

Proposal for TA activity at DESY Test Beam within EUDET project

Title: GEM Prototypes test for Jlab12 SBS Front Tracker and Olympus GEM detectors

Acronym: JLab12/SBS-FT

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Institute: INFN Rome

Participants:

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Scientific Background and Planned Program

The equipment to be tested is a prototype of the tracking system for the Super BigBite Spectrometer under development for the HallA at Jefferson Laboratory (Newport News/VA). The prototype is a candidate for the Luminosity monitor in the Olympus experiment that will be carried out at DORIS ring in DESY (next year test beam and 2012 data taking).

The equipment is made of 3 GEM 10x10 cm² chambers with 2 dimensional readout; two of them with 3 GEM foils and slightly different geometry (fig. 1 and fig. 2); one with 2 GEM foils, geometrically similar to fig. 2. A new GEM 40x50 cm² chamber will also be tested, if CERN will make it available on time for the test beam, if not a new period of test beam in end September/October will be requested.

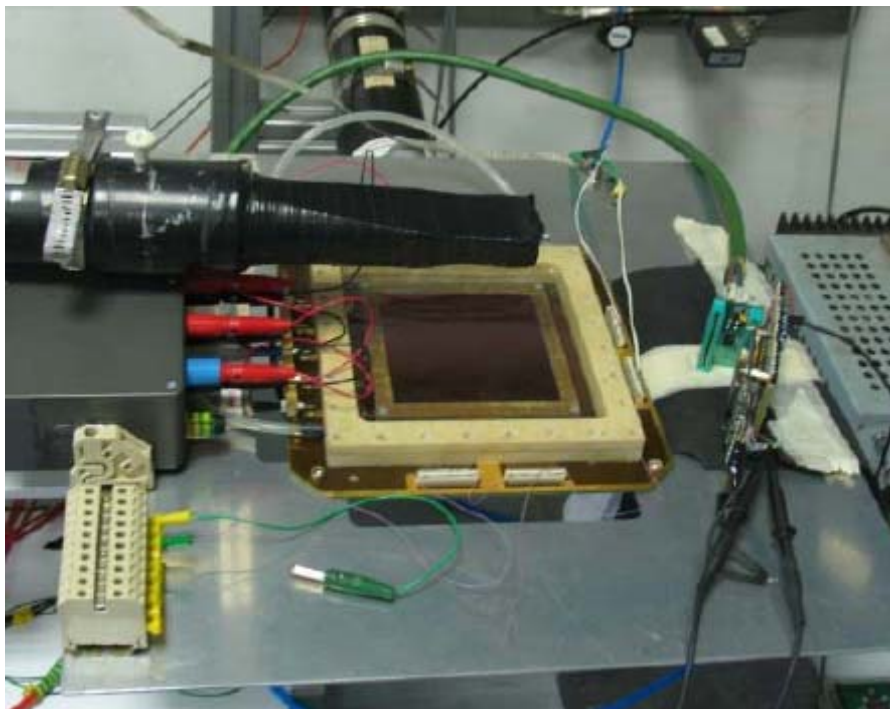


Fig. 1: first 3GEM foils prototype, during the cosmic test

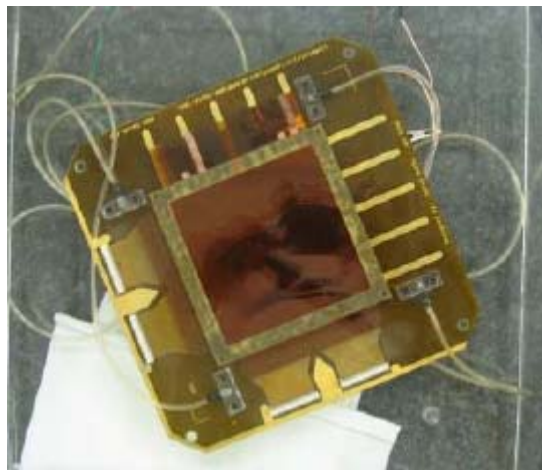
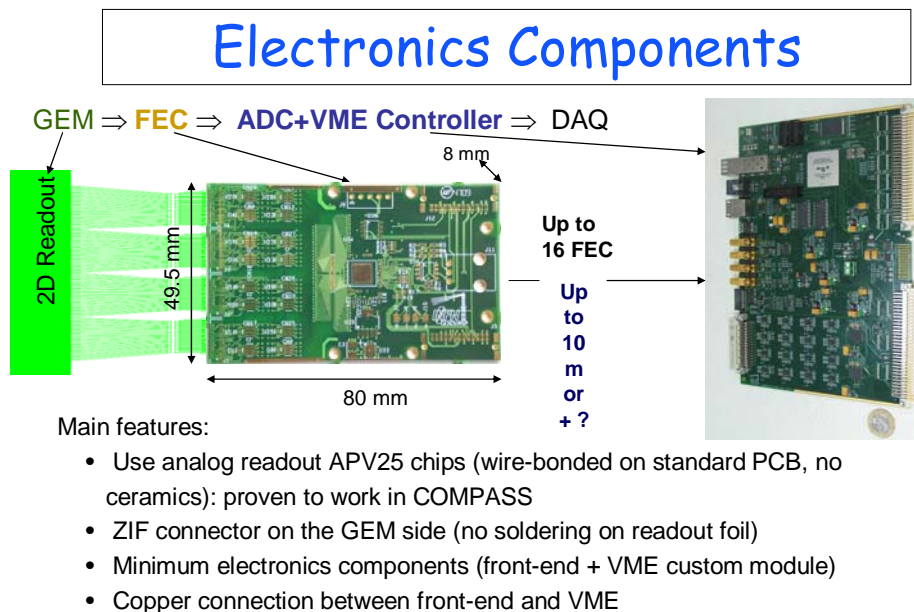


Fig. 2: second 3GEM foils prototype, during the assembling

The new prototype readout electronics is based on the APV25 chips which offer an integration time between 25 and 75 ns, 20 and 40 MHz readout speed. The APV25 based front-end card and the controller VME module will be tested in the requested period of test beam.



