$\eta\pi^0$ photoproduction off protons with the CB-ELSA experiment

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The spectrum of excited baryons reflects the dynamics of QCD in the non-pertubative regime. The experimental information, which states are existing, their quantum numbers, masses and decay channels will help to identify the relevant degrees of freedom of strong QCD. Current constituent quark models predict far more states in the baryon spectrum than have been experimentally observed up to now. As nearly all results stem from πN scattering and many of the unobserved resonances are predicted to decouple from πN, photoproduction experiments seem to have a large discovery potential.
The search for missing resonances is a topical aim of the CB-ELSA experiment.
The Crystal Barrel Detector is a CsI photon calorimeter surrounding a liquid hydrogen target with almost 4π acceptance optimized for observing multi-photon final states. The e^- accelerator ELSA in Bonn provides electrons with energies up to 3.2 GeV in *cw* mode. Real photons are produced by a bremsstrahlung target instrumented with an electron tagger.
In a first series of experiments at Bonn, started at the end of 2000, the Crystal Barrel Detector was used in a combination with Time-Of-Flight scintillator hodoscopes in the forward direction. A large amount of data has been taken with this setup. In a first step differential cross sections of η photoproduction off protons were analyzed. Good consistency was found for $\eta \to 2\gamma$ and $\eta \to 3\pi^0$. In a second step about 40000 events of the type $\gamma p \to p\pi^0\eta$ could be identified and reconstructed. First hints for resonance production are given and cascades of the type $\gamma N \to \Delta^*\eta \to \Delta\eta\pi^0$ are observed. Indications for a Δ resonance around 1900 MeV are seen. Currently the data are investigated by partial wave analysis.