^{9}C β^{+}p decay 1988Mi03,2000Ge09,2001Be51

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. R. Tilley, J. H. Kelley, J. L. Godwin, D. J Millener et al.	NP A745,155 (2004)	31-Mar-2004

Parent: ^{9}C: E=0; J^{π}=(3/2^{-}); $T_{1/2}$=126.5 ms *9*; Q(β^{+}p)=16680.3 *25*; %β^{+}p decay=62.0 *19*

^{9}C-Q(β^{+}p): from 2012Wa38.

1988Mi03: Implanted ^{9}C into a thick Si detector and measured the total β-delayed breakup energy; deduced β-decay feeding to low-lying states. They missed several higherlying states that are fed and did not directly distinguish delayed p vs. α emission.

2000Ge09: ^{9}C from the TRIUMF/TISOL facility was implanted in a thin carbon foil. Data were taken in two detector configurations; one configuration was sensitive to decay through the p+^{8}Be$_{g.s.}$ decay mode while the other configuration was sensitive to the α+^{5}Li$_{g.s.}$ and p+^{8}Be*(3.0) decay channels. Breakup particles from ^{9}C ->^{8}Be+p –> 2α+p and ^{9}C ->^{5}Li+α ->2α+p were detected either in an array of 4 ΔE-E telescopes configured with two segmented Si annular detectors or with a similar array 2 ΔE-E telescopes configured with two doublesided position sensitive Si strip detectors and a plastic scintillator to count β-particles. Detector sensitivities and coincidence efficiencies were evaluated by Monte Carlo techniques, and a phenomenological approach was used to deduce the β-decay reaction branching ratios.

2001Be51: At the CERN/ISOLDE facility, doublesided strip detectors (DSSD) were coupled with thick stopping detectors to provide high-granularity and large solid angle coverage for detecting decay particles. Emphasis was placed on characterizing population and decay of the ≈14.65 MeV IAS. Furthermore a thin ΔE DSSD was implemented to avoid threshold (efficiency) concerns that troubled (2000Ge09). Lastly, the experimenters evaluated the decay branching ratios for the ^{12}B*(12.2) state. Little comment is given on other populated levels.

2001Bu05: The authors of (2000Ge09) give a more rigorous alternate interpretation of their data in a full R-matrix analysis. There is a poor agreement between deduced level energies and accepted energy values.

Comments:

Four relevant articles are given that discuss three different experimental efforts. Agreement is relatively mixed.

The experiments that are most sensitive to decay to ^{9}B$_{g.s.}$ find the largest feeding to that state, we take (54.1 *15*)% from (2001Be51). Data from TRIUMF produced the most comprehensive set of populated levels, though they are analyzed via two different methods in (2000Ge09) and (2001Bu05) yielding somewhat different results, due in part to differences in the ^{9}B$_{g.s.}$ branch and subsequent renormalization. Lastly are the states above 14 MeV, (2000Ge09) reports only ^{9}B*(14.0: J^{π}= ?) which decays mainly via proton emission, while (2001Be51) reports population of ^{9}B*(14.6: J^{π}=3/2^{-}) which decays about evenly via p and α emission. On the other hand the analysis of (2001Bu05) reports population of both levels. Finally, in (2000Ge09, 2001Bu05) a previously unknown ^{9}B level at E$_{x}$=13.3 MeV is reported.

The ^{9}B ground state feeding from (2001Be51) is accepted here; the branching ratios from (2000Ge09) including the mostly α background component are then renormalized (×′ 0.864). The branches feeding both of the E$_{x}$=14.0 and 14.6 MeV states are accepted, though it may be that only one level was populated. The particle breakup branching ratios for ^{9}B*(12.2) are accepted from (2001Be51). And lastly, the weak branch to ^{9}B*(13.3) is included with some uncertainty.

^{8}Be Levels

E(level)†	J^{π}†	$T_{1/2}$†
0.0	0^{+}	5.57 eV *25*
3030 *10*	2^{+}	1513 keV *15*

† From Adopted dataset for ^{8}Be in ENSDF database.