Roma cds 8 luglio 2010

Test plan

The main goal of the beam test is testing the performance of the new electronics readout and if the new GEM module 40x50 cm² will be available to test also its performances. The measurement of the hit spatial resolution at different incidence angles, different HV voltages (in the transfer and induction regions at least) and gas mixtures (Ar-CO₂, N and CF₄). Study the x/y signal correlation in 2D readout and the cluster size as a function of induction HV, gas mixture and beam direction. The new APV25 electronics will be also tested. Tests will be performed allowing different cable length between the FEC and VME module in order to test the maximum allowed distance between the chambers to transmit analog signal before digitization by ADC.

Moreover the performance in track reconstruction will be evaluated, exploiting the MVD silicon telescope of experimental area 22.

Following the last December (2009) test beam period, tests are expected to be completed in additional two (or three) periods (of about 2 weeks each) from July to December 2010.

The tentative starting day of the next test period is July the 19th 2010.

Plan for July test

List of equipments needed in the experimental area (from DESY side):

1. scintillator fingers for trigger
2. MVD telescope for precise tracking
3. Stand for GEM chamber support (possibly moveable)
4. Rack and crates for VME and NIM modules
5. Gasses: CO₂, Ar, N and circulation system

In addition to the expected equipment listed above, the following major items will be used for testing:

1. GEM chambers (to be tested)
2. Readout systems (including few NIM and VME modules)
3. Computer for custom acquisition

The preliminary layout of the equipment during test is shown in fig. 3.

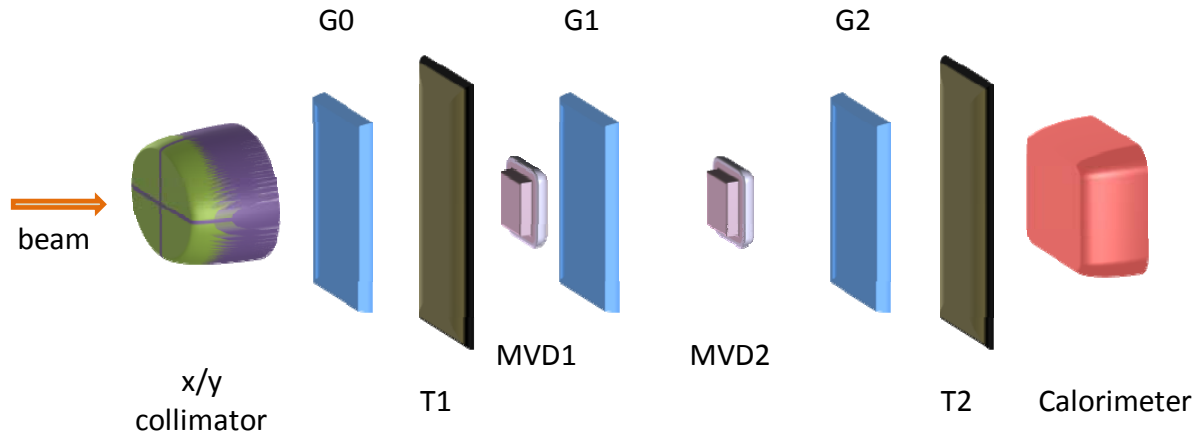


Fig. 3: generic layout; GEM chambers G0, G1 and G2 configuration will be changed during the test. T1, and T2 scintillator finger for trigger, calorimeter for energy measurement (but not needed for the present test) and two 2D planes of silicon detectors (MVD).

Preliminary run plan is presented in table 1; beam energy is expected to be fixed at 3 GeV (optimize rate).

Each test point consists of several runs; each run takes on average 15 min for data taking and configuration change.

Tab. 1: Preliminary run plan summary of the first test period in July 2010 starting at T0=19/July/2010

Test Point	From	To	Target	E_{Beam}	Devices	Comment
Installation	T0	T0+1d	NA	NA	Mechanical supports	
Commissioning	T0+1d	T0+4d	Min thick	3 GeV, perpendicular to the chamber	Scintillators, MVD, Calorimeter	Synch devices and DAQs; provide basic checks of the proper operation of the GEM chambers
Beam at 90° incidence angle and other possible angles	T0+4d	T0+10d	Max thick	3 GeV	All	Varies HV transfer and HV induction by +/- 20% as well as gas mixture (Ar/CO2=20/80, N)
Test of 40x50 cm2 module	T0+10d	T0+14d	Max thick	3 GeV	All	If available

Request for travel support.

Within EUDET project we request travel support for the following participants for the time periods specified:

Evaristo Cisbani 18 – 30 July

Salvatore Frullani 22 – 27 July

Massimo Gricia 18 – 30 July

Roberto Perrino 18 – 30 July

Paolo Musico 22 -27 July