Precise determination of the parameters of resonances $f_0(600)$ and $f_0(980)$ by fitting the data and dispersion relations

Robert Kamiński[(a)], R. Garcia-Martin[(b)], J. R. Pelaez[(b)], J. Ruiz de Elvira[(b)]

[(a)] Department of Theoretical Physics Henryk Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences, 31-342, Kraków, Poland
[(b)] Departamento de Física Teórica II, Universidad Complutense de Madrid, 28040 Madrid, Spain

Long-standing puzzle in parameters of still controversial $f_0(600)$ and still enigmatic $f_0(980)$ mesons seems to be resolved. Very recent dispersive data analysis finally allowed on precise and model independent determination of those parameters (masses, widths and coupling constants) [1]. Latest dispersive analyzes of the $\pi\pi$ scattering data including very recent K_{l4} experimental results have led to the construction of the $\pi\pi$ amplitudes in many partial waves (S, P, D and F) [1,2] and in energy range up to about 1100 MeV. Mutual consistency of those amplitudes expressed by their agreement with once subtracted dispersion relations with imposed crossing symmetry condition ensures that analytical continuation of S-wave amplitude provides reliable and precise information on the $f_0(600)$ and $f_0(980)$ resonances. Presented results agree with those obtained by other, independent, group [3] working on $\pi\pi$ dispersion for many years. One can suppose that these new results will substantially improve the precision of the results given in particle data tables.

[1] *"The Pion-pion scattering amplitude. IV: Improved analysis with once subtracted Roy-like equations up to 1100 MeV"*,
R. Garcia-Martin, R. Kaminski, J. R. Pelaez, J. Ruiz de Elvira and F.J. Yndurain, Phys. Rev. D83, 074004 (2011)

[2] *"Dispersion relations with crossing symmetry for $\pi\pi$ D and F wave amplitudes"*,
R. Kamiński, Phys. Rev. D83, 076008 (2011)

[3] *"Mass and width of the lowest resonance in QCD"*,
I. Caprini, G. Colangelo, H. Leutwyler, Phys. Rev. Lett. 96, 132001 (2006)

E-mail: Robert.Kaminski@ifj.edu.pl