Muographers2023 - International workshop on muography



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Small-area portable resistive plate chambers for muography

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Muography is increasingly applied in many applications, e.g. volcanology, archaeology, civil engineering, industry, mining, nuclear waste surveys, etc. For such applications, muon telescopes need to be installed in remote locations addressing extreme environmental conditions. To reduce the complexities during transportation and re-installation at the experimental site after the calibration and testing at the laboratory, we have been carrying out R&D activities for developing a fully portable muon telescope based on Resistive Plate Chambers. Two glass-RPC based prototype detectors, with varying detector parameters such as active area, gas-gap, and surface resistivity of the electrodes, have already been developed and comparison studies of the prototypes are ongoing. Benefiting from the experience gained in building and operating the prototypes, a double gap RPC is designed and being constructed with a more advanced technical layout and improved spatial resolution and a bakelite-RPC prototype is also under development to study and compare the electrode properties. A manual coating method is implemented to construct the resistive electrodes and a new readout board (V.4.0) has been developed for the data acquisition, which is now in the calibration phase. Next to the hardware efforts, a CRY-Geant4 based simulation framework for the telescope is already developed and running. A simulation study using Garfield++ is also being conducted in parallel to complete the full simulation chain and to tune the hardware parameters. This also includes studying the ionisation and avalanche properties of different eco-friendly gas mixtures that are considered possible alternatives for the standard Freon-based RPC mixtures. The results of the performance studies of the two prototype detectors, comparison results of the existing readout boards with the new version, technical layout and status of the new double gap and bakelite RPCs, and the results of the simulation studies will be presented.

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