Adopted Levels

S(p)=−100 *30* 2017Wa10

The atomic mass excess of ^{8}C is given as 35064 keV *18* in (2017Wa10). Using this mass excess value, the binding energy of ^{8}C is 24.812 MeV *18*. In some of the theoretical articles referenced below, this is the quantity that is calculated. Sometimes the binding energy is given relative to the ^{4}He+4p threshold which is 3.483 MeV *18*. ^{8}C is unstable with respect to single proton decay, Q=98 keV, 2 proton decay, Q=2111 keV, 3 proton decay, Q=1517 keV and 4 proton decay, Q=3483 keV. Results reported in (2010Ch42) indicate that ^{8}C decays by emitting two pairs of protons-^{8}C→^{6}Be+2p→(^{4}He+2p)+2p. Also see (2011ChZW). For theoretical studies that include ^{8}C see (1974Ir04, 1987Bl18, 1987Sa15, 1988Co15, 1996Gr21, 1996Su24, 1997Ba54, 1997Po12, 1998Wi10, 1999Ha61, 2000Wi09, 2001Co21, 2002Ba90, 2003Ba99, 2006Sa29, 2006Wi07, 2007Ma79, 2009Ba41, 2011ChZW, 2012My02, 2012My04, 2014Eb02, 2014Mi17, 2014My03). IMME studies including A=8 are reported in (1974Ro17, 1976Tr01, 1984An18, 1998Br09, 2011Ch53, 2013La29). Calculations of the ^{8}C rms radii are reported in (2017Ka45).

^{8}C Levels

Cross Reference (XREF) Flags

A ^{9}Be(^{9}C,^{8}C)
B ^{12}C(α,^{8}He)
C ^{14}N(^{3}He,^{9}Li)

E(level)	J$^{\pi}$	Γ	XREF	Comments
0	0^{+}	130 keV *50*	ABC	%2p=100 T=2 Γ: from ^{9}Be(^{9}C,^{8}C) (2011Ch32); other values from ^{12}C(α,^{8}He) Γ=0.22 MeV *+8−14* (1974Ro17), ^{14}N(^{3}He,^{9}Li) Γ=290 keV *80* (1976Ro04), ^{12}C(α,^{8}He): either Γ=230 keV *50* from a Gaussian shaped fit or Γ=183 keV *56* from a Breit-Wigner shaped fit (1976Tr01). The higher statistics in (2011Ch32) compared to the earlier results leads to the choice of Γ=130 keV *50*.

^{9}Be(^{9}C,^{8}C) 2010Ch42,2011Ch32

2010Ch42: The authors measured the multiproton decay properties of ^{8}C by measuring the complete kinematics of remnant α+4p decay products. The proton correlations indicate that the decay follows a ^{8}C→^{6}Be+2p→α+2p+2p multi-step path. A beam of 70 MeV/nucleon ^{9}C was produced by fragmentation of a ^{16}O beam at the NSCL. The ^{9}C beam impinged on a ^{9}Be target and short lived unbound nuclei produced in the reactions were studied by reconstruction of the of the breakup particle kinematics. The proton-proton pairing correlations indicate that 92% *5* of events proceed through the 2p+^{6}Be$_{g.s.}$ decay channel. Combined with results on ^{6}Be, this indicates a ^{8}C→^{6}Be+2p→α+2p+2p decay path. Data on ^{8}B* decay is consistent with 2p decay from ^{8}B*(10.61 MeV) which is the IAS of ^{8}C$_{g.s.}$.

2011Ch32: The authors impinged a 70 MeV/nucleon ^{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 A 1900 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 authors obtained the ^{8}C mass excess ΔM(^{8}C)=35.030 MeV *30* and the widh Γ=130 keV *50*.

^{8}C Levels

E(level)	Γ	Comments
0	130 keV *50*	Obtained mass excess 35.030 MeV.

^{12}C(α,^{8}He) 1974Ro17,1976Tr01

1974Ro17: E=156 MeV, measured Q of ^{8}He spectrum, σ, deduced ^{8}C mass excess and width. This is the article in which ^{8}C is first recognized (2012Th01). The differential cross section was found to be about 20 nb/sr at θ_{lab}=2°. The mass excess of ^{8}C was found to be ΔM(^{8}C)=35.30 MeV *20*. As indicated above, ^{8}C decays by proton emission. Assuming a Gaussian line shape, the width of observed ^{8}C state is found to be Γ=0.22 MeV *+8−14*.

Since the ^{8}He spectrum is the observed quantity in this experiment, a change in the measured mass of ^{8}He would lead to a change in the mass of ^{8}C. In (1974Ce05) a more accurate value of the mass defect of ^{8}He led to a revision of the measured mass defect of ^{8}C, ΔM(^{8}C)=35.38 MeV *17*.

1976Tr01: E=123.5 MeV, measured σ, deduced mass excess and width. The mass excess of ^{8}C was found to be ΔM(^{8}C)=35.10 MeV *3*. The width was found to be Γ=230 keV *50* assuming a Gaussian fit and 183 keV *56* assuming a Breit-Wigner fit. An IMME study of A=8 nuclei is reported in this article.

^{8}C Levels

E(level)	Γ	Comments
0	230 keV *50*	Γ: from (1976Tr01), other value Γ=0.22 MeV *+8−14* (1974Ro17).

^{14}N(^{3}He,^{9}Li) 1976Ro04

1976Ro04: The ^{3}He beam with energy E=76 MeV from the MSU cyclotron collided with a target of either a solid melamine ($C_3N_6H_6$) or N_2 gas and the ^{9}Li spectrum was observed. Measured laboratory cross sections with approximately 40% uncertainties are dσ/dω=3 nb/sr and 5 nb/sr at θ_{lab}=8° and 10°. The authors determined that the mass excess of ^{8}C to be ΔM(^{8}C)=35.06 MeV *5*. Assuming a Gaussian shape for the line shape, the width was found to be Γ=290 keV *80*.

^{8}C Levels

E(level)	Γ
0	290 keV *80*