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Improvement of $\pi\pi$ amplitudes and correct position of the σ pole

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Collaboration

Abstract content

Recently a big progress in understanding and description of the $\pi\pi$ interactions has been made due to dispersive analyses with imposed crossing symmetry [1]. This has led to significant changes in the information on these interactions, (mostly below 1 GeV), presented in the Particle Data Tables 2012 [2]. Nevertheless old parameterizations of the $\pi\pi$ amplitudes with e.g. wide and heavy $f_0(500)$ pole are still used in many calculations. The reason is that theoretical approach presented in those dispersive analyses can sometimes be unconvincing and size of those changes difficult to accept especially in experimental analyses. To solve this problem we apply dispersion relations with imposed crossing symmetry to chosen S and P-wave amplitudes with wide and heavy $f_0(500)$ pole and with not correctly parameterized near threshold region. In our work, these amplitudes are modified in the low-energy region and then fitted to experimental data and to the dispersion relations. Very good agreement with data is achieved for both amplitudes from the threshold up to 1.8 GeV and with dispersion relations up to 1.1 GeV. Consequences of the applied modifications, e.g. changes of the S-wave lowest-pole positions, are presented. Presented results of our analysis should show the way the practical application of the results of the dispersive analysis for the $\pi\pi$interactions, or at least make this application significantly easier.

[1] R. Garcia-Martin et al., Phys. Rev. D83, 074004 (2011) [2] "2013 Review of Particle Physics" J. Beringer et al.(Particle Data Group), Phys. Rev. D86, 010001 (2012)

Primary author(s) :   NAZARI, Vahabeddin (Institute of Nuclear Physics PAS)

Co-author(s) :   KAMIŃSKI, Robert (Institute of Nuclear Physics PAS); BYDZOVSKI, Petr (Nuclear Physics Institute ASCR)

Presenter(s) :   NAZARI, Vahabeddin (Institute of Nuclear Physics PAS)

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