Contribution ID: **163** Type: **Poster**

$^{12}\mathrm{C}(\alpha,\gamma)^{16}\mathrm{O}$ cross section measurements with the ERNA separator

Monday 16 September 2024 20:15 (20 minutes)

The amount of carbon and oxygen generated during the helium burning phase of stars has profound implications for stellar evolution. A primary source of this uncertainty lies in the $^{12}\mathrm{C}(\alpha,\gamma)^{16}\mathrm{O}$ reaction, which has been under investigation for over six decades. Despite persistent efforts, the uncertainty regarding the astrophysical factor remains above 10%, under which it would be possible to compare observations and models.

Direct measurements of the cross section within the Gamow window (approximately 0.3 MeV) are unfeasible due to its low value, necessitating reliance on R-Matrix extrapolations for estimation. To achieve a precise extrapolation, high-precision measurements targeting various aspects of the intricate reaction mechanism of $^{12}\mathrm{C}(\alpha,\gamma)^{16}\mathrm{O}$ are needed.
The current cross-section estimation in the Gamow window is strongly constrained by the data from the ERNA collaboration in the E_{CM} range of 1.9-4.9 MeV. The ERNA separator has undergone several upgrades to expand the measurement range and enhance the capability to distinguish between the contribution of E_1, E_2, and cascade transitions to the cross section.

The experimental apparatus is now fully operational for these measurements, and the campaign has started. This contribution provides an overview of the commissioning of the separator and presents preliminary results from the ongoing measurement campaign.

Primary authors: Dr FORMICOLA, Alba (Istituto Nazionale di Fisica Nucleare); Prof. DI LEVA, Antonino (University of Naples & INFN); SANTONASTASO, Claudio (Università della Campania & INFN-Na); RAPAGNANI, David (Università degli Studi di Napoli "Federico II"); Dr MOLITIERNO, Francesco (University of Campania & INFN); Dr PORZIO, Giuseppe (University of Campania & INFN); Dr GARCIA DUARTE, Jeremias (Lawrence Livermore National Laboratory); Dr MORALES-GALLEGOS, Lizeth (University of Campania & INFN); Prof. GIALANELLA, Lucio (University of Campania & INFN); Dr MITSOU, Maria Lucia (University of Campania & INFN); Dr DE CESARE, Mario (Istituto Nazionale di Fisica Nucleare); Dr ROMOLI, Mauro (Istituto Nazionale di Fisica Nucleare); Dr BUOMPANE, Raffaele (University of Campania & INFN)

Presenter: SANTONASTASO, Claudio (Università della Campania & INFN-Na)

Session Classification: Poster Session