$^{11}\text{B}(^3\text{He},^{12}\text{C})$ 2010Ki08,2012Ki07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, J. E. Purcell and C. G. Sheu	NP A968,71 (2017)	1-Jan-2017

2009Ki13: $^{11}\text{B}(^3\text{He,d})$ E=8.5 MeV, measured E_p, I_p, E_α, I_α in complete kinematics. ^{12}C deduced γ-ray and α-decay branching ratios from high energy levels, B(M1).

2010Ki08: XUNDL dataset compiled by TUNL, 2010.

The $^{12}\text{C}^*$(9.6,10.8,11.8,12.7,13.3 MeV) 3α breakup states were populated at $E(^3\text{He})$=8.5 MeV at the Centro de Microanalisis de Materiales in Madrid. The 3α ejectiles were detected in an array of position sensitive ΔE-E detectors that covering 38% of 4π. The excitation energies of residual ^{12}C nuclei were determined by complete reconstruction of the 3α+d ejectiles. For sequential decays involving ^8Be, the participation of $^8\text{Be}^*$(0,3.04 MeV) were resolved.

A Dalitz plot analysis was used to evaluate the spin and parity of participating resonances. Discussion on Sequential vs Democratic (Direct) breakup processes is given.

2012Ki07: XUNDL dataset compiled by TUNL, 2012.

The 3α-particle correlations following $^{12}\text{C}^*$ breakup in search of support for direct 3-body breakup of $^{12}\text{C}^*$(7.65 MeV) as suggested by (2011Ra34). Significant discussion is given on the astrophysical impact of modifications to the 3α reaction rate as suggested by (2011Ra34). Also see (2012Ma10).

The complete reaction kinematics were determined at $E(^3\text{He})$=8.5 MeV by coincidence measurement of the recoiling deuteron and the breakup α-particles in an array of four position sensitive ΔE-E telescopes. Analysis of the deuteron momentum indicates $^{12}\text{C}^*$(7.65,9.6,10.8,11.8,12.7) groups. The d+3α multiplicity=4 events corresponding to $^{12}\text{C}^*$(7.65 MeV) were analyzed via Daliz plot analysis of the α-particle correlations; The analysis employed "kinematic fitting", which constrains the event-by-event data to rigorously conserve energy and momentum for the Hoyle state breakup events.

No definite evidence for breakup other than sequential breakup via $^{12}\text{C}^*$(7.65 MeV)$\rightarrow\alpha + ^8\text{Be}_{g.s.}$ is observed. Limits of: direct breakup into 3 equal energy α-particles (DDE)<0.9×10^{-3}; direct breakup into one α-particle at rest with 2 equal energy α-particles (DDL)<0.9×10^{-3}, and decay into 3-body phase space (DDΦ)<5×10^{-3} are deduced.

^{12}C Levels

E(level)[†]	J^{π}[†]	$T_{1/2}$[†]	Comments
7654.	0^+	9.3 eV	Decay is consistent with 100% decay to α+$^8\text{Be}_{g.s.}$. (2012Ki07) determine upper limit of 0.005 for direct α decay branches bypassing the ground state of ^8Be.
9641	3^-	46 keV	
10844	1^-	273 keV	
11828	2^-	230 keV	
12710	1^+	18.1 eV	
13.35×10^3	4^-	360 keV	

[†] From Adopted Levels.