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Design, construction and in situ testing of a muon camera for Earth science and civil engineering applications.

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Muon tomography is a rising technique with promising applications. It was introduced in the late ‘60s by Alvarez and collaborators to unravel the secrets of the Egyptian pyramids. Nowadays it is a complementary method in several disciplines, such as: volcanology, nuclear management and geological surveys. The main issue resides in the way Muon Tomography can invite itself in the tool box of the geophysicist. Will it bring reliable and independent observations that can be merged with gravity, seismic or electrical resistivity techniques?

Cosmic muons are naturally originated in the upper atmosphere with a set of properties that allow them to propagate up to several hundreds of meters underground. The muon flux decreases progressively, with an absorption proportional to the medium thickness and density. The muon flux drop provides thus useful information about the medium.

The T2DM2 collaboration aims to obtain a temporal tomography of the densitometry by the measurement of muons and develops a new tool to measure the muon’s flux and trajectories in order to image the time-space variations of the medium’s density.

The MUST^2 (MUon Survey Tomography based on Micromegas detectors for Unreachable Sites Technology) camera is based on a thin Time Projection Chamber read by a resistive Micromegas. This innovative combination presents interesting distinctive features, allowing a wide angular acceptance of the detector with a low weight and volume, well adapted for confined spaces or underground operation.

The current work provides an overview of the technology and its functioning principles. It presents the results obtained during the calibration measurements at the reference site, the Low Background Noise Underground Research Laboratory, LSBB (http://lsbb.eu). Preliminary results from field measurement campaign carried out at the dam overlooking the village of Saint-Saturnin-les-Apt (South-East of France) are presented. The influences of (i) the host rock body of the barrage, (ii) the behavior of the dam structure and (iii) the temporal water level variations of the reservoir, on the muons flux are presented and discussed.