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# **$^{12}\text{C}+^{12}\text{C}$ reactions for Nuclear Astrophysics**

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$^{12}\text{C}$  fusion reactions are among the most important in stellar evolution since they determine the destiny of massive stars. Over the past fifty years, massive efforts have been done to measure these reactions at low energies. However, existing data present several discrepancies between sets and large uncertainties specially at the lowest energies. Factors such as beam/environmental backgrounds, extremely low cross sections and insufficient knowledge of the reaction mechanism contribute to these problems.

Recently, the ERNA collaboration measured the  $^{12}\text{C}+^{12}\text{C}$  reactions at  $E_{\text{c.m.}} = 2.51 - 4.36$  MeV with energy steps between 10 and 25 keV in the centre of mass. Representing the smallest energy steps to date.

In these measurements, beam induced background was minimised and S-factors for the proton and alpha channels were calculated. Results indicate that a possible explanation for the discrepancies between data sets is the wrongly assumed constant branching ratios and isotropical angular distributions.

Given the excellent performance of the detectors for low energy measurements, a collaboration with the LUNA group (LNGS) has started. Background measurements underground are being performed and results indicate it could be possible to measure the  $^{12}\text{C}+^{12}\text{C}$  reactions directly into the Gamow Window.

### **Field of work**

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