Abstract ID : 0

Abstract Index : 1
ORAL 1

Development and performance of Microbulk Micromegas Detectors

Content :
A new Micromegas manufacturing technique, based on kapton etching technology, has been developed recently, resulting to further improvement of the characteristics of the detector, such as uniformity and stability. Excellent energy resolution has been obtained, reaching 11% with an 55Fe X-ray source and 1% with an alpha source. The new Microbulk detector shows several advantages like flexible structure, low material and high radiopurity, opening thus new possibilities for both accelerator and low- countrate experiments. The detector has been already used in CAST and n_TOF, while it is being tested for future experiments like NEXT. Details of the production of several types of Microbulk detectors will be described. First benchmark results will be presented, demonstrating the enhanced performance of Microbulk detectors

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Co-authors :

Presenter : Dr. PAPAEVANGELOU, Thomas (IRFU, CEA-Saclay)

Track classification :

Contribution type : --not specified--

Submitted by : PAPAEVANGELOU, Thomas

Submitted on Monday 16 March 2009

Last modified on : Monday 16 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 1

Abstract Index: 2
Poster

Micromegas Detectors for Rare Event Detection

Content :
Micropattern detectors and in particular Micromegas are attracting more and more attention in the community of rare event searches, especially dark matter (axion or WIMPS) and neutrino experiments. In this talk, we will review the main features that make the Micromegas detector s interesting for this community, especially after the development of new manufacturing techniques for the 2nd generation of Micromegas detectors: Bulk and Microbulk. These late developments have led to further improvement of their performance such as uniformity, stability, energy resolution. These performances will be illustrated by their application in several experiments (CAST, T2K, MIMAC, NEXT) where the advantages of Micromegas Detectors in rare event detection are confirmed.

Primary authors : FERRER RIBAS, Esther (IRFU-CEA, FRANCE)

Co-authors :

Presenter : FERRER RIBAS, Esther (IRFU-CEA, FRANCE)

Track classification :

Contribution type : --not specified--

Submitted by : FERRER RIBAS, Esther

Submitted on Monday 16 March 2009

Last modified on : Monday 16 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 2

Abstract Index : 3
ORAL 2

Micromegas detectors in the CAST experiment

Content :
Micromegas detectors have been running in the CERN Axion Solar Telescope (CAST) experiment since 2002. The detector, constructed of low radioactivity materials, operated efficiently by exploiting the spatial and energy resolution of the detector as well as the time information contained in the pulse shape of the events. Last year Microbulk, 2nd generation Micromegas detectors, were installed achieving very low background level during operation reaching the level of 2.0 * 10^-7 keV-1 s-1 cm-2 thanks to the improved performances of the detector as well as the upgraded shielding. The performance during 2008 data taking and last background studies will be presented.

Primary authors : GALAN LACARRA, Javier (Instituto de Fisica Nuclear y Altas Energias - Facultad de Cienc)

Co-authors :

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Track classification :

Contribution type : --not specified--

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Submitted on Tuesday 17 March 2009

Last modified on : Wednesday 18 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 4

Abstract Index: 4
ORAL 3

Progress in the development of a S-RETGEM-based detector for an early forest fire warning system

Content :
G. Charpak1, P. Benaben1, P. Breuil1, P. Martinengo2, E. Nappi3, V. Peskov2,4 1 Ecole des Mines, St.-Etienne, France 2 CERN, Geneva, Switzerland, 3 INFN , Bari, Italy 4 UNAM, Mexico Violent forest and bush fires in South Europe (for instance in Greece), Australia, USA and other countries worldwide bring in danger human lifes, destroy properties, damage the environment and for these reasons they are classified as planetary disasters. Thus the development of an early forest fire warning system is a mandatory task of a global importance. We will report our latest achievements in the development of a new multifunctional flame detector based on Strip -Resistive Thick GEMs (S-RETGEMs). The unique feature of this detector is that it can operate in mixtures of photosensitive gases with air making its design very simple and cheap. The ultraviolet emission of flames creates primary electrons inside the detector (from a gaseous and/or liquid photocathodes), which first experience an attachment to some air molecules, then undergo a drift process in form of negative ions and finally a disattachment and a multiplication process in the holes of the S-RETGEMs. The detector is orders of magnitude more sensitive then any commercial device presently available, it has low power consumption, (battery powered), is insensitive to the direct sunlight and, what is very important, it has an imaging capability. It can easily detect small fires on a distance of about km in polluted or humid air and on much longer distances in clear weather conditions. Combined with low power pulsed UV sources the detector is capable to signal smoke as well as UV absorbing gases. Commercial prototypes of these detectors are now the under an evaluation process by several companies working on the integration of various types of forest fire detectors in a global environmental monitoring system

