Contribution ID: **3** Type: **Plenary talk**

The simulations chain of the MURAVES experiment

Thursday, 25 November 2021 09:40 (20 minutes)

The MUon RAdiography of VESuvius (MURAVES) project aims at the study of the summital cone of Mt. Vesuvius, an active volcano near Naples, Italy. This muographic profile combined with the data from gravimetric and seismic measurement campaigns will be used for better defining the volcanic plug at the bottom of the crater.
We report on a series of simulation studies that are being conducted to investigate the effects of the experimental constraints and to perform comparisons with the actual observations. The simulation setup is developed using Geant4 and for the generation of cosmic showers, a study of particle generators (including CORSIKA and CRY) has been conducted to identify the most suitable one for our simulation framework. To mimic the real data, Geant4 raw hits are converted to clusters through a simulated digitization: energy deposits are first summed per scintillator bar, and then converted to number of photoelectrons with a data-driven procedure. This is followed by the same clustering algorithm as in real data. After application of the same tracking code as in real data, we quantify tracking inefficiencies, the effect of dark noise and other nuisances, and the effect of the lead wall in terms of absorption and scattering as a function of momentum. We also report on the examination of muon transport through the mountain using PUMAS and Geant4.
We will elaborate on the rationale for our technical choices, including trade-off between speed and accuracy, and on the lessons learned, which are of general interest for similar use cases in muon radiography.

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Session Classification: Simulation tools and studies

Track Classification: Simulation tools and studies