

MUON MULTIPLICITIES MEASURED USING THE UNDERGROUND COSMIC-RAY EXPERIMENT EMMA

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EMMA (Experiment with MultiMuon Array), located at the depth of 75 meters (210 m.w.e.) in the shallow section of the Pyhäsalmi mine in Finland, is dedicated to the composition analysis of cosmic rays in the knee region. The array is designed to measure in event-by-event mode the muon multiplicity, the lateral density distribution, and the arrival angle of an air shower. It will ultimately consist of twelve detector stations of 15 m² each. The three central tracking stations are already constructed and have been taking data continuously for a year. The first results of measured muon multiplicities will be presented and compared with model predictions. To yield relevant composition data the remaining three of the total of nine sampling stations must be completed, equipped with detectors, and integrated to DAQ. EMMA uses three types of detectors. Drift chambers form the core of the array. Due to their good position resolution (1 cm²) they are used as the main tracking device. Plastic scintillation detectors (pixel size 12 x 12 cm²) are used to verify muon multiplicities close to and beyond the saturation point of the drift chambers in the tracking stations. The recent addition of the limited streamer

tube detectors allowed extending the coverage with sampling stations. CORSIKA air-shower simulations predict that the lateral density distributions for muons of energy over 50 GeV are sensitive to the energy and mass of the primary cosmic-ray particle. Moreover, these distributions are nearly model independent at the knee region.”

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