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MUon Survey Tomography based on Micromegas detectors for Unreachable Sites Technology (MUST 2). Principles, experimental results and overlook.

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Title (300 char)

MUon Survey Tomography based on Micromegas detectors for Unreachable Sites Technology (MUST^2). Principles, experimental results and overlook.

Body (2000 char + spaces)

Transmission muography is an expanding technique based on the attenuation of the natural-occurring cosmic muons' flux due to the opacity of the medium to obtain the distribution of density around the detector.

The current work introduces the technology developed by the Temporal Tomography of the Densitometry by the Measurement of Muons (T2DM2) collaboration. The MUST^2 camera leans on a thin time projection chamber read by a resistive Micromegas. This new tool 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 results obtained 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 and dam's structure, (ii) the temporal water level variations of the reservoir and (iii) the effect of the temperature on the muons flux measurements are discussed

The main challenge that faces the project is that the muon trajectory reconstruction algorithm cannot infer the arrival angles for a non-negligible number of detected events, with the subsequent loss of information. The data collected during the campaign of measurements, should help improving the algorithm's robustness and reconstruction efficiency.

Field transportability and the capability to perform long-term out-of-lab measurements have been demonstrated. The successful proof-of-concept trial makes the MUST^2 camera a valuable candidate for transmission muography purposes, particularly in challenging available volume scenarios.

The next stage of the T2DM2 project aims at imaging and monitoring the hydrodynamics across the unsaturated zone of the Fontaine-de Vaucluse aquifer. To do so, a network of 20 autonomous detectors will be constructed and deployed within the facilities of the Low Background Noise Laboratory of Rustrel (LSBB), France. The privileged emplacement of the LSBB allows the access to both the surface and to a network of 4 km of underground galleries with depths ranging from 0 to 518 m.

Submission deadline: 30 July