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Recent Elastic and Total Cross-Section Measurements by TOTEM

The TOTEM experiment at the interaction point 5 of the LHC has measured the total, elastic and inelastic proton-proton cross sections in a centre-of-mass energy range from 2.76 to 13 TeV, mostly in dedicated fills with special beam optics.

Most recently, TOTEM has performed a series of detailed measurements at $\sqrt{s}$ = 13 TeV. The total, elastic and inelastic proton-proton cross-sections were determined using the luminosity-independent method based on the optical theorem. Elastic scattering data in the Coulomb-nuclear interference region, at squared four-momentum transfers down to |t| ~ 8 x 10^{-4} GeV^2 allowed the first measurement of the ρ parameter at $\sqrt{s}$ = 13 TeV, where ρ is the ratio between the real and the imaginary part of the nuclear elastic scattering amplitude at t = 0. This measurement, combined with the TOTEM total cross-section results, led to the exclusion of all the models classified and published by COMPETE. The ρ and σ_{tot} results obtained by TOTEM are compatible with predictions of a colourless 3-gluon bound state exchange in the t-channel of proton-proton elastic scattering, as postulated by alternative theoretical models both in the Regge-like framework and in the modern QCD framework.
On the large |t| side the elastic differential cross-section measurement was pushed to 4 GeV^2. Thanks to very high statistics, the dip-bump structure between 0.4 and 0.8 GeV^2 was surveyed with unprecedented precision. At higher |t|-values up to the end of the observed range no further structure is present, and the data can be described with a power law.

The presentation will conclude with an outlook on planned future measurements.

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