Development of the service frame for SBS Tracker GEM and Optimization of the Gas Flow in a GEM Tracker

F. Noto [1,2], V. Bellini [1,2], E. Cisbani [3,4], V. De Smet[5], F. Mammoliti [1,2], M.C. Sutera[2]

[1]*Dipartimento di Fisica ed Astronomia, Università di Catania, via Santa Sofia 64, I-95123 Catania, Italy*

[2] *INFN - Sezione di Catania, via Santa Sofia 64, I-95123 Catania, Italy*

[3]*INFN - Sezione di Roma – Sanità group, P.le Aldo Moro, 2 I-00185 Roma, Italy*

[4]*Istituto Superiore di Sanità, viale Regina Elena 299, I-00161 Roma, Italy*

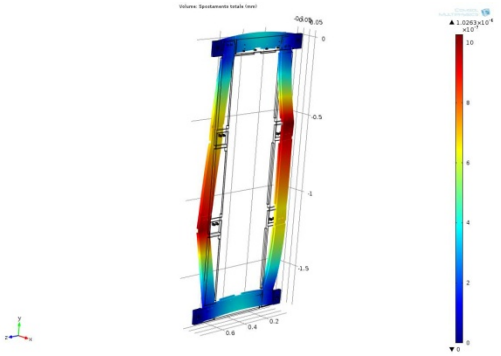
[5]*Haute Ecole Paul - Henri Spaak, ISIB, Brussels, Belgium*

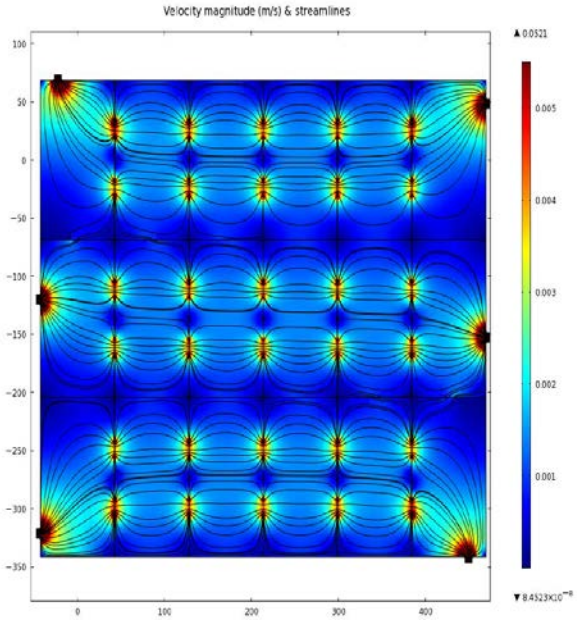
ABSTRACT

In this paper we report results of a fluid-dynamics performance study of Gas Electron Multiplier (GEM) detector. The GEM technology has been proven to tolerate a rate larger than 50 MHz/cm^2 without noticeable aging and to provide the sub-millimeter resolution on working chambers up to 45x45 cm^2 [1]. A new GEM based tracker is under development for the upgrade of the Hall A equipment at Jefferson Lab. The chambers of the tracker have been designed in a modular way: each chamber consists of 3 adjacent GEM modules, with an active area of 40x50 cm^2 each [2]. We optimized the gas flow inside the GEM module volume, a mixture of Ar/CO_2 (70/30). Our simulation includes design of the inlet-outlet pipes, maximization of the uniformity of the gas flux and minimization of the zones where such flux is too low; the result for the selected configuration is represented in figure 1.

The Gas Electron Multiplier (GEM) technology has been proven to tolerate rate larger than 50 MHz/cm2 without noticeable aging and to provide the sub millimeter resolution on working chambers up to 45x45 cm^2 [1]. A new GEM based tracker is under development for the Hall A upgrade at Jefferson Lab. The chambers of the tracker have been designed in a modular way: each chamber consists of 3 adjacent GEM modules, with an active area of 40x50 cm2 each [2].

The support structure of tracker GEM must be very light but at the same time it must be also very resistant to deformation. The finite elements analisys helped to optimize design of support structure and choice of material, relapse at the end in carbon fiber.





Keywords: GEM Technology, carbon fiber, mechanical structure

[1] M. Alfonsi et al. “ Activity of CERN and LNF groups on large area GEM detectors” Nucl. Instr. Meth. A 617 (2010) 151.
[2] V. Bellini et al. - “GEM tracker for high luminosity experiments at the JLab Hall A”, proceedings of the MPGD 2012 conference, to be published on JINST