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Detection of Radio Emission from Ultra-High Energy Cosmic Rays

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Abstract content

The radio technique for the detection of cosmic particles has seen a major revival in recent years. New and planned experiments in the lab and the field, such as GLUE, Anita, Codalema, LOPES and LOFAR as well as sophisticated Monte Carlos experiments have produced a wealth of new information. Radio emission of ultra-high energy cosmic particles offers a number of interesting advantages. Since radio waves suffer no attenuation, radio measurements allow the detection of very distant or highly inclined showers, can be used day and night, and provide a bolometric measure of the leptonic shower component. Particular emphasis will be given to recent results from LOPES (LOFAR Prototype Station) which has been installed at the "Forschungszentrum Karlsruhe" in Germany next to the cosmic ray detector array "KASCADE Grande". The experiment now has detected the radio emission from cosmic rays and confirmed the geosynchrotron effect for extensive air showers. The radio emission seems to be a faithful tracer of primary particle energy. Future steps will be the installation of radio antennas at the AUGER experiment to measure the composition of ultra-high energy cosmic rays and the usage of the LOFAR radio telescope as a cosmic ray detector. Here an intriguing additional application is the search for low-frequency radio emission from neutrinos and cosmic rays interacting with the lunar regolith. This promises the best detection limits for particles above 10ˆ21 eV and allows one to go significantly beyond current ground-based detectors.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Primary author(s) : Dr. FALCKE, Heino (Radboud University, Nijmegen, The Netherlands & ASTRON (Netherlands Foundation for Research in Astronomy), Dwingeloo)

Presenter(s) : Dr. FALCKE, Heino (Radboud University, Nijmegen, The Netherlands & ASTRON (Netherlands Foundation for Research in Astronomy), Dwingeloo)

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