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Searching for odderon in exclusive reactions:

$$pp \rightarrow ppp\bar{p}, pp \rightarrow pp\phi\phi \text{ and } pp \rightarrow pp\phi$$

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Recent results of the TOTEM collaboration [1] suggest that the odderon exchange can be responsible for a disagreement of theoretical calculations and the TOTEM data [2] for elastic pp scattering. It is premature to draw conclusions. Here we present our recent studies for three different processes in pp collisions where the odderon may show up. We apply recently proposed tensor-pomeron and vector-odderon model for soft high-energy processes [3].

The first study concerns CEP of $p\bar{p}$ pairs [4]. Here the odderon exchange may lead to asymmetries for proton and antiproton. It seems, however that the effect from subleading reggeons competes with the odderon. In the process $pp \rightarrow pp\phi\phi$ [5] the odderon does not couple to protons. For the $pp \rightarrow pp\phi$ reaction [6] the odderon-pomeron fusion is an alternative to the photon-pomeron fusion. We consider also other subleading processes to understand the WA102 experimental data [7] and check room left for the odderon exchange. The interference of photoproduction and odderon contributions can explain azimuthal correlations between protons. Upper limit for odderon exchange is obtained. Predictions for the LHC will be presented.

[1] TOTEM Collaboration, arXiv:1812.04732

[2] E. Martynov, B. Nicolescu, Phys. Lett. B786 (2018) 207

[3] C. Ewerz, M. Maniatis, O. Nachtmann, Annals Phys. 342 (2014) 31

[4] P. Lebiedowicz, O. Nachtmann, A. Szczurek, Phys. Rev. D97 (2018) 094027

[5] P. Lebiedowicz, O. Nachtmann, A. Szczurek, arXiv:1901.11490

[6] P. Lebiedowicz, O. Nachtmann, A. Szczurek, in preparation

[7] WA102 Collaboration, Phys. Lett. B432 (1998) 436, B489 (2000) 29

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