Exclusive Rho(770) Photoproduction at HERA

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Exclusive photoproduction of ρ0 mesons is studied with the H1 detector at HERA. More than a decade after the end of HERA operations, the experiment still offers a unique opportunity to study exclusive vector meson production. It provided access to high scattering energies in a clean environment with negligible pileup. In H1, the availability of tracking information on trigger level through the Fast Track Trigger (FTT) allowed to efficiently trigger exclusive VM production. By reconstructing (or vetoing, in the case of photoproduction) the scattered electron, the kinematics of the reactions could be well constrained and measurements performed in a well-defined phasespace.
Dedicated forward detectors were available and allowed to either reconstruct the elastically scattered proton or tag the remnants of diffractive proton-dissociation in which the final state proton dissociates into a multi-particle system of low invariant mass.

In the presented ρ0 photoproduction measurement, a large sample of over 900 000 π+π− photoproduction events was collected in the years 2006-2007 using the FTT. It corresponds to an integrated luminosity of 1.3 pb−1. The dataset is used to study single-, double-, and triple-differential π+π− photoproduction cross-sections as a function of the invariant mass of the pions, the photon-proton collision energy, and the squared momentum transfer at the proton vertex. Given the size of the dataset, even triple-differential cross-sections are measured with a very good statistical precision. Tagging of the proton remnants is used to statistically separate elastic from proton-dissociative events and measure cross-sections for both reactions. The dipion mass distributions are parametrized by a Söding model to extract the ρ0 contribution to π+π− production. Differential ρ0 distributions are parametrized using fits in the context of Regge theory. In particular, this allows extracting the parameters of the effective leading Regge trajectory.