Adopted Levels, Gammas

		History	
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	10-Jun-2015

Q(β^-)=7290 *SY*; S(n)=5510 *SY*; S(p)=15370 *SY*; Q(α)=−8970 *SY* 2012Wa38
Estimated uncertainties (2012Wa38): 200 for Q(β^-) and S(n), 540 for S(p), 210 for Q(α).
Q(β^-n)=2930 *200*, S(2n)=9320 *200*, S(2p)=29380 *360* (syst,2012Wa38).

1994Be24, 1998Do08: ^{106}Zr produced and identified in Pb(^{238}U,F), reaction at E=750 MeV/nucleon. Identification by time-of-flight, FRS at GSI facility.

1997So07: ^{208}Pb(^{238}U,F),E=20 MeV/nucleon at NSCL facility using the A1200 fragment separator, four events assigned to ^{106}Zr.

2009Pe06: ^{106}Zr formed by fragmentation of ^{136}Xe beam at 120 MeV/nucleon at NSCL facility using Coupled Cyclotrons and A1900 fragment separator. The time-of-flight and transversal positions of each particle was measured using two plastic scintillators. The ΔE energy loss in a Si PIN detector was measured which, when combined with time-of-flight (tof) and transversal position measurements, allowed for an event-by-event identification of the transmitted nuclei. Transmitted nuclei and their β decays were measured using the β counting system consisting of four Si PIN detectors and a double-sided Si strip detector. β-delayed neutrons were measured in coincidence with β-decay precursor using neutron emission ratio observer (NERO) detector consisting of 60 proportional gas counter tubes embedded in polyethylene moderator matrix. The γ rays were measured with SeGA Ge detectors. Measured isotopic half-lives and delayed neutron emission probabilities Isotopic half-life was measured by 2009Pe06 from least-squares fit and maximum likelihood method of time differences of implantations and correlated β decay events.

2011Ni01: ^{106}Zr nuclide produced in Be(^{238}U,F) reactions at E=345 MeV/nucleon produced by the cascade operation of the RBIF complex of accelerators at RIKEN. Target=550 mg/cm^2. Identification of ^{106}Zr made on the basis of magnetic rigidity, time-of-flight and energy loss. The separated nuclei were implanted in a nine-layer double-sided silicon-strip detector (DSSSD). Correlations were recorded between the heavy ions and β rays. The half-life of ^{106}Zr isotope was measured from the correlated ion-β decay curves and maximum likelihood analysis technique. In the analysis of the decay curve, β-detection efficiency, background rate, daughter and granddaughter (including those populated in delayed neutron decays) half-lives, and β-delayed neutron emission probabilities were considered. Comparison of measured half-lives with FRDM+QRPA and KTUY+GT2 calculations.

2015Lo04: ^{106}Zr nuclide produced at RIBF-RIKEN facility in ^{9}Be(^{238}U,F) reaction at E=345 MeV/nucleon with an average intensity of 6×10^{10} ions/s. Identification of ^{106}Zr was made by determining atomic Z and mass-to-charge ratio A/Q, where Q=charge state of the ions. The selectivity of ions was based on magnetic rigidity, time-of-flight and energy loss. The separated nuclei were implanted at a rate of 50 ions/s in a stack of eight double-sided silicon-strip detector (WAS3ABi), surrounded by EURICA array of 84 HPGe detectors. Correlations were recorded between the implanted ions and β rays. The half-life of ^{106}Zr isotope was measured from the correlated ion-β decay curves and maximum likelihood analysis technique as described in 2014Xu07. Comparison of measured half-lives with FRDM+QRPA, KTUY+GT2 and DF3+CQRPA theoretical calculations.

2011Su11: ^{106}Zr states populated by β-decay of ^{106}Y. See ^{106}Y β^- decay (79 ms) dataset for details.

2006Jo14: mass measurement.

Theoretical structure calculations:

2012Sh05: levels, J, π, configurations, shapes, and deformation parameters.
2011Li13: levels, J, π, rotational bands, yrast band, quasiparticle bands, inertia moment, B(E2).
2011Pe35: levels, J, π, deformation, shape coexistence, rotational band, band mixing.
2010Bo12: level energies, B(E2) values, and potential energy surface, IBA-1 model.
2009La08: level energies, and B(E2) values. IBA-1 model.
2002Xu02: levels, isomers, deformation parameters.
Additional information 1.
1985Ca33: levels, B(E2) ratios.

Adopted Levels, Gammas (continued)

^{106}Zr Levels

Cross Reference (XREF) Flags

A ^{106}Y β^- decay (79 ms)
B ^{9}Be(^{238}U,Fγ)

E(level)†	J$^\pi$‡	T$_{1/2}$	XREF	Comments
0.0#	0$^+$	180 ms *9*	AB	%β^-=100; %β^-n≤7 (2009Pe06) Theoretical %β^-n=0.6 (2003Mo09). T$_{1/2}$: weighted average of 175 ms *7* (2015Lo04), 186 ms *11* (2011Ni01), and 260 ms *40* (2009Pe06). Method: ion-β correlations.
152.1# *5*	(2$^+$)		AB	
476.5# *7*	(4$^+$)		AB	
607.0 *5*	(2$^+$)		A	Transition from this level to the first 2$^+$ state is expected, but no γ-ray peak was observed at 455 keV due to low statistics (2011Su11).
946.5# *12*	(6$^+$)		B	
1571.5# *23*	(8$^+$)		B	

† From Eγ data, assuming ΔEγ=0.5 keV when not stated.
‡ From systematics of yrast levels in even-even Zr nuclei (2011Su11) and ground-state band members (2014An01).
# Band(A): The g.s. band.

γ(^{106}Zr)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	E$_f$	J$^\pi_f$	Mult.
152.1	(2$^+$)	152.1	0.0	0$^+$	[E2]
476.5	(4$^+$)	324.4	152.1	(2$^+$)	
607.0	(2$^+$)	607.0	0.0	0$^+$	
946.5	(6$^+$)	470 *1*	476.5	(4$^+$)	
1571.5	(8$^+$)	625 *2*	946.5	(6$^+$)	

† From β^- decay, if a level is populated in both the datasets.

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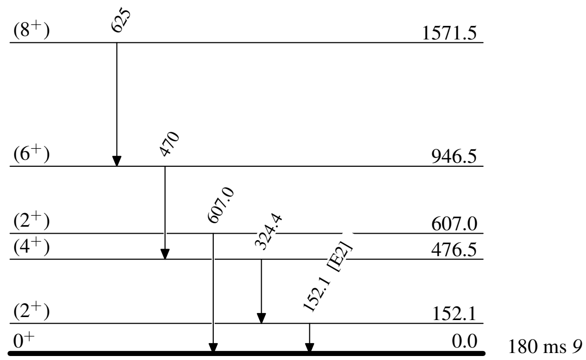
Level Scheme



$^{106}_{40}Zr_{66}$

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