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Fluorine nucleosynthesis: measurement of 15N(α,γ)19F

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The origin of fluorine is a widely debated issue in Nuclear Astrophysics. It is widely recognized that Asymptotic Giant Branch stars are among the most important contributors to the Galactic fluorine production. Various reaction chains may lead to 19F production, however for some α capture re- actions cross sections at astrophysically relevant energies are determined on the basis of some very poorly known low-energy resonance parameters. Among these the 15N(α, γ)19F reaction is a common feature in the various production channels so far proposed. Its reaction rate at relevant temperatures is determined by a number of narrow resonances together with the direct capture and the tails of the two broad resonances at Ec.m.= 1323 and 1487keV. The broad resonances parameters were measured through the direct detection of the 19F recoil ions with the European Recoil separator for Nuclear Astrophysics (ERNA) were performed. The reaction was initiated by a 15N beam impinging onto a 4He windowless gas target. The observed yield of the resonances at Ec.m. = 1323 and 1487 keV was used to determine their widths in the α and γ channels were determined. While a fair agreement was found with earlier determination of the widths of the 1487 keV resonance, a significant difference was found for the 1323 keV resonance. The experiment, the results and their influence at the temperatures of the 19F stellar nucleosynthesis will be discussed. Outlook on the determination of the direct capture component and the 364 keV narrow resonance, whose uncertainties still dominates the reaction rate, will be also presented.

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