



Muon tomography of rock density using Micromegas-TPC telescope

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The knowledge of the subsurface properties is essentially obtained by geophysical methods, e.g., seismic imaging, electric prospecting or gravimetry. The current work is based on a recently developed method to investigate in situ the density of rocks using a measurement of the muon flux, whose attenuation depends on the quantity of matter the particles travel through and hence on the rock density and thickness.

The present project (T2DM2) aims at performing underground muon flux measurements in order to characterize spatial and temporal rock mass density variations above the LSBB underground research facility in Rustrel (France). The muon flux will be measured with a new muon telescope device using Micromegas-Time Projection Chamber (TPC) detectors.

The first step of the work presented covers the muon flux simulation based on the Gaisser model (Gaisser T., 1990), for the muon flux at the ground level, and on the MUSIC code (Kudryavtsev V. A., 2008) for the propagation of muons through the rock. The results show that the muon flux distortion caused by density variations is enough significant to be observed at 500 m depth for measurement times of about one month. This time-scale is compatible with the duration of the water transfer processes within the unsaturated Karst zone where LSBB is located. The work now focuses on the optimization of the detector layout along the LSBB galleries in order to achieve the best sensitivity.