	(3$^+$)	879 *4*	100	2499	(4$^+$)

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{58}_{30}Zn_{28}$