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The $^{12}C +^{16} O$ fusion reaction in carbon burning: study at energies of astrophysical interest using the Trojan Horse Method

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Carbon burning is a fundamental process for the advanced stages of a massive star ($M > 8M_{\odot}$) evolution. It mainly occurs through the $^{12}C +^{12} C$ fusion, however at temperatures higher than $10^9 K$ the $^{12}C +^{16} O$ fusion can become prevalent due to the increased abundance of ^{16}O in the ashes of the helium burning. The $^{12}C +^{16} O$ reaction also plays a role both in the explosive carbon burning and in the oxygen burning. Thus, the astrophysical energy region of interest ranges from 3 to 7.2 MeV in the center-of-mass frame.
In the literature there are various measurements of the cross section between 4 and 7.2 MeV in the center-of-mass, however, none of them goes below 4 MeV, making extrapolation necessary. Recently the reactions $^{16}O(^{12}C, \alpha)^{24}Mg$ and $^{16}O(^{12}C, p)^{27}Al$ have been studied in the entire energy region of astrophysical interest by applying the Trojan Horse Method to three-body processes $^{16}O(^{14}N, \alpha^{24}Mg)^2H$ and $^{16}O(^{14}N, p^{27}Al)^2H$. In this talk, after a brief description of the method, the experimental setup as well as the preliminary phases of the data analysis will be presented and discussed.

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