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Recent TOTEM Results and Perspectives for the LHC Run 2

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We present the final results on low- $|t|$ elastic proton-proton scattering at $\sqrt{s} = 8$ TeV based on two data sets acquired with different, dedicated beam-optics settings. A very high statistics sample allowed, for the first time at LHC energies, the exclusion of a purely exponential differential cross-section in the four-momentum range $0.027 < |t| < 0.2$ GeV² with a significance greater than 7 sigma. Two extended parametrisations, with quadratic and cubic polynomials in the exponent, are shown to be well compatible with the data.

Another data sample covered the range $6 \times 10^4 \text{ GeV}^2 < |t| < 0.2$ GeV², giving access to the region of interference between the hadronic and the electromagnetic scattering amplitudes, again for the first time at LHC. We present the measured cross-section and its interpretation for different assumptions on the functional forms of the interference term and of the phase of the hadronic elastic amplitude.

The conditional results for the ρ parameter, i.e. the arctangent of the hadronic phase at $t = 0$, are reported.

The second part of the presentation is dedicated to the Roman Pot upgrade realised during the first long shutdown of the LHC and the

resulting physics prospects for Run 2. Particular focus will be put on explaining the potential for observing and

characterising glueball states produced exclusively by Double Pomeron Exchange and tagged by detecting both surviving protons in the Roman Pots.

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