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Study of multinucleon knockout reactions of exotic nuclei in the region of nitrogen

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Recently, several works which focused on light isotopes and that were based on inclusive studies [1,2,3] have shown a reduction of the measured cross sections with respect to the theoretical predictions for nucleon-removal and single-nucleon knockout reactions. These studies have reached different conclusions regarding the dependence of the reduction factor observed of the spectroscopic factor with respect to the N/Z of the projectile. The study of (p,pX) knockout reactions with the R3B setup is a golden opportunity since the inverse kinematics technique can be used and the versatile setup offers a high efficiency, acceptance, and resolution for kinematically complete measurements. The two key detectors to do this are the CALIFA calorimeter [4] made of CsI(Tl) crystals and the neutron detector NeuLAND [5], appart from the tracking detectors both from the incoming isotopes and the fragments.

Moreover, not only single-nucleon knockout reactions can be studied but also multi-nucleon knockout ones. Of particular interest is the systematic study of the probability of cluster formation. The successful experiments on stable Sn isotopes [6] indicating the pre-existence of an alpha cluster at the surface of nuclei which are compatible with theoretical predictions [7] have aroused the interest to study this phenomenon also predicted for other light nuclei such as d, t or 3He.

This presentation will be focused the particle identification method using CALIFA, specially regarding deuterons. One of the goals is to study the dependence of the cluster formation probability with respect to the mass of the projectile, since it is expected to decrease for N=Z clusters as the mass of the nuclei increases. In addition, the occurrence of deuteron clusters embodies tensor force effects in nuclei and should be relevant for p-n short-range correlations (SRC) [8].

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