

30 years of strong interactions: a three-day meeting in honor of Joseph Cugnon and Hans-Jürgen Pirner

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Ultra-High energy cosmic-rays and first LHC data

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The determination of the primary energy and mass of ultra-high-energy cosmic-rays (UHECR) generating extensive air-showers in the Earth's atmosphere, relies on the detailed modeling of hadronic multiparticle production at center-of-mass (c.m.) collision energies up to two orders of magnitude higher than those studied at particle colliders. The first Large Hadron Collider (LHC) data have extended by more than a factor of three the c.m. energies in which we have direct proton-proton measurements available to compare to hadronic models. In this work we compare LHC results on inclusive particle production at energies $\sqrt{s} = 0.9, 2.36,$ and 7 TeV to predictions of various hadronic Monte Carlo (MC) models used commonly in cosmic-ray physics. While reasonable overall agreement is found for some of the MC, none of them reproduces consistently the \sqrt{s} evolution of all the observables. We discuss implications of the new LHC data for the description of cosmic-ray interactions at the highest energies.

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