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Two-Body Photodisintegration of ^{3}He between 0.4 and 1.5 GeV

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The $\gamma^3\mathrm{He} \to pd$ reaction was measured with the CLAS detector at Jefferson Lab for photon energies between 0.4 and 1.5 GeV and proton CM angles θ^p_{CM} between 40° and 140°. It is complementary to the three-body breakup of ^{3}He with respect to studying three-body mechanisms. At all photon energies for our experiment, the differential cross sections exhibit a very strong forward-to-backward asymmetry — approximately one order of magnitude. An interesting feature of the differential cross sections is that their slope does not depend on the photon energy and there is a change of slope at $\theta^p_{CM} = 120°$ seen at all photon energies. The invariant cross sections fall off with s (where s is the total CM energy) much faster than expected by the quark counting rules [1]. The latter predict that in the asymptotic regime $t \to \infty$ the invariant cross sections should scale as s^{-17}, whereas our data scale as s^{-22}. A comparison of our preliminary results with the cross sections predicted by Jean-Marc Laget's model [2] shows that the differential cross sections for angles greater than 60° are sensitive to contributions from three-body mechanisms. The relative importance of the latter, with respect to one- and two-body mechanisms, is larger at 0.6 - 0.8 GeV than at higher energies. This has already been observed in our data for $\gamma^3\mathrm{He} \to ppn$ [3] and seems to be a characteristic of the three-body mechanisms at medium energies.

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