

# Status of air-shower measurements with sparse radio arrays

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Current radio arrays like AERA or Tunka-Rex have demonstrated that areas of several km<sup>2</sup> can be instrumented for reasonable costs with antenna spacings of the order of 200 m. This finally fulfills the promise that radio detection of air showers can be relatively cheap –at least when radio antennas extend existing arrays. Recent results indicate that for the reconstruction of the energy of the primary particle the radio technique can already compete in absolute accuracy with other precise techniques, like the detection of air-fluorescence or air-Cherenkov light. Moreover, it has been demonstrated that radio arrays provide information on the mass-composition of the primary cosmic-rays above 100 PeV by their sensitivity to the position of the shower maximum. Although sparse arrays have not yet achieved the same precision for the shower maximum as dense arrays like LOFAR, or as the established detection techniques, radio measurements can be used to increase the total accuracy of observatories containing antennas among other detectors. In particular the combination of radio and muon measurements is expected to yield higher accuracy for the type of primary particle initiating the air shower, and this around the clock and not limited to clear nights as the light-detection methods. This talk will summarize the latest results and plans of several radio experiments, in particular LOPES, AERA, and Tunka-Rex.

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