Primary authors : Prof. PESKOV, Vladimir (CERN and UNAM, Mexico)

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Presenter : Prof. PESKOV, Vladimir (CERN and UNAM, Mexico)

Track classification :

Contribution type : --not specified--

Submitted by : PESKOV, Vladimir

Submitted on Friday 20 March 2009

Last modified on : Friday 20 March 2009

Comments :
The paper is designated to the "Application section" of the Conference

Status : SUBMITTED

Track judgments :

Abstract ID : 5

Abstract Index: 5
Poster

A study of a micromegas chamber in a neutron beam

Content :
The micromegas detectors are proposed as one of the options to upgrade the ATLAS muon spectrometer in the very forward/backward region. One of the problems of all detectors in the LHC and especially the ones near the beam pipe is the high neutron background. A study of the performance of a micromegas detector with neutrons is performed for the first time. The neutrons are supplied by the Tandem accelerator at the N.C.S.R. “Democritos” in Athens and have monochromatic energies up to 25.7 MeV. The first results of this study will be presented.

Primary authors : TSIPOLITIS, Yorgos (National Technical Univ. of Athens)

Co-authors :

Presenter : TSIPOLITIS, Yorgos (National Technical Univ. of Athens)

Track classification :

Contribution type : --not specified--

Submitted by : TSIPOLITIS, Yorgos

Submitted on Tuesday 24 March 2009

Last modified on : Tuesday 24 March 2009

Comments :
This is a collaborative effort of NRSC "Demokritos" - National Technical University of Athens and Saclay

Status : SUBMITTED

Track judgments :

Abstract ID : 6

Abstract Index: 6
Poster

Design and performance of the LHCb triple-gem front-end chip CARIOCAGEM.

Content :
We present the design of the front-end ASD (amplifier-shaper-discriminator) chip CARIOCA-GEM, designed for the triple-gem detector of the LHCb Muon system. This 8 channels ASIC, realized in 0.25um radiation tolerant technology, is derived from the ASIC designed for the Wire Chamber readout of the LHCb Muon detector, named CARIOCA, with appropriate modifications. The detector requirements driving the design will be discussed together with circuit simulations and test bench measurements. The performance of the chip with cosmic rays on the LHCb detector will also be discussed. Other applications of the same ASIC will also be mentioned.

Primary authors : Dr. BONIVENTO, Walter (INFN CAGLIARI)

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Presenter : Dr. BONIVENTO, Walter (INFN CAGLIARI)

Track classification :

Contribution type : --not specified--

Submitted by : Dr. BONIVENTO, Walter

Submitted on Tuesday 24 March 2009

Last modified on : Tuesday 24 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 9

Abstract Index: 7
Poster

Progress on large area GEMs

Content :
A prototype large area GEM detector was constructed in 2008. Its area is 2000 cm^2, and it is based on foils of 70x70 cm. The design introduced two techniques, that were used to exceed the former limits on lateral dimensions. A single-mask technique allowed defining hole patterns of basically any size, and a splicing method was used to go beyond the dimensional limits of the base material. Performance of these techniques and the large prototype will be reviewed, and compared to standard GEM properties. The single-mask technique has significantly developed further after construction of the prototype. The latest improvements and possibilities will be discussed. The asymmetrical holes made with the single-mask technique give rise to a difference of GEM properties between one orientation of the foil and another. A simulation effort was started to gain understanding of the effects on energy resolution, collection and extraction efficiency, and time stability (charging-up). We will report on this study and its implications on optimizing hole shape.

