

**Adopted Levels, Gammas**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	20-Jul-2015

Q( $\beta^-$ )=11216 13; S(n)=3897 12; S(p)=12570 5Y; Q( $\alpha$ )=7910 5Y 2012Wa38

Estimated uncertainties (2012Wa38): 300 for S(p), 400 for Q( $\alpha$ ).

Q( $\beta^-$ )n=4941 13, S(2n)=9489 9, S(2p)=28070 500 (syst) (2012Wa38).

1994Be24: <sup>108</sup>Nb produced and identified in Pb(<sup>238</sup>U,f), E=750 MeV/nucleon, followed by on-line mass separation and time-of-flight method at GSI facility.

1996Pe25, 1996Me09: <sup>108</sup>Nb produced in U(p,F),E=50 MeV in 1996Pe25 and E=25,30 MeV in 1996Me09; measured T<sub>1/2</sub>,  $\beta^-$ n probability.

**Additional information 1.**

2009Pe06: <sup>108</sup>Nb formed by fragmentation of 120 MeV/nucleon <sup>136</sup>Xe beam from 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  $\Delta E$  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  $\beta$  decays were measured using the  $\beta$  counting system consisting of four Si PIN detectors and a double-sided Si strip detector.  $\beta$ -delayed neutrons were measured in coincidence with  $\beta$ -decay precursor using neutron emission ratio observer (NERO) detector consisting of 60 proportional gas counter tubes embedded in polyethylene moderator matrix. The  $\gamma$  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  $\beta$  decay events.

2015Lo04: <sup>108</sup>Nb nuclide produced at RIBF-RIKEN facility in <sup>9</sup>Be(<sup>238</sup>U,F) reaction at E=345 MeV/nucleon with an average intensity of 6x10<sup>10</sup> ions/s. Identification of <sup>108</sup>Nb 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  $\beta$  rays. The half-life of <sup>108</sup>Nb isotope was measured from the correlated ion- $\beta$  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.

Mass measurement: 2011Ha48.

<sup>108</sup>Nb Levels

Cross Reference (XREF) Flags

- A <sup>108</sup>Zr  $\beta^-$  decay (77.4 ms)
- B <sup>108</sup>Nb IT decay (0.109  $\mu$ s)

E(level)	J $^\pi$	T <sub>1/2</sub>	XREF	Comments
0.0	(2 <sup>+</sup> )	198 ms 6	AB	$\% \beta^- = 100$ ; $\% \beta^- n = 6.3$ 5; $\% \beta^- 2n = ?$ $\% \beta^- n$ : weighted average of 6.2 5 (1996Me09) and 8 2 (2009Pe06). Theoretical T <sub>1/2</sub> =307 ms, $\% \beta^- n = 16.6$ , $\% \beta^- 2n = 0.0$ (2003Mo09). J $^\pi$ : from log ft=5.0 to 3 <sup>+</sup> and 5.4 to 2 <sup>+</sup> . Possible configuration= $\pi 5/2[422] \otimes \nu 1/2[411]$ (1996Pe25). T <sub>1/2</sub> : weighted average of 195 ms 6 (2015Lo04, correlated ion- $\beta$ decay curves and maximum likelihood analysis technique), 220 ms 18 (2009Pe06, least-squares fit and maximum likelihood method of time differences of implantations and correlated $\beta$ decay events, with systematic uncertainty=10 ms and statistical uncertainty=15 ms), 0.20 s 3 (1996Pe25, 0.19 s 2 in 1996Me09 from the same group as 1996Pe25, from $\beta$ -gated and neutron singles multiscaling curves by fitting the total growth-in and decay periods of the time spectra).
64.3 5			B	
77.6 5			B	
166.6 5	(4 <sup>-</sup> ,5)	0.109 $\mu$ s 2	B	$\% IT = 100$

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $^{108}\text{Nb}$  Levels (continued)

<u>E(level)</u>	<u>J<sup>π</sup></u>	<u>T<sub>1/2</sub></u>	<u>XREF</u>	<u>Comments</u>
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J<sup>π</sup>: assigned by [2012Au07](#) based on decay pattern.  
 T<sub>1/2</sub>: from γ(t) method ([2012Ka36](#)).

γ( $^{108}\text{Nb}$ )

<u>E<sub>i</sub>(level)</u>	<u>J<sub>i</sub><sup>π</sup></u>	<u>E<sub>γ</sub></u>	<u>I<sub>γ</sub></u>	<u>E<sub>f</sub></u>	<u>J<sub>f</sub><sup>π</sup></u>	<u>Mult.</u>	<u>α<sup>†</sup></u>
64.3		64.3 5	100	0.0	(2 <sup>+</sup> )		
77.6		(14)		64.3			
		77.6 5	100 2	0.0	(2 <sup>+</sup> )	D	
166.6	(4 <sup>-</sup> ,5)	89.0 5	100.0 18	77.6		(E2)	1.77 4
		102.2 5	33.9 18	64.3			

† Total theoretical internal conversion coefficients, calculated using the BrIcc code ([2008Ki07](#)) with Frozen orbital approximation based on γ-ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

-----▶ γ Decay (Uncertain)

