

Adopted Levels

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 114, 661 (2013)	28-Feb-2013

$Q(\beta^-)=4410$  40;  $S(n)=4900$  40;  $S(p)=8000$  SY;  $Q(\alpha)=2300$  SY [2012Wa38](#)

Estimated uncertainties ([2012Wa38](#)): 200 for  $S(p)$ ; 300 for  $Q(\alpha)$ .

$Q(\beta^-n)=580$  40,  $S(2n)=8580$  40,  $S(2p)=18190$  400 (syst) ([2012Wa38](#)).

$^{211}\text{Tl}$  evaluated by B. Singh.

[1998Pf02](#):  $^{211}\text{Tl}$  was produced by fragmentation of a 1-GeV/nucleon  $^{238}\text{U}$  beam on a beryllium target. Isotope was identified by a measurement of mass-to-charge ratio.

[Additional information 1.](#)

[2010AI24](#):  $^{211}\text{Tl}$  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/cm<sup>2</sup>. 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  $^{210}\text{Au}$ ,  $^{216}\text{Pb}$ ,  $^{219}\text{Pb}$ ,  $^{227}\text{At}$  and  $^{229}\text{At}$  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  $^{238}\text{U}$ , fraction of fully stripped  $^{226}\text{Po}$  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  $\sigma$  with model predictions using the computer codes COFRA and EPAX.

[2012Be28](#): see [2010AI24](#) above for method of production at GSI facility. In this work half-life of the isotope is measured from an implant of 3503 events.

 $^{211}\text{Tl}$  Levels

E(level)	$T_{1/2}$	Comments
0	88 s +46-29	<p><math>\% \beta^- = 100</math>; <math>\% \beta^- n = ?</math></p> <p>The <math>\beta^-</math> and delayed neutron decay are the only decay modes expected; <math>\beta^-</math> decay is seen in <a href="#">2012Be28</a> through (implant)<math>\beta</math> correlations. From calculations (<a href="#">1997Mo25</a>), no <math>\beta^-n</math> decay mode is predicted.</p> <p>E(level): it is assumed that the observed fragments correspond to nuclei in their ground state.</p> <p><math>T_{1/2}</math>: from (implant)<math>\beta\gamma</math> correlations (<a href="#">2012Be28</a>) from 3503 implants, using a fitting method for high background conditions.</p> <p><math>J^\pi</math>: <math>1/2^+</math> from systematics (<a href="#">2012Au07</a>), and also predicted in <a href="#">1997Mo25</a> calculations.</p> <p>Production cross section measured in <a href="#">2010AI24</a>, values are given in figure 2, plot of <math>\sigma</math> versus mass number for Tl isotopes. Statistical uncertainty=10%, systematic uncertainty=20%. Production <math>\sigma=82</math> nb (from 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 <a href="#">2010AI24</a>), a large number of events is assigned to <math>^{211}\text{Tl}</math>.</p>