THE $\rho(770)$

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Determination of the parameters of the $\rho(770)$ is beset with many difficulties because of its large width. In physical region fits, the line shape does not correspond to a relativistic Breit-Wigner function with a P-wave width, but requires some additional shape parameter. This dependence on parameterization was demonstrated long ago by PISUT 68. Bose-Einstein correlations are another source of shifts in the $\rho(770)$ line shape, particularly in multiparticle final state systems (LAFFERTY 93).

The same model dependence afflicts any other source of resonance parameters, such as the energy dependence of the phase shift δ_1^1, or the pole position. It is, therefore, not surprising that a study of $\rho(770)$ dominance in the decays of the η and η' reveals the need for specific dynamical effects, in addition to the $\rho(770)$ pole (BENAYOUN 93, ABELE 97B). Recently, BENAYOUN 98 compared the predictions of different Vector Meson Dominance (VMD)-based models with the data on the $e^+e^- \rightarrow \pi^+\pi^-$ cross section below 1 GeV, as well as with the phase and near-threshold behavior of the time-like pion form factor. They showed that only the model based on hidden local symmetry (HLS) is able to account consistently for all low-energy information, if one also requires a point-like coupling $\gamma\pi^+\pi^-$, which is excluded by common VMD but predicted by HLS.

The cleanest determination of the $\rho(770)$ mass and width comes from the e^+e^- annihilation and τ-lepton decays. BARATE 97M showed that the charged $\rho(770)$ parameters measured from τ-lepton decays are consistent with those of the neutral one determined from e^+e^- data of BARKOV 85. This conclusion is qualitatively supported by the high statistics study of ANDERSON 00. However, model-independent comparison of the two-pion mass spectrum in τ decays and the $e^+e^- \rightarrow \pi^+\pi^-$ cross section gives indications of discrepancies between the overall normalization: τ data are about 3% higher than e^+e^- data (ANDERSON 99, EIDELMAN 99). This effect is too big to be explained by isospin violation (ALEMANY 98).