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Position measurement and triggering with large scale Thin Gap Chambers for the super LHC

A new development has been performed to adapt the Thin Gap Chambers (TGC) detectors to provide MUON tracking and trigger capabilities at the high background conditions that will be present in the ATLAS at the Super LHC (SLHC). The detectors, presently used to provide the trigger in the ATLAS End-Cap MUON Spectrometer, have been modified by using low resistivity
(40KOhm/square) cathodes, behind which pads (to provide the trigger) and 3.2mm pitch strips (to provide a high resolution coordinate) are located, while the anode wires provide the orthogonal coordinate. Two large (120x100cmˆ2) structures containing four gaps each, with a total thickness of 50mm have been constructed and exposed to various types of radiation. A single gap position resolution of 60 microns has been obtained for Minimum Ionizing Particle at perpendicular incident angle using these large devices. These devices were also tested with up-to 30KHz/cmˆ2 of detected photons over their full area, while triggering on cosmic muons, as well as with 73Hz/cmˆ2 of detected 5.5-6.5 MeV neutrons, showing in both cases a high efficiency for the detected cosmic muon. Furthermore, to be safe for running at the SLHC conditions, a small detector has been irradiated to an accumulated charge of 6Coulomb/cm of wire, without showing any deterioration in its performance.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

The ATLAS muon spectrometer is a composed of precision tracking
chambers and trigger chambers. At the LHC upgrade (SLHC), with
ten times the LHC luminosity, the high rapidity region of the muon
spectrometer endcaps will suffer considerable loss of its performance.
Increased cavern background will result in a significant reduction of
detector efficiency, increase of fake tracks, degradation
of spatial resolution, detector aging, and radiation damage to the
electronics.
The Thin Gap Chambers (TGC) detectors instrumented at the end
caps of the ATLAS experiment (1.05<eta<2.4) are currently used for
triggering on muons.
For the SLHC we consider to use TGC detectors for both
tracking and triggering on muons at the endcaps.
The detectors will have to deal with total rates of 10KHz/cmˆ2 including 140 Hz/cmˆ2 of
high energy neutrons.
In the talk we will present the excellent performance demonstrated by these new designed detector in various radioation conditions.

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