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Autonomous radio-detection of cosmic rays with GRANDProto300

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The Giant Radio Array for Neutrino Detection (GRAND) is a project aiming at the detection of ultra-high-energy (UHE) cosmic rays, gamma rays and neutrinos through the radio emission produced by extensive air showers in the atmosphere. It consists of a network of autonomous radio antennas deployed over large areas in radio-quiet, mountainous regions, using the surrounding topography as a target for Earth-skimming neutrinos. By exploiting the large instantaneous field of view of sparse radio arrays, GRAND is designed to reach an unprecedented exposure at energies above
10^{17} eV, opening a new window on the origin and composition of UHE cosmic rays, the flux of cosmogenic neutrinos expected from interactions of the highest-energy particles with cosmic backgrounds, the diagnosis of astrophysical neutrino sources, and tests of fundamental physics. In this contribution we present the GRAND detection concept and analysis chain, and we introduce the first cosmic-ray air showers detected with GRANDProto300 a sub-array stage of the experiment. These events validate the autonomous trigger, timing and direction reconstruction, and radio-background rejection strategies, and demonstrate the capability of GRAND-like arrays to deliver high-quality measurements of inclined air showers, paving the way toward the next stages of the experiment.

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