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Elastic and Total Cross-Section Measurements by TOTEM: Past and Future

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The TOTEM experiment at the LHC has measured proton-proton elastic scattering in dedicated runs at √s = 2.76, 7, 8 and 13 TeV centre-of-mass
LHC energies. The proton-proton total cross-section σtot has been derived for each energies using a luminosity independent method. TOTEM has
excluded a purely exponential differential cross-section for elastic proton-proton scattering with significance greater than 7 σ in the |t| range from
0.027 to 0.2 GeV2 at √s = 8 TeV. The ρ parameter has been measured at √s = 8, 13 TeV via the Coulomb-nuclear interference, and at 13 TeV was
found to be ρ = 0.1 ± 0.01. The ρ measurement is a strong evidence of the existence of a 3-gluon bound state, predicted from theoretical models
both in Regge-like and modern QCD framework.

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