New dispersion relation in description of pion-pion scattering amplitudes

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The Roy's equations used in parameterization of the $\pi\pi$ scattering amplitudes described in series of three papers [1] are confronted with one-subtracted dispersion relations. These new equations rely on crossing symmetry assumption for studied amplitudes in the effective $\pi\pi$ mass from the threshold to about 1 GeV and can be used as a test for various parameterizations.

Roy's equations are constructed with use of two subtractions in dispersion relations. In results the S and P output amplitudes have rather small errors near the $\pi\pi$ threshold and significantly larger ones near 1 GeV. This leads to decrease of the weights of the input and output lower partial waves (S, P) near 1 GeV and of the input higher partial waves (D, F, G) from the $\pi\pi$ threshold to 1 GeV.

Introduction of only one subtraction in dispersion relations decreases the weight of the partial amplitudes at low energies and enhances their role at higher ones (near 1 GeV). In results the errors of such constructed equations are bigger near the $\pi\pi$ threshold and significantly smaller near 1 GeV in comparison with those from Roy's equations.

This enables to test with higher precision the lower partial waves near 1 GeV, higher ones below 1 GeV and to construct corresponding equations for higher partial waves (for D-wave for example).

[1] R. Kamiński, J. R. Peláez, F. J. Ynduráin,
The Pion-pion scattering amplitude. III. Improving the analysis with forward dispersion relations and Roy equations, FTUAM-07-11, e-Print: arXiv:0710.1150; Other papers of these authors cited therein.

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