

Radio Detection of Cosmic Rays

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In the last decade significant progress was made regarding the radio detection of cosmic-ray air showers. Mainly at MHz frequencies, air showers emit a coherent radio pulse in the forward direction, which exceeds the galactic radio background at an energy threshold of roughly 100 PeV. The dominant emission mechanism is the deflection of electrons and positrons in the shower by the geomagnetic field, but also sub-dominant processes as the time variation of the charge excess in the shower play a role. Using digital techniques, the detection method was successfully revived by the LOPES and CODALEMA experiments starting 2003. Nowadays a second generation of digital antenna arrays, like AERA, LOFAR and Tunka-Rex, starts to become competitive with traditional air-shower techniques regarding the precision for the shower direction, energy, and position of the shower maximum. Moreover, the signal properties meanwhile are understood, since recent simulation codes for the radio signal agree with experiments within the current measurement accuracy of the radio amplitude of less than 20 %. This talk will provide an overview on the current status of the radio technique and its future prospects at very dense arrays like SKA, and sparser arrays aiming at the highest energies. In particular the combination of particle detectors and radio antennas seems promising, because their combination provides highest accuracy for the primary energy and mass composition with almost 100 % duty cycle around the clock.

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