The ITEP Study of Inclusive Pion Double Charge Exchange: Experiment and Interpretation

B.M.Abramov, L.Alvarez-Ruso[1)], Yu.A.Borodin, S.A.Bulychjov, I.A.Dukhovskoi, A.B.Kaidalov, A.I.Khanov, A.P.Krutenkova[*)], V.V.Kulikov, M.A.Matsuk, I.A.Radkevich, A.I.Sutormin, E.N.Turdakina, and M.J.Vicente Vacas[1)]

State Research Center
Institute of Theoretical and Experimental Physics
Moscow, 117218, Russia

Abstract

The inclusive pion double charge exchange (DCX) on light nuclei at intermediate energies $T_0 = 0.6$, 0.75 and 1.1 GeV was studied in the ITEP experiment on $\pi^- A$ interactions [1]. The differential cross section of these processes decrease with energy rather weakly and exceed the theoretical prediction [2] within the conventional sequential single charge exchange mechanism with neutral pion in the intermediate state (i.e. Glauber elastic rescattering) at the highest energy by about a half an order of magnitude. Our recently updated analysis of the data on ^{16}O (as well as new outgoing pion momentum spectra on ^{16}O and $^{6,7}Li$ at 0.6 GeV) confirms this anomalous DCX energy behavior. Thus other mechanisms of DCX are needed to explain the observed energy dependence. The theoretical analysis [3] showed that the Glauber inelastic rescatterings (IR) mediated by intermediate states of several (mainly two) pions appeared to give an important contribution to the inclusive DCX cross section at energies $T_0 > 0.6$ GeV. To estimate the IR contribution in the framework of Gribov-Glauber approach to DCX [3] the OPE model which is known to give a good description of $\pi^- p \to \pi^+ \pi^- n$ reaction above ~ 2 GeV/c is used [4]. It is shown that IR with 2π intermediate state dominate the pion DCX in a rather wide energy range up to ~ 4 GeV.

References

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1) University of Valencia, Burjassot, Spain
*) krutenkova@vxitep.itep.ru