

Adopted Levels

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen		NDS 172, 1 (2021)	31-Jan-2021

$S(n)=17410$ SY; $S(p)=3200$ SY; $Q(\alpha)=-4140$ SY [2017Wa10](#)

Estimated uncertainties=590 in $S(n)$, 420 in $S(p)$, 500 in $Q(\alpha)$ ([2017Wa10](#)).

$S(2p)=4220$ 310, $Q(\epsilon p)=5360$ 300 ([2017Wa10](#)). $S(2n)=31390$ ([2019Mo01](#), theory).

Measurements:

[1994Sc22](#), [1995Sc28](#), [1996Ki23](#) (also [1995Sc33](#),[1997Su06](#)): ^{100}Sn produced by fragmentation of ^{124}Xe in $^9\text{Be}(^{124}\text{Xe},X)$ reaction at $E=1095$ MeV/nucleon at GSI facility. The isotopic identification made through event-by-event magnetic rigidity, time-of-flight, and energy deposition. A total of nine events for ^{100}Sn observed as reported by [1996Ki23](#). Measured β -endpoint energy in [1997Su06](#) and [1996Ki23](#).

[1994Le27](#), [1995Le14](#) (also [1995Ry03](#)): ^{100}Sn produced by $\text{Ni}(^{112}\text{Sn},X)$ $E=63$ MeV/nucleon fragmentation reaction. The isotopic identification (A,Z,Q) was made by time-of-flight, energy loss, and kinetic energy measurements. A total of 24 events (11 events reported by [1994Le27](#) and 13 additional events by [1995Ry03](#) and [1995Le14](#)) corresponding to ^{100}Sn were observed.

[1996Ch32](#), [1997Mi07](#) (also [1997Le36](#)): $^{58}\text{Ni}(^{50}\text{Cr},2p5n)$ $E=5.3$ MeV/nucleon at GANIL facility. Silicon detector telescope. A total of 10 events of $^{100}\text{Sn}^{22+}$ (charge state) were detected. Measured mass excess for $^{100}\text{Sn}=-57770$ 300(stat) 900(syst); mass excess for $^{100}\text{In}=-64650$ 300(stat) 100(syst); relative to that for ^{100}Ag . Deduced mass difference= 6880 300(stat) 900(syst) between ^{100}Sn and ^{100}In . Production cross section= 40 nb.

[2002Fa13](#): Fragmentation of ^{112}Sn beam at 1 GeV/nucleon by ^9Be target at GSI facility. The fragments were separated, identified and stopped in a highly segmented silicon strip detector stack. Measured total energy of β^+ events. One event ascribed to ^{100}Sn (corresponding production cross section= 1.8 pb). Deduced $T_{1/2}=1.00$ s $+54-26$ ([2002Fa13](#)) from one event observed by [2002Fa13](#) and six events in earlier study by [1994Sc22](#).

[2005Ka47](#): $^{58}\text{Ni}(^{50}\text{Cr},2p5n)$ $E=5.8$ MeV/nucleon at GSI facility. Measured β gated gamma spectrum, production cross section (≈ 3 nb), no β -delayed γ rays detected, total absorption spectrometer (TAS) used.

[2008Ba53](#): primary $E=120$ MeV/nucleon ^{112}Sn beam from NSCL facility and ^9Be target. Secondary beam of ^{100}Sn nuclei analyzed and separated using A1900 fragment separator and radio frequency fragment separator (RFFS). Filtered secondary beam was implanted in beta counting system surrounded by segmented Ge array of 16 detectors. The beta counting system consisted of three silicon detectors and one double-sided strip detector in which the ions were implanted. The β calorimeter consisted of six single-sided strip detectors and a high-purity thin planar Ge detector. Measured cross sections for production of secondary beam nuclei and isotopic half-lives. The measured cross sections and half-lives were compared with model calculations.

[2012Lo08](#): ^{100}Sn produced from fragmentation of a ^{112}Sn beam at $E=120$ MeV/nucleon on a 195 mg/cm 2 ^9Be target at NSCL-MSU facility. Fragments separated by the A1900 Fragment Separator and the Radio Frequency Fragment Separator (RFFS). Ions were implanted in a double-sided silicon strip detector (DSSD). Detection system: NSCL Beta Counting System in conjunction with the SeGA Array of 16 HPGe detectors. Measured $E\gamma$, $I\gamma$, β spectra, $E(p)$, $I(p)$, $\beta\gamma$ -coin, βp -coin, $\gamma\beta p$ -coin, half-life, β -delayed proton emission probability. Total of 14 ^{100}Sn nuclei were implanted into the DSSD but no βp coin events were identified.

