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pp scattering at LHC and cosmic ray energies

Using a unified analytic representation for the elastic scattering amplitudes of pp scattering for all energies, the behavior of observables at the LHC energies in the range 2.76 - 14 TeV is discussed. Similar to the case of 7 TeV data, the proposed amplitudes give excellent description of the preliminary data at 8 TeV. The energy dependence of the observables, with predictions for the experiments at 2.76, 13 and 14 TeV is discussed.

As an application of these results, we study p-air cross sections, with comparison to the data from Extensive Air Shower (EAS) measurements. The comparison with cosmic ray data is very satisfactory in the whole pp energy interval from 1 to 100 TeV.

High energy asymptotic behaviour of cross sections is investigated in view of the geometric scaling property of the amplitudes. It is predicted that the proton does not behave as a black disk even at asymptotically high energies, and possible non-trivial consequences of this fact for pA collision cross sections are investigated.

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