

# TEST OF THE GEM FRONT TRACKER FOR THE SBS SPECTROMETER AT JEFFERSON LAB

F. MAMMOLITI<sup>1,2</sup>, V. BELLINI<sup>1,2</sup>, E. CISBANI<sup>3,4</sup>, L. LAGAMBA<sup>5,6</sup>, F. LIBRIZZI<sup>2</sup>,  
P. MUSICO<sup>7</sup>, F. NOTO<sup>1,2</sup>, R. PERRINO<sup>8</sup>, C.M. SUTERA<sup>2</sup>

<sup>1</sup>*Dipartimento di Fisica ed Astronomia, Università di Catania, via Santa Sofia 64,  
I-95123 Catania, Italy*

<sup>2</sup>*INFN - Sezione di Catania, via Santa Sofia 64, I-95123 Catania, Italy*

<sup>3</sup>*INFN - Sezione di Roma-Gruppo Sanità, viale Regina Elena, 299, I-00161 Roma, Italy*

<sup>4</sup>*Istituto Superiore di Sanità, viale Regina Elena 299, I-00161 Roma, Italy*

<sup>5</sup>*Dipartimento Interateneo di Fisica, Università di Bari, Via Orabona 4, I-70124 Bari, Italy*

<sup>6</sup>*INFN - Sezione di Bari, Via Orabona 4, I-70124 Bari, Italy*

<sup>7</sup>*INFN - Sezione di Genova, via Dodecaneso 33, I-16146 Genova, Italy*

<sup>8</sup>*INFN - Sezione di Lecce, via Arnesano, I-73100 Lecce, Italy*

Corresponding Author: Francesco Mammoliti, Dipartimento di Fisica e Astronomia Via Santa Sofia 64, I-95123 Catania, Italy. Email: francesco.mammoliti@ct.infn.it, tel.: +390953785266.

A new Large-Acceptance Forward Angle Spectrometer (Super BigBite) is under development at JLab/Hall A to optimally exploit the exciting opportunities offered by the 12 GeV upgrade of the electron beam. The tracking of this new apparatus is based on the Gas Electron Multiplier (GEM) technology [1], which has been chosen to optimize cost/performance, position resolution and to meet the high hit rate ( $>1$  MHz/cm<sup>2</sup>) [2].

The first GEM detector modules, designed and built by the INFN Collaboration JLAB12, were tested at the DESY test beam facility in Hamburg, by using an electron beam with energy ranging from 2.0 to 6.0 GeV.

In particular, two 40x50 cm<sup>2</sup> and two 10x10 cm<sup>2</sup> GEM chambers were equipped with a new implementation of the APV25 readout chip [3]. Measurements were performed at different impact points and angles between the electron beam and the plane of the GEM chambers, with one large chamber in a solenoid magnetic field up to 500 Gauss.

In this report we present the technical characteristics of the detector and comment on the presently achieved performance.

**Keywords:** GEM Detector, SBS Tracker.

[1] F. Sauli, “GEM: A new concept for electron amplification in gas detectors” Nucl. Instr. Meth. A 386 (1997) 531.

[2] V. Bellini et al. – “GEM tracker for high luminosity experiments at the JLab Hall A”, proceedings of the MPGD 2012 conference, JINST (2012).

[3] M.J. French et al., “Design and results from the APV25, a deep sub-micron CMOS front-end chip for the CMS tracker”, NIM A466 (2002) 359.