Photoproduction of eta and eta' mesons

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Under the MAID project at Mainz we have developed a series of isobar models for electromagnetic production of pseudoscalar mesons (π, K, η, η') from the nucleon. These models are available as online programs on the web (http://www.kph.uni-mainz.de/MAID/) for easy access and individual studies of model parameters and kinematical conditions.

For η photo- and electroproduction the isobar model ETAMAID contains a field-theoretical background with s- and u-channel nucleon Born terms and ρ, ω-exchange in the t-channel. In the resonance sector eight nucleon resonances are included in Breit-Wigner form, most importantly, the $S_{11}(1535)$ resonance, which plays the dominant role in eta production. But also other resonances like $D_{13}(1520)$ and $D_{15}(1675)$ are very important in order to explain the beam asymmetry Σ measured at GRAAL. This model can describe most of the data of photo- and electroproduction on the proton from MAMI, ELSA, GRAAL and JLAB/CLAS very well, except for the target asymmetry measured at ELSA near threshold. Recently, new data have been obtained on the deuteron both at GRAAL [1] and CB-ELSA [2]. Both experiments show a bump structure in the neutron cross section near a total c.m. energy of $W = 1675$ MeV. This bump is qualitatively explained with the $D_{15}(1675)$ resonance in ETAMAID due to a very large branching ratio of $\Gamma_{\eta N}/\Gamma_{tot.} = 17\%$. Alternatively, the bump can also be described with a narrow $P_{11}(1675)$ resonance, following the suggestion by Polyakov [3,4], who predicted such a state as a non-strange member of the Θ^+ pentaquark decuplet. We will show that, due to the Fermi motion in the deuteron, both pictures can lead to very similar total cross sections but can well be distinguished in angular distributions.

Finally, we will discuss η' photoproduction and will show that a reggeization of the t-channel vector meson exchange is necessary in order to understand high energy photoproduction data. We will present a new analysis for our η' model with recent preliminary data from CLAS [5].

[1] V. Kouznetsov (for the GRAAL collaboration), Proc. of N*2005, Tallahassee, FL.
[2] I. Jaegle (for the CB-ELSA collaboration), Proc. of N*2005, Tallahassee, FL.
[3] M.V. Polyakov and A. Rathke, Eur. Phy. J A18 (2003) 691.
[4] Y. Azimov, V. Kouznetsov, M.V. Polyakov and I. Strakovsky, Eur. Phy. J A25 (2005) 325.
[5] M. Dugger (for the CLAS collaboration), Proc. of N*2005, Tallahassee, FL.

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