

Ultra high energy cosmic rays induced air showers: from nuclear interactions of particles in the air to detection techniques on the ground

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Ultra-high energy cosmic rays (UHECRs) are the most energetic, rare and mysterious particles in the Universe. Although they are known to be of extragalactic origin, their actual sources remain a subject of debate yet. Modern large-scale experiments are indirectly observing them on the ground, and are further expanded to increase data statistics with improved mass-sensitive measurements of cosmic rays induced air showers, i.e. when a cosmic ray particle enters the Earth's atmosphere, it develops an extensive air shower of secondary particles through multiple nuclear interactions.

In this talk, I will shortly introduce the physics of cosmic rays air showers, with the detection methods used nowadays, e.g. at the world's largest cosmic rays experiment, the Pierre Auger Observatory, including Monte Carlo simulations, with the focus on radio signals from air showers and the detector response. Additional emphasis will be put on data analysis and online tools for data visualization.

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