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Particle physics measurements at the highest energies with the Pierre Auger Observatory

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The Pierre Auger Observatory measures cosmic rays with energies between 10^17.5 eV and 10^20 eV, based on air shower sampling at ground, complemented with shower development measurements with a smaller 12% duty-cycle.

The cross-section for the primary interaction of 10^18 eV protons with air has been measured by analysing the maximum of shower development in the atmosphere. This corresponds to a centre-of-mass energy of 57 TeV, and the LHC results later confirmed the observed evolution of the proton-proton cross-section at intermediate energies.

The depth of shower maximum is sensitive to cross-section and primary mass. Its energy evolution indicates a change towards the behavior expected for heavier primaries or larger cross-sections. We will show also the results on other observables related to primary nuclear mass composition.

The results of the Observatory include also limits on the possible fluxes of photons and neutrinos, which will be briefly reviewed.

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