THE $\rho(770)$

Written February 1998 by S. Eidelman (Novosibirsk).

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 parametrization was demonstrated long ago by PISUT 68. Bose-Einstein correlations are another source of shifts in the $\rho(770)$ line shape, particularly in the multiparticle final state systems (LAFFERTY 93).

The same model dependence afflicts any other source of the 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 $e^+e^- \to \pi^+\pi^-$ cross section below 1 GeV as well as with the phase and near-threshold behaviour of the timelike pion form factor. They showed that only the model based on a 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.