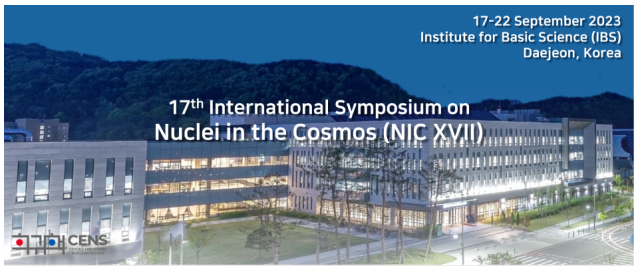

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Evaluation of 19Ne nuclear structure with a Bayesian approach

Tuesday, 19 September 2023 17:05 (5 minutes)

The 15O(α, γ)19Ne and 18F(p, α)15O reaction rates at stellar temperatures have significant impacts on the dynamics in x-ray bursts, novae explosions, and heavy element synthesis. Due to its importance, the nuclear structure of the compound nucleus 19Ne, which determines the reaction rate, has been widely investigated. Collecting the available data from experimental measurements, Nesaraja et al. had previously evaluated the nuclear structure of 19Ne above the proton-threshold energy [Phys. Rev. C 75, 055809 (2007)], which provided useful information for reaction rate calculations. Because many new experiments have been performed since that evaluation, the nuclear structure properties of 19Ne needs to be updated. In this work, the results from the latest measurements are compiled and then evaluated employing a novel Bayesian approach to integrate the results from independent measurements. By demonstrating the statistical and physical meanings of the priors for resonance parameters and likelihoods for previous experimental results, the posterior (i.e., updated) distributions of the resonance parameters could be obtained. These posteriors will be presented and directly used as probability density functions for Monte Carlo reaction rate calculations.

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