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Muon tomography with resistive plate chambers

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Resistive Plate Chambers are widely used in high energy physics experiments as reliable trigger systems due to their excellent time resolution and rate capability, while generally the track spatial information is obtained by means of different detectors. Studies show that it is possible to produce RPC with good spatial resolution (~ 0.5 mm) by appropriate choice of the pitch of the readout strips. High resolution RPC (HRPC) can be economically produced to cover large area and represent a valid alternative to more expensive detectors in applications when a spatial resolution of 0.5 mm is sufficient. Our group has successfully produced a Muon Scattering Tomography (MST) prototype based on 12 HRPCs which provide 3D information on muons scattering in a volume ~ 50 cm x 50 cm x 80 cm (suitable for scanning a suitcase). Both the incoming and the outgoing tracks of the muon are reconstructed. The required spatial granularity is achieved using ~300 readout strips per HRPC, with a pitch of 1.5 mm. All the strips from an HRPC are multiplexed into a single differential analog line by four Helix 3.0 chips daisy chained on a hybrid circuit. The detector has been collecting data since June 2011, with the HRPC showing an efficiency above 99% and purity above 98%. The spatial resolution on the tracks is ~0.8 mm. This is a preliminary measurement and includes the intrinsic detector resolution as well as the extrapolation errors due to multiple scattering in the detectors and separation of the planes. Additional results will be presented.

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