

Modern View on the Resonance Parameters Extraction

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The recent results on the properties of N^* and Δ resonances acquired within coupled-channel approaches will be presented. Modern descriptions of resonant scattering are given by the solutions of Bethe-Salpeter equation (or some non-relativistic reductions to it) with two immediate consequences: the dressing of resonances and the coupling of reaction channels. The dressing of parameters implies that all resonance masses, widths and couplings become functions of the squares of particle four-momenta. Therefore, the exact relation between them and conventional resonance parameters, for example Breit-Wigner ones, becomes much less clear. This gives rise to the breakdown of standard resonance extraction methods based on the assumption of constant resonance parameters [1], e.g. speed plot or time delay, and calls for redefinition of the conventional resonance parameters [2]. The importance of coupled-channel approaches will be illustrated by some selected results for meson photoproduction processes based on a dynamical approach [3]. In this approach, more complex terms than the standard s, t and u-channel Feynman diagrams appearing in the full photoproduction amplitude are systematically approximated by contact terms, which preserves the off-shell gauge symmetry as demanded by Ward-Takahashi identity. We will show how the consideration of different reaction processes influences, through the coupled-channel effects, the extracted resonance parameter values [1,2,3,4] and even the existence of a resonance [5].

[1] S. Ceci, J. Stahov, A. Švarc, S. Watson, and B. Zauner, hep-ph/0609236.

[2] S. Ceci, A. Švarc, B. Zauner, M. Manley, and S. Capstick, Phys. Lett. **B659** (2008) 228.

[3] H. Haberzettl, K. Nakayama, S. Krewald, Phys. Rev. **C74** (2006) 045202.

[4] Preliminary results, prepared for the MESON 2008 conference.

[5] S. Ceci, A. Švarc, B. Zauner, Phys. Rev. Lett. **97** (2006) 062002.

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