

Exclusive central diffractive production of scalar, pseudoscalar and vector mesons

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Collaboration

Abstract content

We discuss exclusive central diffractive production of scalar ($f_0(980)$, $f_0(1370)$, $f_0(1500)$), pseudoscalar (η , $\eta'(958)$), and vector (ρ^0) mesons in proton-proton collisions. The amplitudes are formulated in terms of effective vertices required to respect standard rules of Quantum Field Theory and propagators for the exchanged pomeron and reggeons [1]. Different pomeron-pomeron-meson tensorial (vectorial) coupling structures are possible in general. In most cases two lowest orbital angular momentum - spin couplings are necessary to describe experimental differential distributions [2]. We discuss differences between results of the tensorial pomeron" and vectorial pomeron" models. For the $f_0(980)$ and η production the reggeon-pomeron, pomeron-reggeon, and reggeon-reggeon exchanges are included in addition, which seems to be necessary at relatively low energies. The theoretical results are compared with the WA102 experimental data, in order to determine the model parameters. Correlations in azimuthal angle between outgoing protons, distributions in rapidities and transverse momenta of outgoing protons and mesons in a special "glueball filter variable", as well as some two-dimensional distributions are presented. For the ρ^0 production the photon-pomeron and pomeron-photon exchanges are considered. The coupling parameters of tensor pomeron and/or reggeon are fixed from the H1 and ZEUS experimental data of the $\gamma p \rightarrow \rho^0 p$ reaction. We present first predictions of this mechanism for $pp \rightarrow pp\pi^+\pi^-$ reaction being studied at COMPASS, RHIC, Tevatron, and LHC [3]. We analyse influence of the experimental cuts on integrated cross section and various differential distributions for pions. We compare the ρ^0 contribution with two-pion continuum [4]. We show that high-energy central production, in particular of pseudoscalar mesons, could provide crucial information on the spin structure of the soft pomeron. This is particularly clear for the coupling of the pomeron to particles carrying non-zero spin as ρ^0 meson for example.

[1] C. Ewerz, M. Maniatis, and O. Nachtmann, *Ann. Phys.* **342** (2014) 31, arXiv:hep-ph/1309.3478. [2] P. Lebiedowicz, O. Nachtmann, and A. Szczurek, in print in *Ann. Phys.*, arXiv:hep-ph/1309.3913, [3] P. Lebiedowicz, O. Nachtmann, and A. Szczurek, a paper in preparation. [4] P. Lebiedowicz, Ph.D. thesis, Exclusive reactions with light mesons: From low to high energies, IFJ PAN, 2014.

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