

Analysis of the pion scalar form factor provides model independent values of $f_0(500)$ and $f_0(980)$ meson parameters

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Collaboration

Abstract content

Starting from general considerations of the pion scalar form factor in elastic region, the parametrization of tangens of the S-wave isoscalar $\pi - \pi$ scattering phase shift is found to be rational function in the pion c.m. three-momentum variable q with real coefficients. As a result, this phase shift can achieve asymptotically either the value $\pi/2$ or 0, depending on the fact, if degree of the numerator is larger, or lower, than the degree of the denominator. An optimal description of the data on the S-wave isoscalar $\pi - \pi$ scattering phase shift reveals that asymptotically the phase shift achieves the value $\pi/2$. Taking into account this fact the phase representation of the pion scalar form factor with one subtraction is derived in the framework of the unitary and analytic approach. Substituting explicit form of the S-wave isoscalar $\pi - \pi$ scattering phase shift into the pion scalar form factor phase representation and calculating the corresponding integral by theory of residues, [1/4] Pade-type approximation of the pion scalar form factor in the pion c.m. three-momentum variable q is found, from which the $f_0(500)$ and $f_0(980)$ scalar meson parameters are determined in a model independent way.

Primary author(s) : DUBNICKA, Stanislav (Institute of Physics SAS)

Co-author(s) : DUBNICKOVA, Anna Zuzana (Comenius University); LIPTAJ, Andrej (Institute of Physics SAS)

Presenter(s) : DUBNICKA, Stanislav (Institute of Physics SAS)

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