

Adopted Levels

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Michael Birch	ENSDF	15-May-2011

$Q(\beta^-)=4.3\times 10^3$ syst; $S(n)=4.8\times 10^3$ syst; $S(p)=6.9\times 10^3$ syst; $Q(\alpha)=3.4\times 10^3$ syst [2012Wa38](#)

Note: Current evaluation has used the following Q record \$ 4190 syst 4760 syst 7190 syst 3160 syst [2011AuZZ](#).

Estimated uncertainties in [2011AuZZ](#): 300 for $Q(\beta^-)$, 360 for $S(n)$ 500 for $S(p)$ and $Q(\alpha)$.

$Q(\beta^-n)=650$ 360, $S(2n)=8510$ 360 (syst,[2011AuZZ](#)), $S(2p)=17770$ ([1997Mo25](#),calculated).

[2010AI24](#): ^{221}Bi 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 [2010AI24](#) 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. See also previous report [2009AI32](#) by the same group as [2010AI24](#).

[2003Bo48](#): used microscopic models to calculate $T_{1/2}$.

 ^{221}Bi Levels

E(level)	$T_{1/2}$	Comments
0	>300 ns	<p>$\% \beta^- = ?$; $\% \beta^- n = ?$</p> <p>Production $\sigma = 5.00$ nb (from e-mail reply of Oct 29, 2010 from H. Alvarez-Pol, which also stated that further analysis was in progress).</p> <p>From A/Z plot (figure 1 in 2010AI24), a large number (certainly more than one hundred) of events are assigned to ^{221}Bi.</p> <p>E(level): the observed fragments are assumed to be in the ground state of ^{221}Bi nuclei.</p> <p>The β^- and delayed neutron decay are the only decay modes expected.</p> <p>Calculated $\% \beta^- n = 1.9$ (1997Mo25).</p> <p>$T_{1/2}$: 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 calculated value of 17 s for β decay and $>10^{20}$ s for α decay (1997Mo25), and systematic value of 5 s for β decay (2011AuZY).</p> <p>J^π: 1/2 predicted in 1997Mo25 calculations; 9/2⁻ from systematics (2011AuZY).</p> <p>Production cross section measured in 2010AI24, values are given in figure 2, plot of σ versus mass number for Bi isotopes. Statistical uncertainty=10%, systematic uncertainty=20%.</p>