Primary authors : Mr. VILLA, Marco (CERN) ; Mr. DUARTE PINTO, Serge (CERN)

Co-authors : Mr. ROPELEWSKI, Leszek (CERN) ; Mr. CROCI, Gabriele (CERN) ; Mr. SAULI, Fabio (TERA Foundation) ; Mr. ALFONSI, Matteo (CERN) ; Mr. DE OLIVEIRA, Rui (CERN) ; Mr. BROCK, Ian (Physikalisches Institut der Universitaet Bonn)

Presenter : Mr. VILLA, Marco (CERN)

Track classification :

Contribution type : --not specified--

Submitted by : DUARTE PINTO, Serge

Submitted on Friday 27 March 2009

Last modified on : Friday 27 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 10

Abstract Index: 8
ORAL 4

Making spherical GEMs

Content :
We report on the development of the first spherical GEM foils. With spherical GEMs one can eliminate the parallax error that limits the spacial resolution of flat gas detectors for point-like x-ray sources, for instance in x-ray diffraction studies. The method we propose to manufacture these curved foils involves a heat treatment of preconditioned GEM foils in a controlled atmosphere. First results with this method will be presented, and an outline will be given of identified and expected limitations. First performance tests will be done with a truly spherical drift region but using a flat readout structure for simplicity. Options for a spherical readout structure are under study, and will also be presented. If successful this will ultimately allow the construction of the first entirely spherical gas detector.

Primary authors : Mr. DUARTE PINTO, Serge (CERN)

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Presenter : Mr. DUARTE PINTO, Serge (CERN)

Track classification :

Contribution type : --not specified--

Submitted by : DUARTE PINTO, Serge

Submitted on Friday 27 March 2009

Last modified on : Friday 27 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 11

Abstract Index: 9
ORAL 5

A transparent detector for neutron beam monitoring

Content :
One of the fundamental parameter, for the achievement of high precision on the neutron cross-section measurements, is the precise knowledge of the neutron flux during the measurements. The detector dedicated for this measurement must be placed at the entrance of the experimental area upstream of the main n-TOF apparatus with various detectors for the neutron-cross section measurement. The main requirement is to reduce the mass of the detector as small as possible, in order to minimize the perturbation of the neutron beam and, especially, the background produced by the device itself. A second requirement is the good stability and radiation resistance of the detector. According to these considerations a new neutron detector equipped with a small-mass device based on Micromegas Micro-bulk technology has been designed for monitoring the CERN n_TOF neutron beam. In order to cover the full range of the neutron energy from thermal to several MeV two different neutron/charged particle converter isotopes (235U and 10B) are used. The 235U(n,f) is suited for energies above a few 100 eV. Below that energy the resonance structure of 235U(n,f) does not allow a precise determination of the neutron flux. To fill this gap the 10B(n,alpha) reaction is simultaneously used. We will present the description of the innovative concept of the new transparent detector for neutron beam monitoring. The new principle of the similar detector permitting to simultaneously measure the neutron flux and the lateral beam profile is also presented. Furthermore, the calibration results as obtained at the IRMM Geel neutron beam facility are presented along with the preliminary commissioning of the new device at the CERN n_TOF facility.

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Presenter : Dr. ANDRIAMONJE, Samuel (CERN)

Track classification :

Contribution type : --not specified--

Submitted by : ANDRIAMONJE, Samuel

Submitted on Saturday 28 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 12

Abstract Index: 10
ORAL 6

Development of Micro-Mesh Micro-Pixel Chamber

Content :
The Micro-Mesh Micro-Pixel Chamber (M^3-PIC) has been developed for particle imaging detector. The M^3-PIC consists of a micro-pixel chamber (μ-PIC) and a thin micro mesh film. A point like anodes surrounded by both cathode ring and micro-mesh forms an intense electric field, and that provides higher gain and stable operation than existing MPGDs. The longtime stabilities are tested successfully for one month in high gain (>10^4) operation. Operation gases are also studied using Ar+C2H6 mixture and Ar+CF4+hydrocarbon mixture, and 5 x 10^4 of gas gains were achieved. The preliminary results of testing large size (10cm x 10cm) M^3-PIC will be also reported.

Primary authors : Dr. OCHI, Atsuhiko (Faculty of Science, Kobe University)

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Presenter : Dr. OCHI, Atsuhiko (Faculty of Science, Kobe University)

Track classification :

Contribution type : --not specified--

Submitted by : OCHI, Atsuhiko

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 13

Abstract Index: 11
ORAL 7

Advances in GEM-based cryogenic avalanche detectors

Content :
Cryogenic avalanche detectors combine dense noble gas media at cryogenic temperatures with electron avalanche multipliers, namely with Gas Electron Multipliers (GEMs) or thick GEMs. Such detectors are relevant in the field of rare-event experiments, in particular in those of coherent neutrino-nucleus scattering, dark matter search and solar neutrino detection, and in the medical imaging field, such as Positron Emission Tomography. We discuss the physical processes governing the operation of cryogenic gaseous and two-phase avalanche detectors, in particular electron emission through liquid-gas interface and electron avalanche mechanisms at cryogenic temperatures. We summarize the recent progress made in cryogenic two-phase Ar avalanche detectors, including those with CsI photocathodes, two-phase Xe avalanche detectors and gaseous He and Ne avalanche detectors.

