Spectroscopy of the proton drip-line nucleus ^{19}Na by elastic and inelastic scattering*

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The structure of nuclei near the drip lines is one of the major current interests in nuclear physics. Proton-rich light nuclei are a remarkable case since the level scheme is not known for many of them. The ^{19}Na proton drip-line nucleus was investigated using the ^{18}Ne+p resonant elastic scattering in inverse kinematics at the CYCLONE RIB facility at, Louvain-la-Neuve. A low-energy intense ^{18}Ne beam was used to bombard polyethylene foils of different thicknesses. In a first experiment, the recoil protons were detected at a large angular range with TOF technique using the LEDA system [1]. The $1/2^+$ second excited state of ^{19}Na was observed at an energy of 1066±3 keV above the ^{18}Ne+p threshold with a proton width of 101±3 keV [2]. In order to complete the information on the ^{19}Na low-energy states, a second experiment was performed at CYCLONE using ^{18}Ne+p elastic and inelastic scattering. For this new experiment, a ΔE-E detection system ("CD-PAD" detectors) was used to identify the recoil protons [3]. Preliminary results confirm the presence of two new states as predicted by the GCM model. Two resonant peaks are clearly observed in the proton energy spectrum (Figure 1), one in the elastic part (at about 9 MeV) and the other one in the inelastic part (at about 6 MeV). Analysis in progress using the R-matrix model will provide the energy and the proton widths of these levels.

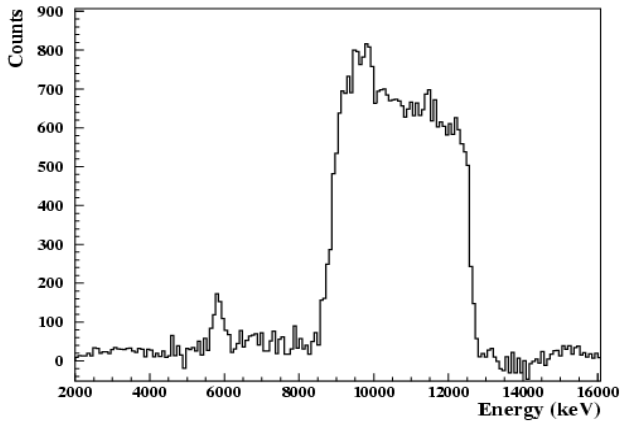

Figure 1: Proton energy spectrum for a 2 mg/cm^3 CH_2 target and a 66 MeV ^{18}Ne beam (see text).

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[2] C. Angulo *et al.*, Phys. Rev. **C67**, 014308 (2003).
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