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A new 12C+12C reaction rates: Impact on stellar evolution

Thursday, 8 September 2022 15:00 (15 minutes)

Among the reactions driving stellar evolution, $^{12}C + ^{12}C$ fusion gives the key ingredients during carbon burning. This system reveals many resonances [1], but also regions with suppressed fusion cross-sections [2,3]. The reaction was recently measured by the STELLA collaboration utilizing the gamma-particle coincidence technique for precise cross-section measurements reaching down to the Gamow window of massive stars. From the experimental data, reaction rates were determined by approximating a hindrance trend and by adding on top a resonance at the lowest measured energy. The impact of these reaction rates on the evolution of massive stars was explored with models of 12 and $25M_{\odot}$ using the stellar evolution code GENEC [4], and a detailed study of the resulting nucleosynthesis with a 1454 elements network [5] was performed. The sensitivity of the STELLA experimental cross-sections on the temperature range for C-burning for the stellar models studied will be presented. The final abundances and their impacts on stellar evolution will be discussed in detail in this contribution [6].

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