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 multi-particle 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).

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 $e^+e^- \to \pi^+\pi^-$ 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 can be partly explained by isospin violation (ALEMANY 98, CZYZ 01), but its complete understanding requires additional consideration of electroweak and QED radiative effects (CIRIGLIANO 01, EIDELMAN 01, MELNIKOV 01).

References

References may be found at the end of the $\rho(770)$ Listing.