Partial wave analysis of $(\gamma/\pi)N \to \eta N$ reactions within coupled channel unitary Lagrangian model [*]

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An unitary coupled-channel Lagrangian model is developed for simultaneous analysis of pion- and photon-induced reactions in the resonance energy region. The πN, $2\pi N$, ηN, ωN, $K\Lambda$ and $K\Sigma$ final states are treated on the same basis. The coupling constants are constrained by comparison with the available experimental data. Recent results on η-production channel are presented and discussed. The calculated cross section of the η-photoproduction on the proton is in good agreement with the recent reaction measurements at MAMI [1]. We demonstrate that the experimentally observed dip in the differential production cross section at 1.67 GeV [1] can be explained by conventional resonance contributions coming from the $S_{11}(1535)$ and $S_{11}(1650)$ states. This supports our early guess [2] on the $\gamma p \to \eta p$ reaction mechanism. The need for new measurements of the $\pi N \to \eta N$ reaction is discussed.

[1] E. F. McNicoll *et al.* [Crystal Ball at MAMI Collaboration], Phys. Rev. C **82** (2010) 035208 [Erratum-ibid. C **84** (2011) 029901].

[2] V. Shklyar, H. Lenske and U. Mosel, Phys. Lett. B **650** (2007) 172.

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