Rate capability and gamma rejection studies of thin-gap RPC detectors with thin phenolic glass electrodes

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The Resistive Plate Chambers (tRPCs) detectors for timing applications are generally characterized by a multi-gap structure with multiples floating high resistivity glass electrodes. These features restrict their field of application to medium-sized areas experiments with a low radiation background. In this presentation we show the performance of two single thin-gap RPCs prototypes designed to work as an intermediate solution between tRPCs and RPCs. The detectors are characterized by a 0.2 mm gas gap, 0.4 mm thick phenolic glass electrodes and a Front-End electronics with 2 fC threshold. Phenolic glass, instead of bakelite, has been selected for its mechanical strength even in thin sheets despite the high bulk resistivity. The combination of this parameters allows to gain significant factors both in terms of rate capability and temporal resolution. Test with 180 GeV/c muons beam with and without gamma radiation background have been performed showing the possibility of achieving a time resolution better than 150 ps, operating up to 4 kHz at 80% of efficiency.

This solution has been studied in two configurations: two detectors with independent pick-up electrodes and gas volumes, and one detector with one read-out electrode picking up the signal from two shared gas volumes.

The characterization of all the detector figures of merit is described and compared to the traditional solutions.