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The MU-RAY project: volcano radiography with cosmic-ray muons

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Cosmic-ray muon radiography is a technique for imaging the variation of density inside the top few hundred meters of a volcanic cone. it is based on the high penetration capability of the high energy muon component of the cosmic radiation.The measurement of the flux variation allows the evaluation of the average density along the observation line with few percents precision and spatial resolution up to tens of meters, in optimal detection conditions. Muon radiography can provide images of the top region of a volcano edifice with a resolution that is considerably better than that typically achieved with conventional methods.Such precise measurements are expected to provide us with information on anomalies in the rock density distribution, like those expected from dense lava conduits, low density magma supply paths or the compression with depth of the overlying soil.
The MU-RAY project developed a muon telescopes prototype for muon radiography. The telescopes is required to be able to work in harsh environment and to have low power consumption, good angular and time resolutions, large active area and modularity. The telescope consists of three X-Y planes of one square meter area made by plastic scintillator strips of triangular shape. Each strip is read by a fast WLS fibre coupled to a silicon photomultiplier. The readout electronics is based on the SPIROC/EASIROC ASIC. The prototype is under test and will be soon installed at the Mt Vesuvio in Naples.Detector technology and first results will be presented.