

On scalar mesons from the combined analysis of multi-channel pion-pion scattering and J/ψ decays

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The data on isoscalar S-wave processes $\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$ and on decays $J/\psi \rightarrow \pi\pi, K\bar{K}$ are analyzed jointly in a model-independent approach [1,2], based on analyticity and unitarity and using an uniformizing-variable method, for studying f_0 -mesons lying below 1.9 GeV. The uniformizing variable is used [3], in which, in addition to the $K\bar{K}$ - and $\eta\eta$ -threshold branch-points, also the left-hand branch-point at $s = 0$, related to the $\pi\pi$ crossed channels, is taken into account. It is shown that in the region below 1 GeV, there are two solutions, "up" and "down", related to the σ -meson of mass $m_\sigma \approx m_\rho$ and of width equal to about 0.5 GeV in the former case and 1 GeV in the latter. An arrangement of poles and zeros on the Riemann surface of the S -matrix, which describe the $f_0(980)$, indicates on its non- $q\bar{q}$ nature (e.g., the bound $\eta\eta$ state) in both cases. An existence of the $f_0(1370)$ of the $s\bar{s}$ nature does not contradict to the data, though the analysis does not give a decisive evidence for it. It is shown also that in the 1.5-GeV region, there are two states of different nature: the narrow $q\bar{q}$ and wide glueball. The $f_0(1710)$ have the dominant $s\bar{s}$ component.

[1] Yu.S. Surovtsev, P. Bydžovský, R. Kamiński, and M. Nagy: Int.J.Mod. Phys. A 24 (2009) 586.

[2] Yu.S. Surovtsev, P. Bydžovský, R. Kamiński, and M. Nagy: Phys. Rev. D 81 (2009) 016001.

[3] Yu.S. Surovtsev, T. Branz, T. Gutsche, and V.E. Lyubovitskij: Talk at Int. Bogolyubov Conf. "Problems of Theoretical and Mathematical Physics", Moscow-Dubna, Russia; Book of Abstracts, Dubna: JINR, 2009, p.176. ISBN 978-5-9530-0222-6.

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