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Tunka-Rex: Status, Plans, and Recent Results

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Tunka-Rex, the Tunka Radio extension, meanwhile consists of 44 SALLA antennas at the TAIGA facility (Tunka Advanced Instrument for cosmic ray physics and Gamma Astronomy) in Siberia, and soon will be extended to a total of 63 antennas, most of them distributed on an area of one square kilometer. In the first years of operation, Tunka-Rex was solely triggered by the co-located air-Cherenkov array Tunka-133. The correlation of the measurements by both detectors has provided direct experimental proof that radio arrays can measure the position of the shower maximum. The precision achieved so far is 40 g/cm^2, and several methodical improvements are under study. Moreover, the cross-comparison of Tunka-Rex and Tunka-133 shows that the energy reconstruction of Tunka-Rex is precise to 15 %, with a total accuracy of 20 % including the absolute energy scale. By using exactly the same calibration source for Tunka-Rex and LOPES, the energy scale of their host experiments, Tunka-133 and KASCADE-Grande, respectively, can be compared even more accurately with a remaining uncertainty of about 10 %. The main goal of Tunka-Rex for the next years is a study of the cosmic-ray mass composition in the energy range above 100 PeV: For this purpose, Tunka-Rex now is triggered also during daytime by the particle detector array Tunka-Grande featuring surface and underground scintillators for electron and muon detection.

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