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CHARACTERIZATION OF THREE GEM CHAMBERS FOR THE SBS FRONT TRACKER AT JLAB HALL A

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A new Large-Acceptance Forward Angle Spectrometer (Super Bigbite Spectrometer-SBS [1]) is under development for the upcoming experiments in Hall A at the Thomas Jefferson National Accelerator Facility (Virginia-USA) [2], where a longitudinally polarized (up to 85%) electron beam up to 12 GeV energy is now available. The excellent beam intensity (up to 100 μA), combined with innovative polarized targets, will provide luminosity up to 1039/(s·cm2), opening interesting opportunities to investigate unexplored aspects of the inner structure of the nucleons [3].

In its full configuration, the new spectrometer will consist of a dipole magnet, three charged particle trackers, two identical proton polarimeters and a segmented hadron calorimeter [1].

The main requirements for the SBS tracking system come from the upcoming experiments devoted to the measurement of the nucleon form factors at high momentum transfer and more generally from the experiments at high luminosity and with high energy beam.

For these reasons, the SBS tracking system is made of three tracking stations (front, second and third tracker). The front tracker, placed just after the dipole magnet, consists of six layers of large area GEM (Gas Electron Multiplier) chambers (40x150 cm2); each chamber is made by three adjacent GEM modules of 40x50 cm2 active rectangular area (18 modules as a total) [3].

The GEM technology has chosen in order to optimize gain (~105), spatial resolution (~80 μm), high hit rate (~100 MHz/cm2), cost/performance and high radiation hardness [4].

Members of the JLab12 collaboration INFN (from Catania, Roma, Bari and Genova) together with Istituto Superiore di Sanità of Roma (ISS) has taken in charge the construction and characterization of the front tracker of the spectrometer.

We present the main features of the SBS front tracker and its GEM detectors and, finally, we will discuss the first results of the tracker commissioning at JLab.

References

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