Adopted Levels

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, G. C. Sheu	ENSDF	16-Jan-2016

History

$Q(\beta^-)=23.418\times10^3$ *25*; $S(n)=-82$ *33*; $S(p)=19.99\times10^3$ *syst*; $Q(\alpha)=-14.23\times10^3$ *29* 2012Wa38

The particle instability of ^{16}B:

1974Bo05: Spallation products induced by 4.8 GeV Bevatron protons on a uranuim target were analyzed and identified using standard techniques. The measurement was carried out inside a 91 cm diameter scattering chamber, where the ΔE detector was placed 17 cm from the spallation target and the E detector was 12 cm from the ΔE detector. The time-of-flight between signals in the ΔE and E detectors was measured, and particle identifications were made using ΔE vs E and ΔE vs ToF techniques. The particle instability, limited by the flight time between the ΔE and E detectors, was shown by the lack of observation of any ^{16}B counts along with the positive observation of the neighboring ^{15}B and ^{17}B nuclides.

1985La03: The particle instability of ^{16}B was confirmed at GANIL in a study of the nuclides produced in the fragmentation of a 44 MeV/nucleon ^{40}Ar beam on a thick tantalum target. The fragments were momentum analyzed in the LISE spectrometer, with a 18 meter flight path, and then detected using a ΔE-ΔE-E-VETO telescope at the focal plane. The $^{13,14,15,17}B$ isotopes were identified in the measurement, but the absence of $^{16,18}B$ isotopes provide evidence that they are not particle stable (within the limits of the short flight path).

1996Kr05: The authors analyzed the experimental conditions of prior studies and estimated lifetime limits of ≈9 ns (1974Bo05) and ≈260 ns (1985La03). With the aim on better constraining the ^{16}B lifetime, a new experiment was carried out that reached an upper limit of T<170 ps for ^{16}B.

An 880 MeV ^{17}C beam was produced using the NSCL/A1200 fragment separator. The beam was identified by ΔE vs time-of-flight techniques immediately before impinging on a 114 mg/cm^2 ^{nat}C target. Reaction products were stopped in a four element ΔE-ΔE-ΔE-E Si detector telescope that was placed immediately behind the secondary target and covered $\theta<15°$. No peak corresponding to ^{16}B events was observed in the spectrum, and a limit of T<170 ps *69* was suggested. A significant discussion on "background" events was given in the text.

2013Th07: The authors suggest two novel techniques for measuring lifetimes of neutron unbound nuclides.

Decay in Target: An analysis of the average velocity difference of neutrons vs. charged "core" fragments is suggested as an approach to determine a difference in energy loss in the target that can give average lifetime information.

Decay in Magnetic Field: For relatively long-lived neutron unbound nuclides, if the decaying nuclides are introduced into a dipole magnetic field the average deflection of the neutron yield away from 0° could be correlated with the lifetime.

Theoretical analysis:

1985Po10: The binding energies of the four lowest ^{16}B states were predicted in a shell model calculation. The ground state was predicted near the neutron binding threshold with $J^\pi=0^-$; excited states were predicted at E_x=0.95, 1.1, 1.55 MeV having $J^\pi=2^-, 3^-, 4^-$, respectively.

1992Wa22: Shell-model calculations in an *s, p, sd, f, p* valence space predicted a $J^\pi=0^-$ ground unbound by 164 keV, with $J^\pi=3^-$, 2^- and 4^- excited states at E_x=0.78, 0.84 and 1.44 MeV, respectively.

2011Du01, 2011Du16: An extended two-cluster model predicts a $J^\pi=0^-$ resonance near the $E(^{15}\beta^+n)_{res}\approx80$ keV state presently identified as the ground state, but also suggests the existence of other $J^\pi=1^-, 2^-$ states that may be closer to the neutron separation threshold.

See general predictions of the ground state binding energy and other properties in (1981Se06, 1993Pa14, 1997Ba54, 2004La24, 2004Ne16, 2006Ko02, 2012Yu07) and discussion in (1999Ka67).

^{16}B Levels

Cross Reference (XREF) Flags

A	$^9Be(^{17}C,^{16}B)$
B	$C(^{17}B$,N15B)
C	$C(^{17}C$,N15B)
D	$^{14}C(^{14}C,^{12}N)$

Continued on next page (footnotes at end of table)

Adopted Levels (continued)

^{16}B Levels (continued)

E(level)	$T_{1/2}$	XREF	Comments
0	<100 keV	ABCD	%n=100 E(level): We accept the ΔM = 37112. keV *25* value of (2012Wa38), but note this value differes slighty (+8 keV) from the weighted value obtained from (2010Sp02, 2009Le02, 2000Ka21). Furthermore, the excited state energies have been adjusted from those reported in (2000Ka21) to account for the difference in the adopted ground state mass. $T_{1/2}$: From (2009Le02). The resolution was ≈100 keV; a fit to the spectrum, convoluted with the resolution, uses Γ≈0.5 keV. ΔM= 37112. keV *25*, which implies S_n=−82 keV *33*.
2.32×10^3	≈150 keV	D	Decay mode not specified.
6.02×10^3?		D	Decay mode not specified.