

Astroparticle and High-Energy Physics of the Pierre Auger Observatory

> <http://www.auger.org>

>What is their nature?

The hybrid detector system is used to study the composition of ultra-high energy cosmic rays. Limits on the flux of ultra-high energy neutrino's and gamma rays have been measured. Beyond 10^{18} eV the data indicate a change in composition from light to heavy nuclei, as a function of the primary energy. The composition data are being used to study hadronic interactions beyond the 10^{12} eV center of mass energy.

>Hybrid detection

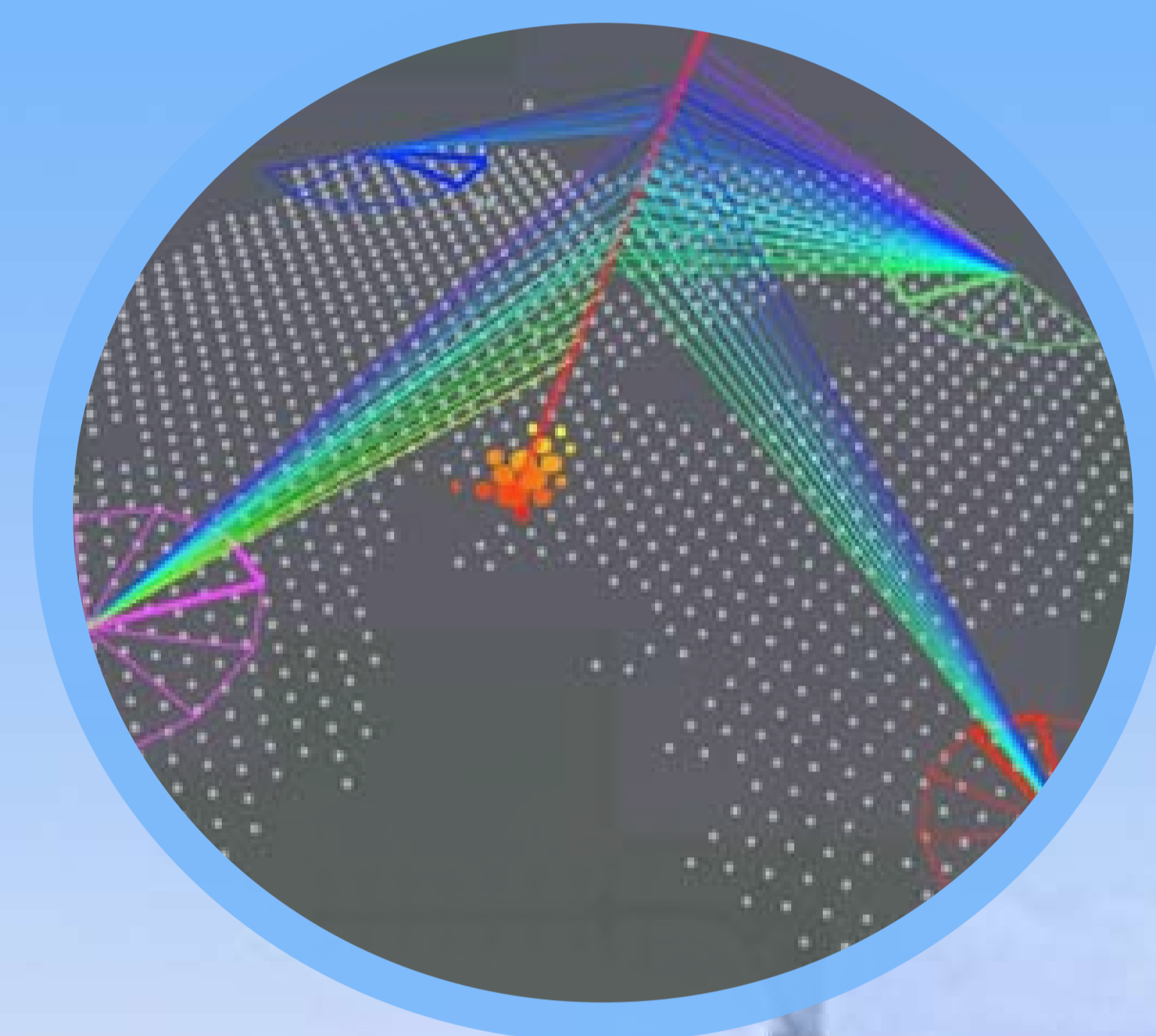
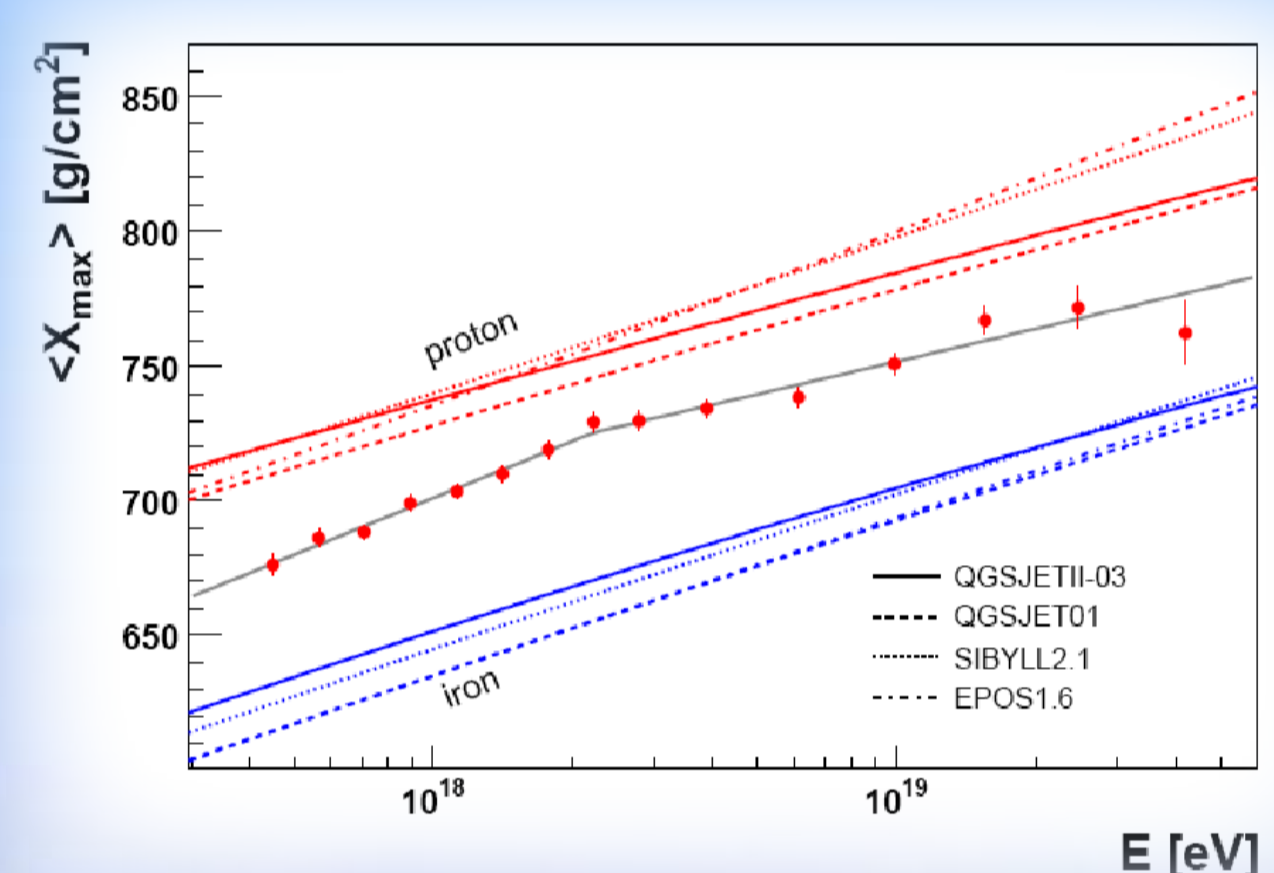
The Pierre Auger Observatory in Argentina (the Southern Auger Observatory) uses different detection systems to observe air showers induced by ultra-high energy cosmic rays: a surface detector and a fluorescence detector. Both systems provide complementary information on the arrival direction, the primary energy, and the composition of cosmic rays.

>The highest energies

The Pierre Auger Observatory is studying ultra-high energy cosmic rays, the most energetic and rarest of particles in the universe. While much progress has been made in nearly a century of research in understanding cosmic rays with low to moderate energies, those with extremely high energies remain mysterious.

>What are their sources?

The data from the observatory show that the distribution of arrival directions of cosmic rays with an energy larger than $6 \cdot 10^{19}$ eV is not isotropic. These directions are strongly correlated with the distributions of nearby Active Galactic Nuclei. More data will be needed to fully understand the sources and the acceleration mechanisms.



>New detector systems

The Observatory will be completed with a site in Colorado, the Northern Auger Observatory, and with new detector systems. One of these new systems is the Radio Detector. This detector uses rather simple radio antennas and state-of-the-art low-power electronics for the detection of air showers in the atmosphere.