

# Exclusive production of $f_1(1285)$ meson at low and high energies

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We present a new study of the exclusive production of  $f_1(1285)$  meson at near threshold energies relevant for the HADES and PANDA experiments at GSI-FAIR [1]. At energies close to the threshold the  $VV \rightarrow f_1(1285)$  fusion processes ( $V = \rho, \omega$ ) are the dominant production mechanisms. The vertex for the  $VV \rightarrow f_1$  coupling is derived from an effective coupling Lagrangian. In order to determine the parameters of the model the  $\gamma p \rightarrow f_1 p$  reaction is discussed and results are compared with the CLAS experimental data [2]. The possibility of a measurement by HADES@GSI is discussed.

In a second part we discuss the central exclusive diffractive production of  $f_1$  mesons in high-energy proton-proton collisions, where the pomeron-pomeron fusion process is expected to be dominant. The vertex for the pomeron-pomeron- $f_1$  coupling is derived within the tensor-pomeron approach [3]. We adjust the parameters of our model to the WA102 experimental data [4] and compare with predictions of the Sakai-Sugimoto model, where the couplings are determined by the mixed axial-gravitational anomaly of QCD [5]. The total cross section and several differential distributions are presented. Our results may be used to investigate the  $pp \rightarrow pp\pi^+\pi^-\pi^+\pi^-$  reaction at LHC energies [6]. The four-pion final state is also interesting in searches for glueball. We predict a much larger cross section for production of  $f_1(1285)$  than for production of  $f_2(1270)$  in the  $\pi^+\pi^-\pi^+\pi^-$  channel for the LHC energies. This opens a possibility to study the  $f_1(1285)$  meson in experiments at the LHC. Some effort to measure central exclusive four-pion production was initiated already by the ATLAS Collaboration [7].

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## Collaboration

**Primary authors:** LEBIEDOWICZ, Piotr (Institute of Nuclear Physics PAS); Prof. NACHTMANN, Otto (Heidelberg University); Prof. SZCZUREK, Antoni (Institute of Nuclear Physics PAS)

**Presenter:** LEBIEDOWICZ, Piotr (Institute of Nuclear Physics PAS)

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