

## Minutes of the WG1 meeting held at CERN on February 22, 2010 (RD51 mini-week)

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### Task 1 : Large surface MPGDs

Archana Sharma gave a status report on the activities for forward muon chambers upgrade in CMS. The goal is to extend the coverage up to  $\eta$  2.4, and then start to replace chambers at lower rapidity as they will age or become overwhelmed as luminosity increases. A possibility to stage in 12 steps of 72 or 36 chambers is envisaged. They decided to concentrate their R&D on a 3-GEM solution, where they have more competence, given their bad experience with sparks in Micromegas.

They are performing tests with a 10x10 cm<sup>2</sup> prototype with 0.8 mm strips read out by VFAT and with an Argon mixture. The measured resolution (with cosmic-ray tracks) is in agreement with the expected, high gain and velocity can be reached (at rather high voltages), but the efficiency seems low (90 to 95 %) in such conditions. They obtained a time resolution of 4.25 ns.

Archana also reported on design in progress for 1m long, 27 to 45 cm wide trapezoidal chambers, segmented in 8 GEM stacks, for the higher  $\eta$  region. She then showed a few slides from Stefano Colafranceschi on gas flow studies in the designed chamber.

On the ATLAS side, Jörg Wotschack brought the latest news from the Micromegas chambers. The recent efforts were focused on the study of resistive coatings to damp the sparks. The fate of various tries of layers with very different resistivity was reviewed, leaving a few guidelines for the future tries but not clear solution so far. Systematic studies of the <sup>55</sup>Fe energy spectrum, for detectors that survived sparks, pointed to several cases where clearly a part of the deposited energy is downgraded by the resistive overlay. This might lead to a better selection of the pastes used, to a better technique to obtain the pad-paste contact, or to using other techniques than pastes.

Two-stage amplification seems to be an option to be pursued. This can be done by pre-amplification in the drift space or by adding a GEM on top of a Micromegas.

Jörg showed pictures of a large segmented chamber 1.5x0.5 m<sup>2</sup>, which took beam data in November and is under study in the lab, and drawings of a 'keystone-shape' chamber, 1x1 m<sup>2</sup>, designed to be tested in situ behind a CSC, when there will be an opportunity. Answering to a question, Jörg estimates that the recent decision taken at Chamonix to have a long continuous LHC data taking period could delay significantly the technology choice.

(see also talk by S. Wu on performance studies at high intensity with the Saclay telescope in the WG2 meeting).

### GEMS for ILC prototype

Stefano Caiazza showed the plans for GEM modules under study in Germany for the ILC Large Prototype. It is an alternative to the Japanese effort (double GEM, with two  $r\phi$  stiffeners to hold the GEMS). In Stefano's presentation, a self-supporting ceramic frame is used.

## **Large surface MPGDs for calorimetry**

Max Chefdeville showed the recent tests of the Micromegas DHCAL and Semi-DHCAL, and the route to the  $m^2$ . The module structure was shown: 128  $\mu\text{m}$  gap bulk technology with a 3mm conversion gap and embedded chips on the board (total thickness 6mm not counting the steel absorber). Results from several beam tests were shown, including shower profiles obtained by varying the absorber thickness. At present the efficiency is limited by a too short shaping time of the HARDROC pre-amplifier. A small digital prototype was constructed with the new DIRAC ASIC.

A corresponding talk with GEMs by Jae Yu was foreseen but was shifted to the next meeting in Freiburg end of May.

## **Task 2 : New structures**

Serge Duarte Pinto gave some news on the spherical GEM detector. It is an interesting geometry to avoid parallax effects on converted diffracted X-rays, but it required special developments to give the spherical shape to GEM foils and to make adequate spacers.

## **Task 4 : Portability**

Several talks were devoted to portable systems.

Richard Plackett and Gabriele Croci presented a project with the CERN@school effort to make radiation detectors available for scholars and students. Richard presented the initiative at the Simon Langton school in Canterbury to acquire 10 TimePix+silicon sensors with a USB connection to a laptop, and he made a demo of this with a small radioactive source. Gabriele showed the plans for a 1cm drift GEM Micro-TPC to study tracks from cosmic-ray and radioactive sources: develop a sealed detector, try both 2-GEM and 3-GEM, develop a finer-pitch GEM, etc...

Fabrizio Murtas showed recent developments of GEM-based detectors meant to be portable. In particular, he showed the HV system (HVGEM) supplied in 12V. The applications are for a beam monitor at Frascati, a monitor for the UA9 experiment at CERN, and a neutron flux monitor for a nuclear fusion reactor. A new X-ray detector consisting of a polycapillary detector in front of a GEM stack would allow to measure X-ray energy spectrum by moving the detector along the focal axis of the polycapillary. The HVGEM module since very recently also features a nA-meter on each of the 7 channels.

The transparencies of the talks presented can be found at:

<http://indico.cern.ch/conferenceOtherViews.py?view=nicecompact&confId=81503>

