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Long term performance testing of gas-tight RPC for muography application

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Muography is a technique employed for object scanning using muons by analyzing their interaction with the scanned object. This interaction involves various mechanisms, with absorption and multiple Coulomb interactions being the most dominant. Muography offers non-destructive, radiation-free sub-surface imaging due to high penetration power of readily available cosmic muons.
The muography techniques have gained popularity in recent times due to advancements in position sensitive detectors and their Data AcQuisition (DAQ) systems. Our focus is to develop a detector system using glass-based gas-tight portable RPC detectors. RPC's are well studied and are commonly used detectors however, for our application a gas-tight version is under development. The primary emphasis of our studies lies in the long-term stability of these detectors, covering aspects such as efficiency, time response, and gas stability. Additionally, an absorption muography study has been conducted with various objects to assess the feasibility and performance of the current version of the detector.
The developed RPC and DAQ systems are portable and currently undergoing testing with the gas mixture utilized in the CMS experiment at CERN. The detector boasts an active area measuring 16 by 16 cm, featuring a readout strip with a pitch of 1.0 cm and a strip width of 0.9 cm. The glass electrodes, coated with resistive graphite paint, are positioned within an aluminum chamber, maintaining a 1 mm gap between them. At present an efficiency of above 90 percent with respect to plastic scintillators has been achieved through the implementation of various filters at both the hardware and software levels. These filters are designed to maximize the signal to noise ratio.

Collaboration

Role of Submitter

I am the presenter

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