Search for Li-α cluster state in ^{12}B using Inverse Kinematics Thick Target Scattering

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The study of exotic clustering in light n-rich nuclei is one of the possible applications of radioactive ion beams. We performed an experiment aimed at the search for $^{8}Li - \alpha$ cluster configurations in ^{12}B using the radioactive ^{8}Li provided by the Laboratori Nazionali del Sud radioactive facility EXCYT. Cluster states associated to the $^{8}Li - \alpha$ configurations located just above the α decay threshold were already predicted by using Resonating Group Method [1].
The $^{8}Li + ^{4}He$ elastic scattering excitation function was measured by using the inverse kinematic thick target method [2]. The ^{8}Li beam at an energy of 30 MeV and was delivered in a large scattering chamber filled with ^{4}He gas at a pressure of 700 mbar. The ^{4}He gas acts as target and as degrader at the same time, reducing the incident particle energy from the initial value down to zero and allowing to measure the excitation function at angles around 180^{o} in CM system in a wide range of energies using a single beam energy.
Thanks to the large difference in the stopping power of helium for ^{8}Li and for ^{4}He, the beam is stopped inside the target while the recoiling ^{4}He particles can reach the detectors placed at the end of the chamber. The detection system was made by 4 silicon telescopes, each one consisting in a four quadrant thin silicon detector and a thick Double Sided Silicon Strip Detector. A Micro Channel Plate was used to measure the number of incident particles as well as the time difference between the entrance of the projectile in the chamber and the arrival of the recoil α on one of the detectors. This allows discrimination between elastic and inelastic scattering.
The setup and the experimental technique will be described in details and preliminary results will be shown and discussed.

[1] P. Descouvemont, Nucl. Phys. **A596** (1996) 285.
[2] V.Z.Goldberg *et al.*, Phys. Rev. C **69** (2004) 024602