[2012Hi07](#): ^{100}Sn produced in fragmentation of ^{124}Xe beam at 1.0 GeV/nucleon with a 4.008 g/cm 2 thick beryllium target at GSI facility. The FRS fragment separator was used to separate reaction products. Fragments were separated and identified event-by-event with respect to A/Q and Z based on magnetic rigidity and flight times. A total of 259 ^{100}Sn nuclei were identified, much more than in any previous experiment. The ions were implanted into segmented Si strip detectors surrounded by the RISING array consisting of 105 Ge detectors. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ -coin, $E\beta$, $I\beta$, ^{100}Sn half-life by detecting radiations in correlation with 163 ^{100}Sn nuclei stopped in the implantation layer. Out of 163 ^{100}Sn implanted nuclei, 126 decay chains could be assigned.

[2019Lu08](#): ^{100}Sn from 345 MeV/nucleon ^{124}Xe beam incident on a 4 m.m. thick ^9Be target at the RIKEN-RIBF facility. The identification of the nuclide of interest was made through the BigRIPS separator and the ZeroDegree spectrometer by determining the atomic number and the mass-to-charge ratio of the ion using the tof-B ρ - ΔE method. The secondary beam was stopped in the double-sided silicon strip detector of the WAS3ABi spectrometer. A total of 2500 nuclei of ^{100}Sn were detected. The γ rays were detected by EURICA array comprising 47 HPGe detectors. Measured $E\gamma$, $I\gamma$, (implant) γ -coin, half-life of ^{100}Sn decay by (implant) γ -decay and implantations decay curves. Comparisons with previous experimental data and shell-model calculations.

Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for 301 primary references, 294 dealing with nuclear structure calculations and seven with decay modes and half-lives.

[Additional information 1.](#)

Adopted Levels (continued) ^{100}Sn LevelsCross Reference (XREF) FlagsA ^{104}Te α decay:tentative

<u>E(level)</u>	<u>Jπ</u>	<u>T$_{1/2}$</u>	<u>XREF</u>	<u>Comments</u>
0	0 ⁺	1.18 s 8	A	<p>$\% \epsilon + \% \beta^+ = 100$; $\% \epsilon p < 17$ (1996Ki23,1997Su06) XREF: A(?). $\% \epsilon p < 17$ (1996Ki23,1997Su06); <35% from 2012Lo08 based on analysis of seven ^{100}Sn implantations, with no delayed proton events observed; upper limit of 35% given with 95% confidence limit. Other: from observation of a single proton event attributed to delayed proton decay in 2012Hi07, $\% p$ decay of the 2720+x level in ^{100}In is estimated by 2012Hi07 as <1%.</p> <p>T$_{1/2}$: weighted average of 1.18 s 8 (2019Lu08, average of 1.17 s 10 from decay correlations of 2500 ^{100}Sn implantations, and 1.19 s 10 from implant-γ correlations); and 1.16 s 20 (2012Hi07, from time distribution of decay events correlated with 163 ^{100}Sn implantations analyzed by maximum likelihood method taking into account half-life of daughter nuclei and small background). Others: 0.55 s +70-31 (2008Ba53, from β decays correlated with 14 5 implanted nuclei); 1.00 s +54-26 (2002Fa13, from one event in 2002Fa13 and six in 1996Ki23,1994Sc22; also 0.94 s +54-27 from analysis of seven events in 1997Su06,1996Ki23, 1994Sc22); 0.66 s +59-22 (1995Sc28,1995Sc33, from four events). Weighted average of all the measured values from 2019Lu08, 2012Hi07, 2008Ba53, 2002Fa13, and 1995Sc28 is 1.16 s 8, close to the Adopted value here.</p> <p>Production $\sigma = 5.8$ pb 21 (2012Hi07) from 259 nuclei assigned to ^{100}Sn, 0.25 pb 15 (2008Ba53) from 14\pm5 events assigned to ^{100}Sn in $^9\text{Be}(^{112}\text{Sn},X)$ at 120 MeV/nucleon, NSCL-MSU facility. Production cross section=11 pb 4 (1997Su06) from seven events in $^9\text{Be}(^{124}\text{Xe},X)$ at 1095 MeV/nucleon, GSI facility.</p> <p>Measured E(β endpoint)=3.29 MeV 20 (2012Hi07), 3.8 MeV +7-3 (2002Fa13), 3.4 MeV +7-3 (1996Ki23, 1997Su06), 3.5 MeV +13-2 (1995ScZZ), observed β energies=700-2700 keV from seven events (1995Sc28,1995Sc33).</p>