NUSTAR monthly Seminar

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https://indico.gsi.de/event/18611/

Wednesday, November 22, 2023 at 02.30 pm CET,

Seminarroom theorie SB3 3.170a

https://gsi-fair.zoom.us/j/62772561578

Meeting-ID: 627 7256 1578

Kenncode: 807198

The ^{7}Be(n,p_1)^{7}Li* reaction relevant to the cosmological lithium problem studied with the ^{9}Be(^{3}He,a)^{8}Be(p)^{7}Li and ^{7}Li(^{3}He,d)^{8}Be(p)^{7}Li reactions

The cosmological lithium problem stems from the discrepancy between the observed primordial ^{7}Li abundance and that predicted by big bang nucleosynthesis (BBN) models. It is one of the most important issues in BBN. Many theoretical and experimental studies were performed to solve the problem, but no solutions were found without using new physics beyond the standard model which was not confirmed experimentally. The primordial ^{7}Li abundance strongly depends on the ^{7}Be production and destruction processes because most of ^{7}Li synthesized in BBN were immediately destroyed by the ^{7}Li(p,a) reaction and after the end of BBN ^{7}Be decayed into ^{7}Li via the electron capture. The ^{7}Be(n,p_0)^{7}Li$_{gs}$ reaction is one of the most important ^{7}Be destruction reactions. The ^{7}Be(n,p_1)^{7}Li* (0.478keV, 1/2^{-}) reaction is also ^{7}Be destruction reaction, but it was neglected in BBN.

To study the ^{7}Be(n,p_1)^{7}Li* reaction, we have performed experiments to populate the resonant states of ^{8}Be at 18.9-20.1 MeV by the ^{9}Be(^{3}He,a)^{8}Be* and ^{7}Li(^{3}He,d)^{8}Be* reactions and to measure decay protons to the ground and first excited states in ^{7}Li (called as p_0 and p_1, respectively). The resonance widths of the states at 18.9 and 19.4MeV and the branching ratios of G_{p1}/G_{p0} of the resonant states at 19.23, 19.40, and 20.1MeV were deduced, and the ^{7}Be(n,p_1)^{7}Li* cross section was calculated using the resonance widths and partial widths deduced by fitting the ^{7}Be(n,p_0)^{7}Li$_{gs}$ cross section. New resonant states were found around 18.91MeV. The influence of the ^{7}Be(n,p_1)^{7}Li* reaction on the cosmological lithium problem is discussed.

Convener: T. Dickel
Secretary: R. Krause / D. Press
Organized by: T. Dickel