Photoproduction of eta mesons off protons at CB-ELSA

A. WOODARD, V. CREDE, A. MCVEIGH, Florida State University, CB-ELSA COLLABORATION — QCD-inspired models predict more states in the hadron mass spectrum than have been seen experimentally. Models show that some of these states should be observed in photoproduction experiments, thus providing a sensitive tool to study hadron properties. Baryon resonances have broad, overlapping widths. Photoproduction of $\eta$ mesons serves as an isospin filter; the $\eta$ meson has isospin $I = 0$ and for this reason, isospin conservation guarantees that the $N\eta$ final state can only be reached via formation of $N^*$ resonances. Contributions from $\Delta^*$ states with $I = 3/2$ are excluded. We used the Crystal-Barrel Detector (CsI(Tl) calorimeter) at ELSA to determine the cross-section of the reaction $\gamma p \rightarrow \eta p$ studying the $\eta$ in its two neutral decay modes ($\eta \rightarrow 3\pi^0 \rightarrow 6\gamma$ and $\eta \rightarrow 2\gamma$) for photon incoming energies in the range of $E_\gamma = 850 - 3000$ MeV. In this experiment, the Two-Armed Photon Spectrometer (TAPS) was placed in the forward direction. This BaF$_2$ calorimeter serves as a fast trigger and increases the overall angular coverage to essentially the full 4$\pi$ solid angle. We present differential cross sections for $\eta$ photoproduction off the proton for $(-1 < \cos \theta^\text{cm}_\eta < 1)$. Approximately 600,000 events have been identified. Preliminary results of a partial wave analysis are discussed.

\textsuperscript{1}This work is supported by NSF grant PHY-04-56463.

Anna Woodard
Florida State University

Date submitted: 01 Aug 2007

Electronic form version 1.4