

Extreme Energy Events Project: A National Network of MRPC Muon Telescopes for Cosmic-Ray Physics and Science in Schools

The Extreme Energy Events (EEE) Project is an innovative cosmic-ray experiment that combines frontier astroparticle physics with a large-scale educational mission. EEE is built around a network of muon telescopes based on Multigap Resistive Plate Chambers, distributed across Italy and hosted primarily in high schools. One of the defining features of the experiment is the direct involvement of students and teachers in many stages of the scientific process, from detector construction and commissioning to monitoring, data taking, and analysis.

EEE addresses several key topics in cosmic-ray physics, including measurements of the secondary muon flux at ground level, the observation of extensive air showers, and the study of correlations between distant events through synchronized observations over a wide geographical area. The distributed nature of the array, together with centralized reconstruction and analysis, makes EEE an effective observatory for investigating both local and large-scale features of cosmic radiation.

In 2018, the EEE scientific program was further extended through the PolarquEEEest initiative, which introduced compact scintillator-based detectors to perform cosmic-ray measurements at very high geomagnetic latitudes. The first campaign explored the latitude dependence of the secondary cosmic-ray flux up to the Svalbard archipelago, and in 2019 three detectors were installed at Ny-Ålesund (Svalbard) enabling long-term monitoring of muons in an extreme environment. This extension broadened the scientific reach of EEE toward high-latitude studies, with potential connections to atmospheric and environmental phenomena, while preserving the project's emphasis on compact instrumentation and distributed measurements.

The talk will provide an overview of the EEE scientific program, the detector and network architecture, and selected physics results, while also discussing the broader impact of the project as a model of research-driven education. EEE demonstrates that a school-based infrastructure can produce meaningful scientific results while at the same time fostering scientific culture, hands-on training, and long-term collaborative communities in experimental physics.

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