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Extraction of the $\pi^+\pi^-$ subsystem in Diffractively Produced $\pi^-\pi^+\pi^-$ at COMPASS

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The COMPASS experiment at CERN has collected a very large data set of 50 million diffractively produced $\pi^-\pi^+\pi^-$ events using a 190 GeV/c negatively charged hadron beam. The partial-wave analysis (PWA) of these high-precision data reveals previously unseen details. The PWA, which is currently limited by systematic uncertainties, is based on the isobar model, in which multi-particle decays are described as a chain of subsequent two-body decays. In this approach, fixed amplitudes for the intermediate two-pion resonances have to be assumed. These isobar amplitudes are usually parametrized e.g. by Breit-Wigner amplitudes, which enter as prior knowledge, thus increasing systematic uncertainties. We present a novel method, which allows to extract isobar amplitudes directly from the data in a more model-independent way. The focus lies especially on the scalar $\pi^+\pi^-$ subsystem, where in a previous analysis a signal in the $\pi^-\pi^+\pi^-$ sample for a new axial-vector state $a_1(1420)$ in the $f_0(980)\pi$ decay mode was found.

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