Adopted Levels

S(n)=27.7×10^3 *20*; S(p)=−2013 *25*; Q(α)=−3.4×10^3 *20* 2012Wa38

Evidence of the unbound ^{7}B nucleus is observed in three measurements. Each of these measurements is complicated by backgrounds, which affect the extraction of ground state properties. Since ^{7}B is unbound to 1p, 2p and 3p emission, the ^{7}Li(π^+,π^-) measurements of (1981SeZR) are complicated by multi-body breakups that add a phase-space background component to their analyzed spectra. The ^{10}B(^{3}He,^{6}He) measurements of (1967Mc14) were complicated by a rather large ^{11}B(^{3}He,^{6}He) background of ^{8}B states along with a multi-body breakup phase-space background component. Finally, the kinematically complete ^{7}B analysis of ^{9}Be(^{9}C,^{7}B) reactions of (2011Ch32) are "contaminated" by ^{9}Be(^{9}C,^{8}C) events where one proton is unobserved.

The corrections applied in 2012Ch32 appear to be the smallest, and arguably most reliable, which perhaps explains that the 2012Wa38 mass evaluation has based the ^{7}B mass excess on this value alone. Without further experimental information, it is agreed that this is the best decision.

Mass predictions and comparison with T=3/2 isobaric analog states are found in (1965De08, 1988Co15, 1997Po12, 2011Ch53). See (1974Ir04, 1993Po11, 1997Ba54, 1998Na17, 2001Co21, 2006Wi07, 2007Ma79) for broad analyses of ^{7}B and other p-shell nuclei, and see (2006Ca35, 2007Do01, 2007Ca31, 2011My03, 2012My04) for more specific analysis on ^{7}B and nearby nuclides.

The connection between wave-function diffuseness and proton decay is analyzed in 1997Ab27.

^{7}B Levels

Cross Reference (XREF) Flags

- A ^{7}Li(π^+,π^-)
- B ^{9}Be(^{9}C,^{7}B)
- C ^{10}B(^{3}He,^{6}He)

E(level)	J$^\pi$	Γ	XREF	Comments
0	(3/2$^-$)	801 keV *20*	ABC	%p≈100 T=(3/2) J$^\pi$: From systematics. All decay paths emit protons. The intensity for decay to p+^{6}Be$_{g.s.}$ is (81 ± *10*)%. Proton decay to ^{6}Be*(1.6 MeV) is suppressed. Decay to 2p+^{5}Li and 3p+^{4}He are other open channels.

^{7}Li(π^+,π^-) 1981SeZR

An apparently unpublished experimental result on ^{7}Li(π^+,π^-) is contained in a conference proceedings overview of pion induced measurements carried out at the EPICS facility at LAMPF.
The review indicates a 180 MeV π^+ beam impinged on a ^{7}Li target, and the reaction π^- particles were momentum analyzed in a QQQDD magnetic spectrometer. The missing mass spectrum is deduced.
The missing mass spectrum shows a clear indication of the ground state, with some indication of a possible excited state. However, a broad continuum background, attributed to multi-body phase-space breakups could not be well fit with reasonable assumptions for ^{4}He+3p, ^{5}Li+2p and ^{6}Be+p contributions. A best fit to the data indicated a mass excess of ΔM=27.80 MeV *10* with Γ=1.2 MeV *2* for the ground state, and suggestve evidence for a narrower excited state at $E_x \approx$ 1.5 MeV.
See other measurements and analysis of partial cross sections in (1984Gr27, 1985La20, 1989Gr06, 1998Pa40, 2000Dr19, 2007Fo05).

^{7}B Levels

E(level)	Γ	Comments
0	1.2 MeV *2*	Analysis of the missing mass spectrum indicates ΔM=27.80 MeV *10*.
$\approx1.5\times10^3$?		

^{9}Be(^{9}C,^{7}B) 2011Ch32

The authors impinged a 70 MeV/A ^{9}C beam on a thick ^{9}Be target and detected ejected reaction products with a large area position sensitive ΔE-E array. Reconstruction of the complete kinematics permitted an analysis of excitation energies, decay pathways and associated branching ratios for several nuclei.

A beam of 150 MeV/nucleon ^{16}O ions was fragmented in a thick ^{9}Be target to produce a 70 MeV/nucleon ^{9}C beam in the NSCL A1900 fragment separator. The ^{9}C beam impinged on a 1mm thick ^{9}Be target and reaction products were detected in 14 position sensitive ΔE-E elements of the HiRA array. The coincident reaction products were analyzed via kinematic energy reconstruction to evaluate excitation energies and decay paths.

The $^{7}B_{g.s.}$ is observed in the 3p+α decay spectrum, which is significantly contaminated by ^{8}C events (4p+α) where one proton is not detected. The ^{7}B excitation energy spectrum is "corrected" for ^{8}C events and a broad background is also considered.

^{7}B Levels

E(level)	J^{π}	Γ	Comments
0	(3/2^{-})	801 keV *20*	T=(3/2) J^{π}: From Adopted Levels. A kinematic reconstruction of α+3p events indicates a state at mass excess=27677 keV *25*, which is ≈ 250 keV lower than the accepted value for $^{7}B_{g.s.}$ (27.94 MeV *10*). A width of Γ=800 keV *20* was deduced, which compares with 1.4 MeV *2* from 1967Mc14. The decay path was evaluated to determine the fraction of $^{7}B_{g.s.}$ –> p+$^{6}Be_{g.s.}$ decay events. Initial analysis indicated a (54 ± *6*)% probability for p+$^{6}Be_{g.s.}$ events in the data, though after correction for a broad background component a final ratio of $^{7}Be_{g.s.}$ –> (81 ± *10*)% p+$^{6}Be_{g.s.}$ is deduced. This appears consistent with a shell model spectroscopic factor prediction S=0.688. Discussion on the p+^{6}Be*(1.67 MeV; Jπ=2^{+}) decay branch is given. The p+^{6}Be(2^{+}) configuration is expected to be 3 times larger than the p+$^{6}Be_{g.s.}$(0^{+}) configuration in $^{7}B_{g.s.}$; however the p+^{6}Be(2^{+}) channel is suppressed due to a smaller barrier penetration factor.

^{10}B(^{3}He,^{6}He) 1967Mc14

The authors impinged a 50 MeV ^{3}He beam, from the Berkeley 88-inch cyclotron, on a 93% enriched 280 μg/cm^{2} ^{10}B target and measured the ejected ^{6}He ions produced in the ^{10}B(^{3}He,^{6}He)^{7}B reaction. The products were measured using a pair of ΔE_1-ΔE_2-E-E_{veto} Si detector telescopes that were positioned at θ_{lab}=10°, 14.1° and 19.65°.

The ^{6}He energy spectra indicated ^{11}B(^{3}He,^{6}He)^{8}B contamination, hence the corresponding spectra was measured and was subtracted. A peak interpreted as the ^{7}B ground state was observed, superimposed on a 2p+^{5}Li and 3p+4He phase-space distribution.

The mass excess was found as ΔM=27.94 MeV *10* with Γ=1.4 MeV *2*. A comparison of the A=7 T=3/2 IMME mass equation parameters was also given.

^{7}B Levels

E(level)	$T_{1/2}$	Comments
0	1.4 MeV *2*	Level observed in background subtracted ^{6}He energy spectrum. The ground state energy corresponds to ΔM=27.94 MeV *10*.

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