Delayed Protons (^{8}Be)

E(p)	E(^{8}Be)	I(p)	E(^{9}B)
165.18 *81*	0.0	54.1 *15*	0
2249.6 *98*	0.0	0.156 *17*	2345
2.64×10^{3} *14*	0.0	5.19 *52*	2780
8281 *37*	3030	1.47 *44*	12160

Continued on next page (footnotes at end of table)

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Delayed Protons (continued)

E(p)	E(^{8}Be)	I(p)	E(^{9}B)
10499 *24*	3030	0.0033	14655
10974 *36*	0.0	0.53 *8*	12160
11987 *89*	0.0	0.0017 *3*	13300 ?
12619 *62*	0.0	0.164 *17*	14010
13192 *22*	0.0	0.0011	14655

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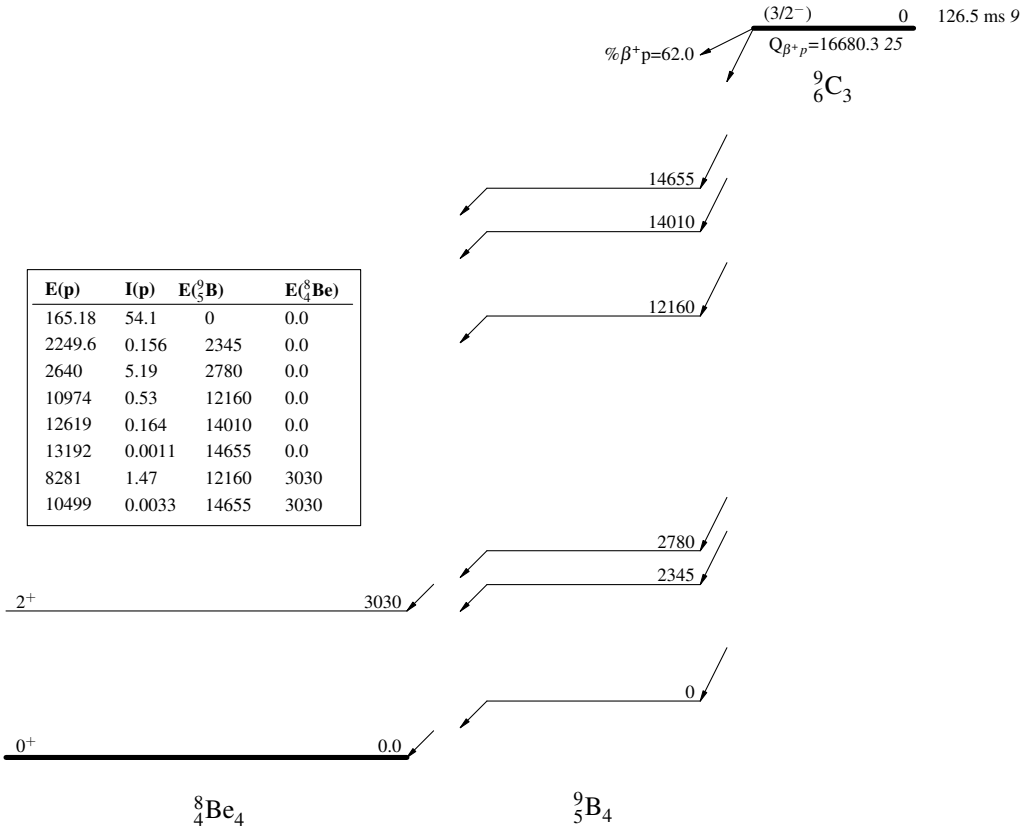
Decay Scheme

I(p) Intensities: Relative I(p)



E(p)	I(p)	E($^{9}_{5}$B)	E($^{8}_{4}$Be)
165.18	54.1	0	0.0
2249.6	0.156	2345	0.0
2640	5.19	2780	0.0
10974	0.53	12160	0.0
12619	0.164	14010	0.0
13192	0.0011	14655	0.0
8281	1.47	12160	3030
10499	0.0033	14655	3030