Parameters of scalar resonances from the combined analysis of pion-pion scattering and coupled-channel data

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Peculiarities of obtaining parameters for broad multi-channel resonances from data are discussed analyzing the experimental data on processes $\pi\pi \to \pi\pi, K\overline{K}$ in the $I^G J^{PC} = 0^+ 0^{++}$ channel in a model-independent approach based on analyticity and unitarity and using an uniformization procedure. It is shown that it is possible to obtain a good description of the $\pi\pi$ scattering data from the threshold to 1.89 GeV with parameters of resonances cited in the PDG tables as preferred. However, in this case, first, representation of the $\pi\pi$ background is unsatisfactory. Second, the data on coupled process $\pi\pi \to K\overline{K}$ are not described even qualitatively above 1.15 GeV. The combined analysis of this coupled processes is needed, which is also carried out satisfactorily. Then both above-indicated important remarks, related to consideration on the basis of the analysis only of $\pi\pi$-scattering, are taken back. There are changed most considerably parameters of the $f_0(600)$ which are now in some accordance with prediction by S. Weinberg on the basis of mended symmetry. The obtained $\pi\pi$-scattering length is in accordance with the ones get from the data on K_{e4} decay and in the DIRAC experiment at CERN and also calculated in ChPT.

[1] Yu.S. Surovtsev, P. Bydžovský, T. Gutsche, R. Kamiński, V.E. Lyubovitskij, and M. Nagy, Nucl. Phys. B (Proc. Suppl.) **219-220** (2011) 263.

[2] Yu.S. Surovtsev, P. Bydžovský, and V.E. Lyubovitskij, Phys. Rev. D **85** (2012) 036002-1.

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