

Adopted Levels

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Ictp-2014 Workshop Group		NDS 132, 257 (2016)	15-Jan-2016

$Q(\beta^-)=4600$ SY; $S(n)=5200$ SY; $S(p)=7350$ SY; $Q(\alpha)=2920$ SY [2012Wa38](#)

Estimated uncertainties in [2012Wa38](#): 300 for $Q(\beta^-)$, 420 for $S(n)$, 500 for $S(p)$ and $Q(\alpha)$.

$S(2n)=9050$ 420, $Q(\beta^-n)=670$ 300 (syst,[2012Wa38](#)), $S(2p)=17890$ ([1997Mo25](#),theory).

^{227}At evaluated by **B. Singh**.

[2010A124](#): ^{227}At nuclide identified in $^9\text{Be}(^{238}\text{U},X)$ reaction with a beam energy of 1 GeV/nucleon produced by the SIS synchrotron at GSI facility. Target=2500 mg/cm². The fragment residues were analyzed with the high resolving power magnetic spectrometer Fragment separator (FRS). The identification of nuclei was made on the basis of magnetic rigidity, velocity, time-of-flight, energy loss and atomic number of the fragments using two plastic scintillators and two multisampling ionization chambers. The FRS magnet was tuned to center on ^{210}Au , ^{216}Pb , ^{219}Pb , ^{227}At and ^{229}At nuclei along the central trajectory of FRS.

Unambiguous identification of nuclides required the separation of different charge states of the nuclei passing through the FRS. At 1 GeV/nucleon incident energy of ^{238}U , fraction of fully stripped ^{226}Po nuclei was about 89%. Through the measurement of difference in magnetic rigidity in the two sections of the FRS and the difference in energy loss in the two ionization chambers, the charge state of the transmitted nuclei was determined, especially, that of the singly charged (hydrogen-like) nuclei which preserved their charge in the current experimental setup. Measured production cross sections with 10% statistical and 20% systematic uncertainties.

Criterion established in [2010A124](#) for acceptance of identification of a new nuclide: 1. number of events should be compatible with the corresponding mass and atomic number located in the expected range of positions at both image planes of the FRS spectrometer; 2. number of events should be compatible with >95% probability that at least one of the counts does not correspond to a charge-state contaminant. Comparisons of measured σ with model predictions using the computer codes COFRA and EPAX.

 ^{227}At Levels

E(level)	$T_{1/2}$	Comments
0	>300 ns	$\% \beta^- = ?$; $\% \beta^- n = ?$ Production $\sigma=10.8$ nb (priv. comm. as e-mail reply of Oct 29, 2010 from H. Alvarez-Pol, which also stated that further analysis was in progress). From A/Z plot (figure 1 in 2010A124), ≈ 110 events are assigned to ^{227}At . E(level): the observed fragments are assumed to be in the ground state of ^{227}At . The β^- decay is the main decay mode expected. From $Q(\beta^-n)=670$ 300 (syst, 2012Wa38), β -delayed neutron decay is marginally possible. Theoretical $\% \beta^- n=0.12$ (2003Mo09). $T_{1/2}$: lower limit from time-of-flight as given in 2006Ca30 for a similar setup. Actual half-life is expected to be much larger as suggested by the theoretical value of 8.1 s for β decay (2003Mo09) and $>10^{20}$ s for α decay (1997Mo25), and systematic value of 20 s for β decay (2012Au07). J^π : $3/2^-$ predicted in 1997Mo25 calculations; $1/2^+$ suggested from systematics (2012Au07). Production cross section measured in 2010A124 , values are given in figure 2, plot of σ versus mass number for At isotopes. Statistical uncertainty=10%, systematic uncertainty=20%.