



Contribution ID: 56

Type: **not specified**

New Readout Codification in Large-Area Multi-Gap Timing RPCs for Muon Scattering Tomography

Friday 13 September 2024 10:40 (20 minutes)

A novel readout technique was designed for applications covering large surfaces, such as the muon scattering tomography. Knowing that the FEE is often the driving cost of RPCs, the new codification was developed with the initial intention of significantly reducing the dependence of the number of electronic channels on the detector area, without substantial decrease of its performance.

The technique was first tested with a multi-gap timing RPC, composed of a double stack of 6 gaps of 300 μm and sensitive area of 30 cm x 30 cm, using 24+24 preamps to read out 120+120 strips. A new setup is currently being prepared with a detector area tenfold larger: 120 cm x 90 cm, while the same 24+24 preamps will be used to read out a much higher number of strips.

The new readout scheme used with the 30 cm x 30 cm RPC resulted in a spatial resolution better than 1 mm and time resolution below 100 ps. Details about the new readout codification and preliminary results obtained with the larger RPC will be presented in this communication.

FLUKA simulations were performed in order to demonstrate the relevance for the scattering tomography technique of having not only a submillimetric spatial resolution, but also a very good time resolution. These calculations will be presented too.

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Session Classification: Applied research and new ideas (part I)