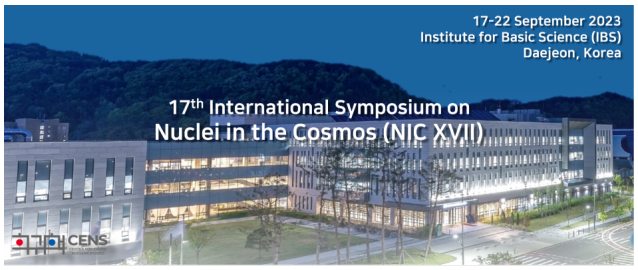

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Measurement and evaluation of the 7Be + n reactions approaching the cosmological lithium problem

Tuesday, 19 September 2023 17:15 (5 minutes)

The cosmological lithium problem has been known as the outstanding discrepancy of primordial lithium abundances between observations and theoretical predictions. We have measured key nuclear reactions which act to reduce ^{7}Li during the big bang nucleosynthesis (BBN), namely, $^{7}\mathrm{Be}(n,p)^{7}\mathrm{Li}$ and $^{7}\mathrm{Be}(n,)^{4}\mathrm{He}$, by means of the Trojan Horse method [1].

We also performed R-matrix fits to data sets including both the previous and present cross sections of the (n,p_0), (n,p_1) and (n,α) reaction channels based on the resonances at known excited levels. This analysis resulted in an improved uncertainty evaluation of the (n,p_0) cross section, and the first-ever quantification of the (n,p_1) contribution in the BBN energy region.

We implemented the revised total reaction rate summing both the (n,p_0) and (n,p_1) contributions in one of the state-of-the-art BBN codes PRIMAT. It results in a reduction of the predicted ^{7}Li abundance by about one tenth, which would offer less nuclear physics uncertainty to further theoretical works on the cosmological lithium problem.

[1] S. Hayakawa et al., Astrophys. J. Lett., **915**, (2021), L13.

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