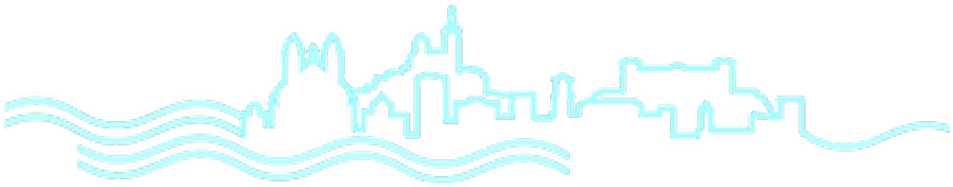

Contribution ID: **626** Type: **Poster**

The ACROMASS project: study of the charged components of the atmospheric cosmic radiation

Although various measures of atmospheric muons have been conducted between the 60s and 80s of the last century, the study of these particles is still of interest in two fields of physics. The first one is related to neutrinos. A precise measurement of the parameters describing the phenomenon of oscillation between the three families of neutrinos known so far, through the study of atmospheric neutrinos, requires a detailed knowledge of the production spectra of these particles. This can be obtained with detailed simulations calibrated with precise measurements of atmospheric muons spectra. The second one, of an applied nature, is muon radiography, an imaging technique that uses atmospheric muons to produce radiographic representations of enormous volumes of materials and which requires the use of reliable simulations of the fluxes of atmospheric muons and their absorption inside materials.

Between the late 90s and the beginning of the 2000s, the INFN section of Florence and the Department of Physics of the University of Florence developed the ADAMO magnetic spectrometer, a test system for the preparation of the PAMELA satellite experiment. ADAMO was used in 2004 for a measurement of the inclusive momentum spectrum of cosmic rays at ground level at several zenith angles in the momentum range between 100 MeV/c and 130 GeV/c.

The ACROMASS project, started in 2024, was funded in Italy by INFN for the development of a compact, transportable detector based on a magnetic spectrometer with an MDR of approximately 260 GV/c, complemented with two auxiliary systems for particle identification. Its purpose is a precise study of atmospheric cosmic rays at different locations and altitudes. This development, which takes advantage of the experience gained with the previous PAMELA and ADAMO projects, is mainly aimed at precise measurements of the muon production spectrum at an altitude of 3500-4000 m a.s.l. for calibrating the simulations used for the estimation of the atmospheric neutrino spectra. This is important both to improve the measurements of the oscillation parameters and to improve the estimation of the atmospheric neutrinos background for neutrinos coming from outside of the Earth atmosphere.

Detector's construction will be finalized in 2025 and the apparatus will be tested at CERN PS and SPS by the end of the year. We have already contacts for a first measurement in a laboratory at an altitude of 3580 m, to be implemented in the next years.

Secondary track

T03 - Neutrino Physics

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Session Classification: T11

Track Classification: T11 - Detectors