

Carbon burning in stars: An experimental study of the $^{12}\text{C}+^{12}\text{C}$ reactions towards astrophysical energies

Tuesday, 26 June 2018 19:00 (1h 30m)

$^{12}\text{C}+^{12}\text{C}$ reactions are among the most important processes in the evolution and nucleosynthesis of massive stars. The measurement of these reactions at astrophysical energies is very challenging due to their extremely small cross sections, heavy resonant structure and the presence of natural hydrogen and deuterium contaminants in the carbon targets. To date, no measurement of the $^{12}\text{C}+^{12}\text{C}$ reactions has been possible at energies below $E_{\text{cm}}=2.14\text{MeV}$. In addition, measurements at $E_{\text{cm}}<3.0\text{MeV}$ present large uncertainties due to the target H contamination. In this work, the measurement of the $^{12}\text{C}+^{12}\text{C}$ reactions at $E_{\text{cm}}=2.52\text{--}4.30\text{MeV}$ was performed using the CIRCE accelerator in Caserta, Italy. We used the dE-Erest particle identification technique to unequivocally identify protons and alpha particles. The $^{12}\text{C}+^{12}\text{C}$ reactions cross sections and S-factors were extracted from the thick target yield. The experimental results as well as their impact on the determination of the stellar rate of $^{12}\text{C}+^{12}\text{C}$ fusion reactions are discussed.

Primary author: MORALES GALLEGOS, Elia Lizeth (INFN Napoli)

Co-authors: DI LEVA, Antonino (INFN Napoli); D'ONOFRIO, Antonio (INFN Napoli); Dr BRUNO, Carlo Giulio (University of Edinburgh); RAPAGNANI, David (Perugia University & INFN); TERRASI, Filippo (NA); IMBRIANI, Gianluca (Napoli University & INFN); PORZIO, Giuseppe (INFN Napoli); GARCIA DUARTE, Jeremias (INFN Napoli); ROMERO GASQUES, Leandro (INFN Napoli); GIALANELLA, Lucio (University of Campania); Prof. ALIOTTA, Marialuisa (University of Edinburgh); DE CESARE, Mario (INFN Napoli); ROMOLI, Mauro (NA); BUOMPANE, Raffaele (INFN Napoli); DAVINSON, Tomas (University of Edinburgh)

Presenter: MORALES GALLEGOS, Elia Lizeth (INFN Napoli)

Session Classification: Poster session