

Searching for odderon exchange in exclusive $pp \rightarrow pp\phi$ and $pp \rightarrow pp\phi\phi$ reactions at the LHC

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We discuss the possibility to use the $pp \rightarrow pp\phi$ and $pp \rightarrow pp\phi\phi$ reactions in identifying the odderon exchange. So far there is no unambiguous experimental evidence for the odderon, the charge conjugation $C = -1$ counterpart of the $C = +1$ pomeron, introduced on theoretical grounds in [1]. Last year results of the TOTEM collaboration [2] suggest that the odderon exchange can be responsible for a disagreement of theoretical calculations and the TOTEM data [4] for elastic proton-proton scattering. Similar conclusion can be drawn when comparing recent result for $\sqrt{s} = 2.76$ TeV with the Tevatron data [3]. It is premature to draw definite conclusion. Here we present some recent studies for two related processes where the odderon exchange may show up. We apply recently proposed tensor-pomeron and vector-odderon model for soft high-energy reactions [5].

The first reaction is central exclusive production of pairs of ϕ mesons. Here odderon exchange is not excluded by the WA102 experimental data [8] for high $\phi\phi$ invariant masses. The process is advantageous [6] as here odderon does not couple to protons (the corresponding coupling constant is probably small). Predictions for the LHC will be presented. The observation of $M_{\phi\phi}$ and the rapidity difference $Y_{\phi\phi}$ seems well suited to identify odderon exchange.

Finally we discuss the $pp \rightarrow pp\phi$ reaction [7]. At high energies probably the photon-pomeron fusion is the dominant process. The odderon-pomeron fusion is an interesting alternative. Adding odderon exchange with parameters adjusted for the $\phi\phi$ production improves considerably description of the proton-proton angular correlations measured by the WA102 collaboration [9]. At the low energy we consider also some other subleading processes that turned out to be rather small. Predictions for the LHC will be presented.

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