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Direct measurement of the 7Li(p, α)4He reaction at astrophysical energies using the ELISSA array

Direct measurement of the 7Li(p, α)4He reaction at astrophysical energies using the ELISSA array has been performed at IFIN-HH with the 3 MV Tandem. This reaction is intimately linked with the so-called "Cosmological Lithium Problem". The existing 7Li(p, α)4He direct measurement data suffer from large uncertainty, particularly at energies below 500 keV (in the center-of-mass system). Thus, a new direct measurement of the 7Li(p, α)4He reactions at low energies, from 59.5 keV to 990 keV (10 different beam energies) in the center-of-mass system has been carried out to reduce the uncertainty in the S(E) factor.
In this experiment, ~ 2 - 4 pnA beam intensity and self-supported thin polyethylene targets (CH2, about 70 μg/cm2 thick, placed at 90° with respect to the beam axis) were used. The spot size of the 7Li beam on the target was ~ 1 mm. The ELISSA array, having 12 X3 position-sensitive strip detectors arranged in a barrel-like configuration, was used to detect the transfer alpha. The solid angles of the X3 detectors have been determined from the NPTool simulation. The absolute differential cross-section of the 7Li(p, α)4He reaction has been determined by normalising to the 7Li(p, p)7Li Rutherford scattering cross-section measured in the monitor detector. The total cross-sections (σtotal) of 7Li+p were obtained by fitting the angular distributions of the present data with DWBA calculations. The S(0) value is obtained from the present DWBA and polynomial fits. Reaction rates have also been calculated.

In this talk, measurement of the 7Li(p, α)4He reaction using the ELISSA array will be presented.
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