Contribution ID: **128** Type: **Poster not shown**

New pixelized Micromegas detector with resistive boards for the COMPASS experiment

In view of the future physics experiments planned by the COMPASS collaboration at CERN, new large size Micromegas (Micro-mesh gaseous detectors) are being developed . Compared to the Micromegas presently used in COMPASS, several major upgrades are foreseen: standing five time higher hadron rates, detection of beam particles with pixelized read-out in the center of the detector (flux up to a few hundred of kHz/mm², 10 times higher than presently), light and integrated electronics, and improved robustness.
Two prototypes with pixels in the center and 30 cm long strips at the periphery were tested in the hottest region of the COMPASS spectrometer both with muon and hadron beams. One prototype has a standard board and the other one is built with the 'bulk' technology.
In parallel, in view of the expected rates of highly ionizing particles, several solutions are being studied to reduce the discharge rate. We will show beam test results for small prototypes with various resistive coatings, as well as one Micromegas coupled to a GEM.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

Future physics programs using high intensity muon and hadron beams of a few hundred GeV impinging on various targets are being prepared by the COMPASS collaboration at CERN for the years 2012 and beyond. We consider to replace the present large size micropattern gaseous 'Micromegas' detectors, 40 cm x 40 cm, by new ones featuring several new developments to cope for the foreseen higher beam intensities and these additional requirements: five time higher hadron rates, detection of beam particles with pixelized read-out in the center of the detector (muon flux up to a few hundred of kHz/mm², 10 times higher than presently), light and integrated electronics, and improved robustness.

Pixelized prototypes
Two prototypes with pixels in the center (32x 32 1 mm² pixels) and 30 cm long strips at the periphery, were tested during several months in the hottest region of the COMPASS spectrometer both with muon and hadron beams. One prototype has a standard board and a thin 5 μm copper mesh while the other one is built with the new robust 'bulk' technology, where a 30 μm woven stainless steel mesh is emprisoned together with the board by coverlay layers. It is the first time that a large size thin bulk Micromegas is realized and glued to a honeycomb board. Pixels and strips are read by a compact and integrated electronics using APV chips (128 channels per chip) mounted on cards with an adapted protection circuit. The same gas mixture is used as for the standard COMPASS Micromegas: Neon + 10% ethane + 10% CF4. The prototypes operated well during the whole COMPASS data taking of 2009. The response and performances of both prototypes in the pixel areas as well as in the strip areas will be shown together with the discharge rates.

Resistive boards
In parallel, in view of the expected rates of hadrons which are highly ionizing particles inducing discharges in micropattern gaseous detectors, several solutions are being studied to reduce the discharge rate and their effect on the detector. A first approach is to try using resistive coating of the boards, in order to reduce the capacity involved in the discharge process. Another approach would be to do a preamplification of the primary electrons using a GEM foil, in order to reduce the gain in the Micromegas step.

Several 10cm x 10 cm prototypes were prepared for tests in the CERN SPS hadron beam. The drift space is 5 mm thick and the amplification gap is 128 μm. They feature 400μm and 1mm pitch strips. Ten prototypes were tested, nine of them built using the new 'bulk' technology and the last one being a standard Micromegas with a 5 μm thin copper mesh. Four detectors had a resistive layer over the strips: one with a resistive paste applied directly onto the strips, two with a full layer of paste of different resistivities over an isolating layer and one with a resistive Kapton foil over an isolating layer. The last Micromegas bulk prototype was equipped with an additional GEM foil 2.6 mm above the mesh. The discharge rates were monitored using the mesh signals, while the strips signals were read by 'AFTER' front-end chips. Six detectors were mounted simultaneously on the beam trajectory, all but one showing the same view in order to track the beam particles.The gas mixture was Argon + 5% Isobutane.

Data were taken for various conditions of beam, with hadrons and muons at various intensities. Resulats for the

Authors: Dr NEYRET, Damien (IRFU CEA Saclay); Dr KUNNE, Fabienne (IRFU CEA Saclay)

Co-authors: GIGANON, A (IRFU CEA Saclay); MAGNON, A (IRFU CEA Saclay); MORREALE, A (IRFU CEA Saclay); KETZER, B (TUM Munchen); MORENO, B (IRFU CEA Saclay); PAUL, B (IRFU CEA Saclay); LAHONDE, C (IRFU CEA Saclay); MARCHAND, C (IRFU CEA Saclay); BURTIN, E (IRFU CEA Saclay); SABATIÉ, F (IRFU CEA Saclay); KONOROV, I (TUM Munchen); ANFREVILLE, M (IRFU CEA Saclay); VANDENBROUCKE, M (TUM Munchen & IRFU CEA Saclay); MAKKE, N (IRFU CEA Saclay); D'HOSE, N (IRFU CEA Saclay); AUNE, S (IRFU CEA Saclay); PLATCHKOV, S (IRFU CEA Saclay); PROCUREUR, S (IRFU CEA Saclay); BEDFER, Y (IRFU CEA Saclay)

Presenter: Dr KUNNE, Fabienne (IRFU CEA Saclay)