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Air Shower Measurements with LOFAR

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LOFAR is a new radio telescope that is being built in the Netherlands. The core of LOFAR will have a high density of antennas, the central “superterp” with nearly 600 antennas on a circular area of about 400m diameter, and more stations close by. In addition, the calibration on multiple astronomical objects will give an excellent calibration with an expected phase error of less than 50 ps. Together this will give LOFAR a unique sensitivity for the study of the radio emission of single air showers.

LOFAR is currently being set up with more than half of the stations already in the field. At the same time we are working on a triggering system for air showers and other radio transients, and on the analysis pipeline to extract air shower parameters from the recorded waveform data.

Triggering on the radio emission from air showers means detecting a nano-second radio pulse and discriminating real events from radio interference. At LOFAR, we will search for pulses in the digital data stream and use pulse-shape parameters to discriminate real events from background. We will also have a small scintillator array to test and confirm the performance of the radio-only trigger and to provide additional measurements for the air shower reconstruction and analysis.

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