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Direct vs. final state tensor meson photoproduction - amplitude analysis

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Collaboration

Abstract content

Understanding the mechanism of the non-strange tensor meson photoproduction is essential for description of the light meson spectrum. This is because the $f_2(1270)$ photoproduction amplitude is prominent in partial wave analyses where two pions or two kaons in the final state are involved. Description of this sector is complicated, however, by possible existence of scalar and tensor glueballs which mix with conventional mesons. Contribution of the D-wave resonances is also important for the hybrid and exotic meson searches where it makes the essential part of the non-exotic background. So far the experimental data on the tensor meson photoproduction were very scarce and the situation changed only recently with the advent of abundant CLAS data [1] and is to further improve with CLAS12 and GlueX experiments at JLab where data are to be taken in 2015. Thus our study of the tensor meson photoproduction is timely and opportune. We analyze two mechanisms of $f_2(1270)$ resonance photoproduction, namely the direct photoproduction with t-channel vector meson exchange and the mechanism where tensor meson is created due to final state interactions of pion pairs. The first (direct) photoproduction mechanism is justified by the common belief that $f_2(1270)$ is conventional $q\bar{q}$ state. So it is a kind of surprise that the strengths of the partial waves corresponding to different tensor meson helicities are very well described with the final state interaction model which we described in [2]. Another advantage of the final state interaction model is that it respects two particle unitarity of the amplitude and properly accounts for its analytical structure [3]. In the talk we will discuss predictions of these two models with respect to basic polarization observables and confront them with the CLAS data.

[1] M. Battaglieri et al., Phys. Rev. D 80, 072005 (2009) [2] Ł. Bibrzycki, R. Kamiński, Phys. Rev. D 87, 114010 (2013) [3] R. Kamiński, Phys. Rev. D 83, 076008 (2011)

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