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Generalized Gounaris-Sakurai formula and $\rho(770)$, $\rho'(1450)$ and $\rho''(1700)$ masses and widths

It is demonstrated that Gounaris-Sakurai model of the pion electromagnetic form factor is based on the P-wave iso-vector $\pi\pi$ scattering phase-shift given by a generalized effective-range formula of the Chew-Mandelstam type, valid exclusively only at the elastic region up to $1GeV^2$. Therefore the Gounaris-Sakurai model is justified to be used in a determination of the $\rho(770)$ meson parameters from existing data, however, in no case in a determination of the inelastic $\rho'(1450)$ and $\rho''(1700)$ resonance parameters.

We propose the pion electromagnetic form factor model found on the analyticity in the complex energy plane in which all three resonances $\rho(770)$, $\rho'(1450)$, $\rho''(1700)$ are defined on equal level as poles on unphysical sheets of the corresponding Riemann surface. The $\rho(770)$ meson parameters obtained in a such way coincide with the parameters obtained in the framework of the GKPY Roy-like equations analysis..

Experimental Collaboration

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