

$\eta' - \pi$ production and search for exotic mesons at COMPASS and JLab12

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Collaboration

Abstract content

In a recent analysis of the exclusive production of $\eta - \pi$ and $\eta' - \pi$ meson systems with a 191 GeV/c pion beam on a proton target at COMPASS, an unexpected enhancement of $\eta' - \pi$ over $\eta - \pi$ was observed for the odd partial waves. These carry exotic quantum numbers therefore cannot be associated with the conventional quark-antiquark states. The collected data covers a wide range of the dimeson invariant masses extending to the region where the multi-particle production process enters the diffractive regime and can be well described by means of the theory of complex angular momentum, namely in terms of the t -channel exchanges of Regge trajectories. Assuming the analyticity and the multi-Regge behavior of the scattering amplitude at high energies, the finite energy sum rules for multiple production can be formulated. The sum rules give a consistency condition between a quasi-two-body Regge amplitude and a double Regge amplitude in the case of reactions with three particles in the final state. Such conditions allow to examine the analytical structure of the multi-particle production amplitudes and to shed light on the observed $\eta - \pi$ puzzle.

Primary author(s) : PAUK, Vladislav (JLab)

Co-author(s) : MATHIEU, Vincent (Indiana University); SZCZEPANIAK, Adam (Indiana University/JLab)

Presenter(s) : PAUK, Vladislav (JLab)

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