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Measurements of High Energy Particle Interaction Properties with the Pierre Auger Cosmic Ray Observatory

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The Pierre Auger Observatory is a cosmic ray detector optimized for the detection of air showers (particle cascades in the atmosphere) created by particles with energies ranging from 10^{17} eV to about 10^{20} eV. The Pierre Auger Observatory is a hybrid detector. It uses a ground array of water Cherenkov tanks (deployed over an area of 3000 square kilometers), and a set of fluorescence telescopes overlooking the atmosphere above the ground array. The ground array measures the density of particles at ground level, while the fluorescence telescopes measure the shower development profile through the atmosphere. In this presentation, I will focus on our recent measurements of the proton-air cross section at $\sqrt{s} = 57$ TeV, and on our measurements of the muon content in air showers, which appears to be approximately a factor of two larger than predicted by models.

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