Measurements of the Backward Pion Deuteron Quasielastic Scattering and of the Pion Double Charge Exchange on ^{6}Li and ^{7}Li

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Two nuclear processes which can proceed at least on two nucleons were studied on isotopes ^{6}Li and ^{7}Li: the backward pion-deuteron quasielastic scattering Li($\pi^-, d_{forward}\pi^-$)X (1) and the inclusive pion double charge exchange (DCX) Li($\pi^-, \pi^+_{forward}$)X (2). The experiment was carried out at the ITEP Proton Synchrotron with the 3-m magnet spectrometer at initial negative pion momenta 0.72, 0.88 and 1.28 GeV/c. For calibration purposes the cross sections of the backward elastic pion scattering on free protons and deuterons were measured (see [1,2]) with H_2O and D_2O targets, and the results appeared to be in a good agreement with known data.
The deuteron knock out (1) was investigated in complete kinematics, and the momentum distributions of the internal motion of the quasideuteron clusters, the missing energy spectra and the effective numbers of quasideuterons in ^{6}Li and ^{7}Li were obtained. The pion induced deuteron knock out from nuclei was studied for the first time. The results are compared with the data taken at proton and electron beams and with theoretical calculations.
The energy dependence of the cross sections of the inclusive reactions (2) were measured in the region kinematically forbidden for two pion production. The DCX cross sections on ^{6}Li and ^{7}Li are found to decrease weakly with energy similarly to our earlier observation on ^{16}O [3], which gave an evidence for a new mechanism of high energy DCX. A comparison of the DCX cross section on ^{6}Li and ^{7}Li allowed to estimate the screening effect in ^{7}Li, and together with lower-energy data showed that the screening effect falls with energy according to the energy behaviour of the total π^-n cross section.

References

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