

Radio Detection of Cosmic Ray Air Showers

Abstract for seminar talk by Frank Schröder

One of the major open questions in astroparticle physics is the origin of ultra-high energy cosmic rays with energies above 10^{17} eV. Answering this question requires precise measurements of the energy and composition of cosmic rays, to compare them to the predictions derived for different hypotheses on their origin. A relatively new method for the reconstruction of the energy and composition is the radio detection of air showers generated by the primary cosmic rays. Compared to the established methods of air-Cherenkov and fluorescence light measurement of air showers it has the advantage of a much higher duty cycle close to 100%, and, compared to surface particle detectors, a better resolution in particular for the composition is expected. However, the latter still remains to be proven experimentally. Prototype experiments like LOPES, a digital antenna array at the Karlsruhe Institute of Technology could demonstrate the principal feasibility, but not yet reach a sufficient measurement precision for the composition. This is the goal of current radio arrays like AERA at the Pierre Auger Observatory and Tunka-Rex, the radio extension of the Tunka experiment in Siberia.

The talk will start with an introduction on the physics behind the radio emission of air showers. Then, the main focus is on experimental techniques and results - including methods to obtain the cosmic ray composition from the radio signal.