DE LA RECHERCHE À L'INDUSTRIE

Micromegas Vertex Tracker Status Report

Latest news about the MVT, FMT and the associated electronics





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The CLAS12 MVT Project : Barrel and Forward





Setup

▶ 18 Barrel Tiles

- > Total of 6 layers segmented in ϕ (3 x 120° sectors)
- ▶ Total of 18000 channels
- Resistive strips
- Two phases: 2 Layers (6 det.) then 6 Layers (18 det.)

▶ 6 Forward Disks

- Resistive strips divided in 2 zones: inner/outer
- 1024 strips, pitch 525 μm
- Dimensions: 430 mm diam. disk with a 50 mm diam. hole



Electronics: MVT readout system









- All the needed Electronics components have been produced.
- MVT / FTT DAQ enriched with **self-trigger** readout mode
 - -> Handy for tests with cosmics
 - -> Possibility to select multiplicity on frontend and backend levels
- Interface between the MVT / FTT slow control and the Clas12 EPICS framework validated

 Major part of the remaining work will be accomplished during the June 2017 integration
 period
- On-going work to secure MVT / FTT Low Voltage distribution
 -> Choice to use more robust Harting connectors



MVT barrel B6 filling with detectors



MVT – 6-layer mechanical structure

- Barrel carbon mechanics ready
- Interface B6 (3 double layers) with MVT tube ready
- Integration of 6 curved micromegas for sector 1 under progress for autotrig cosmic run week 13 (March 27 to 31)
- Integration of micromegas in sector 2 and 3 weeks 14-16
- Full B6 cosmic run week 16 (April 18 to 21)
- MVT and FTT electronics air cooling with remote fan validated
 - 3D printing of final component under progress



Remote fan



Forward vertex tracker





The 6 detectors have been delivered to Jlab

2 spare detectors are still under construction and are foreseen to be ready during Fall 2017



MVT gas distribution rack and control rack



- MVT distribution rack (DR) done and tested
- MVT control rack with (CR) PLC done and under test with DR
 - PDF documentation in progress ☺
- Ready for MVT cosmic run at Saclay for week 13



MVT barrel and forward gas control rack



MVT distribution gas rack under test



Barrel tests – Cosmic bench



Trigger

- 2 Scintillators in coincidence

Efficiency calculation

- Compute track of particles using reference detectors.

- Check if the Micromegas has signal at the expected position.

- Efficiency is the ratio :

 $Eff = \frac{N_{tracks\ correctly\ detected}}{N_{tracks}}$



J. Ball MVT Status report 3/28/2017



Detector tests – Cosmic bench









Barrel detectors Tests (layer by layer) :

- CR4Z : 4 detectors : tests OK, in boxes
- CR4C : #1 and #2 detectors tests OK, #3 in test, #4 ready for test
- CR5Z : #1 to be redone, #2 in test, #3 and #4 ready for test
- CR5C : #1 under integration at Saclay #2 test flat OK, #3 under bulk at CERN => Saclay week 13, #4 under bulk at CERN
 => Saclay week 18
- CR6Z : 4 detectors : tests OK, in boxes - CR6C : 3 detectors : tests OK, in boxes CR6C v2Bal4Aspares to be made for June



Software



1 - Files are decoded

2 - **Pedestals substraction** (average of the ADC without signal)

3 - **Common noise suppression** (noise common to all the strips of an ASIC)

4 – Zero suppression
(root mean square (RMS) calculation and suppression of signals below a threshold
(5 times RMS for example))



- Geometry of the detectors has been implemented in Gemc (M. Garçon)
- Hitprocess nearly ready and calibration software as well
- Next important step will be merging with COATJAVA
- Maxime Defurne will be at Jlab in a fortnight to stay for one year and will be on site to complete the work. He will be joined in June by Guillaume Christiaens, PhD Student





Project started with R&D at the end of 2005.



Design





Three Scientific Supervisors were involved throught the years on the Project but there is still one and only unalterable **S. Aune** as Project Leader.

The team is looking forward to start the final installation at Jlab which will be initiated in June 2017.