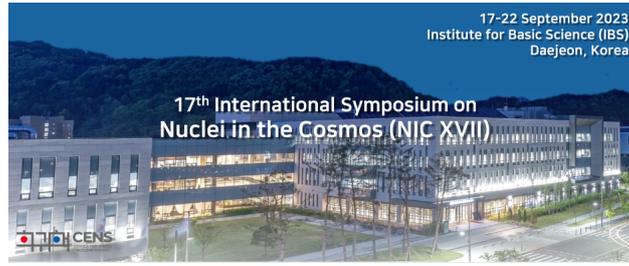


Nuclei in the Cosmos (NIC XVII)



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Astrophysical S factor of $^{15}\text{N}(p, \gamma)^{16}\text{O}$ in the cluster effective field theory

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The radiative proton capture reaction of $^{15}\text{N}(p, \gamma)^{16}\text{O}$ is one of the thermonuclear reactions in the carbon-nitrogen-oxygen (CNO) cycle. This process provides a link between the type-I (CN) cycle and type-II (NO) cycle so that the ^{16}O nucleus can be produced and the further types of the cycle start. We investigated the $^{15}\text{N}(p, \gamma)^{16}\text{O}$ reaction in the effective field theoretical approach. The effective Lagrangian which is appropriate for this reaction in a stellar environment is introduced, and the capture amplitude and the corresponding S factor are calculated. In this work, we included two resonances due to the excited states of ^{16}O as di-field propagators. By fitting our theoretical result to the empirical data of the S factor we determined the model parameters such as the low-energy constants and the S factor values of $S(0) = 29.8 - 34.1 \text{ keV b}$ from the recent data sets are estimated. These results are compared to the estimations from several approaches such as the R-matrix and the potential models.

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