

Strong evidence of the $\rho(1250)$ from a unitary multichannel reanalysis of elastic scattering data with crossing-symmetry constraints

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We present an analysis of elastic P -wave $\pi\pi$ phase shifts and inelasticities up to 2 GeV, in order to identify the corresponding $J^{PC} = 1^{--}$ excited ρ resonances and focusing on the $\rho(1250)$ vs. $\rho(1450)$ controversy. In our approach we employed an improved parametrization in terms of a manifestly unitary and analytic three-channel S -matrix with its complex-energy pole positions. The included channels were $\pi\pi$, $\rho 2\pi$, and $\rho\rho$. The improvement with respect to prior work amounts to the enforcement of maximum crossing symmetry through once-subtracted dispersion relations called GKPY equations. A clear picture emerges from this analysis, identifying five vector ρ states below 2 GeV which are $\rho(770)$, $\rho(1250)$, $\rho(1450)$, $\rho(1600)$, and $\rho(1800)$, with $\rho(1250)$ being indisputably the most important excited ρ resonance.

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