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Study of the $^{4}He(^{3}He,\gamma)^{7}Be$ astrophysical reaction using activation and direct recoils detection methods

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Since the first measurement by Holmgren et al. [1] vast efforts have been made to study the $^{4}He(^{3}He, \gamma)^{7}Be$ reaction rate both from experimental and theoretical point of views. The new measurements performed by our group solve the discrepancies between previous experiments [2-3] in the medium energy range from 1 to 3 MeV centre of mass energy and help to constrain the extrapolation power of the theoretical models, confirming for example the new ab initio calculations performed by T. Neff [4].

We report here upon the results from two recent experiments performed at medium energies using two complementary experimental techniques:

Firstly [5], in the direct reaction using the activation method at the *Centro de Microanálisis de Materiales (CMAM)* in Madrid, where the ^{7}Be recoils were collected onto Cu-catchers, and the subsequent beta delayed gamma radiation was measured off-line using a low-background HPGe station.

Secondly, a complementary experiment using the direct recoil detection method with the DRAGON spectrometer [6] at TRIUMF. In this case, we study the cross section of the reaction in inverse kinematic detecting the recoiling ^{7}Be directly in a Double Sided Si-strip detector placed at the focal plane of the spectrometer. Furthermore, a real density profile measurement of the windowless target was performed on-line using the resonance reaction ^{3}He ($^{12}C,\gamma$), reducing the systematic error of this method.

In this presentation we will detail the two experimental techniques. We will show the analysis of the two experiments and we will discuss and compare the results between themselves and to previous experimental and theoretical works.

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