## **ICRC 2025 - The Astroparticle Physics Conference**



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## **Cosmic-ray detection with LOFAR 2.0**

The LOFAR radio telescope has been used to measure radio emission from cosmic-ray air showers in the  $10^{16.5} - 10^{18}$  eV range for over a decade. LOFAR's uniquely dense array of hundreds of antennas measuring from 30-80 MHz is ideal for probing the radio footprint in detail. To date, LOFAR data have been used to gain an understanding of radio emission mechanisms and reconstruct cosmic ray energy, arrival direction, and depth of shower maximum. LOFAR is currently undergoing an upgrade (LOFAR 2.0) which will enable continuous observation and a tenfold increase in data rate. Moreover, in LOFAR 2.0 we will be able to observe in the 120-240 MHz band simultaneously with the 30-80 MHz band. In the last years, we also doubled the size of the particle detector array used to trigger radio data readout, going from 20 to 40 detectors. These upgrades will allow us to probe air shower development in greater detail and measure over a wider energy range. In order to best utilize the new influx of data, we have revamped our data reduction pipeline using the NuRadioReco framework. In this contribution, we present an overview of the LOFAR 2.0 cosmic-ray observation program.

## **Collaboration(s)**

LOFAR Cosmic-ray Key Science Project

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