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Investigation of the ${}^3\text{He}(\alpha,\gamma){}^7\text{Be}$ reaction using the Asymptotic Normalization Coefficient technique

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The ${}^3\text{He}(\alpha,\gamma){}^7\text{Be}$ reaction plays an important role in several astrophysical scenarios including stellar hydrogen burning and Big Bang nucleosynthesis [1]. Contrary to its importance – and despite the large number of experimental and theoretical works devoted to this reaction – the knowledge on the reaction cross section at the relevant energies is still limited and further experimental efforts are needed [2,3]. The precise knowledge on the external capture contribution to the ${}^3\text{He}(\alpha,\gamma){}^7\text{Be}$ reaction cross section is of crucial for the theoretical description of the reaction mechanism. Therefore, the aim of the present work is to measure this direct contribution using the Asymptotic Normalization Coefficient technique [4] and through this to improve our knowledge on the reaction rate at the temperatures of the solar core. To extract the ${}^3\text{He}(\alpha,\gamma){}^7\text{Be}$ reaction cross section, the angular distribution of deuterons emitted in the ${}^6\text{Li}({}^3\text{He},d){}^7\text{Be}$ α -transfer reaction was measured with high precision at several energies. The experimental details and the preliminary results are planned to be presented.

[1] C. Iliadis, Nuclear Physics of Stars (New York: Wiley) (2007).

[2] E.G. Adelberger et al., Rev. Mod. Phys. 83, 195 (2011).

[3] R. J. deBoer et al., Phys. Rev. C 90, 035804 (2014).

[4] H.M. Xu et al., Phys. Rev. Lett., 73 2027 (1994).

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