Primary authors : Dr. BUZULUTSKOV, Alexei (Budker Institute of Nuclear Physics)

Co-authors :

Presenter : Dr. BUZULUTSKOV, Alexei (Budker Institute of Nuclear Physics)

Track classification :

Contribution type : --not specified--

Submitted by : BUZULUTSKOV, Alexei

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 14

Abstract Index: 12
ORAL 8

The ATLAS muon Micromegas R project

Content :
Large-size detectors based on the bulk-Micromegas technology, provide excellent position resolution and high counting rate performance along with trigger capability. These characteristics, coupled with the detector's mechanical robustness and the possibility for cost-effective industrial production, makes them a promising candidate for the upgrade of the ATLAS Muon Spectrometer in the sLHC. Towards the development of a large surface prototype (1mx2m), a medium size Micromegas has been constructed and tested in the laboratory and in test beams at CERN during 2008, while a half size prototype is planned to be tested this year. The status of the project will be present together with the obtained results in the effort to define the baseline system specifications.

Primary authors : Mr. NIKOLOPOULOS, Konstantinos (University of Athens)

Co-authors :

Presenter : Mr. NIKOLOPOULOS, Konstantinos (University of Athens)

Track classification :

Contribution type : --not specified--

Submitted by : NIKOLOPOULOS, Konstantinos

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :
Abstract submitted on behalf of the ATLAS muon Micromegas R&D; group

Status : SUBMITTED

Track judgments :

Abstract ID : 15

Abstract Index: 13
ORAL 9

Performance study of the first TPC for the T2K experiment

Content :
The T2K experiment is a long baseline neutrino experiment νμ-νe oscillations and measurement of the mixing angle θ13. A high intensity muon neutrino beam provided by the new JPARC accelerator facility (Tokai, Japan) will be sent towards the water Cerenkov detector Super-Kamiokande, 295 km away. A near detector complex, called ND280 and located 280 m from the target, will be used to measure the neutrino energy spectrum, flavor content and interaction rates of the unoscillated beam and hence predict the neutrino interactions at Super-Kamiokande. The tracking part of the ND280 includes two Fine Grained Detectors (FGDs) and three Time Projection Chambers (TPCs) operated with a 0.2 T magnetic field. This tracking system will allow charge and momentum measurement and charged particles identification. 72 large bulk-MICROMEGAS modules with an equivalent active surface about 9 m^2 will equip the three TPCs. The TPCs are now being constructed and will be commissioned at JPARC in 2009. Design and construction aspects of the T2K TPCs will be described, and performance obtained with cosmic and beam tests at TRIUMF facility for the first TPC already completed will be presented.

Primary authors : Dr. BEUCHER, Jerome (CEA/DSM/IRFU)

Co-authors :

Presenter : Dr. BEUCHER, Jerome (CEA/DSM/IRFU)

Track classification :

Contribution type : --not specified--

Submitted by : BEUCHER, Jerome

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 16

Abstract Index: 14
ORAL 10

Gas Electron Mutiplier (GEM) application for TPC gating

Content :
A voltage-controlled Gas Electron Multiplier (GEM) can be used to block the re- injection of positive ions in large volume Time Projection Chambers (TPC). With proper choice of geometry, gas filling and external fields enough electron transmission can be obtained at very low GEM voltages (Gating GEM) even if the energy resolution is degraded because of the loss of primary electrons. The addition of a pre-amplification GEM in front of the Gating GEM shows an improvement in energy resolution while keeping the ion feedback at the level of primary ionization. The measurements prove that a small pulse of about 40 V completely closes the gate stopping the ions produced in the amplification stage.

Primary authors : Mr. CROCI, Gabriele (CERN & University of Siena)

Co-authors : Dr. ROPELEWSKI, Leszek (CERN) ; Prof. SAULI, Fabio (TERA Foundation & CERN) ; Dr. ALFONSI, Matteo (CERN) ; Mr. DUARTE PINTO, Serge (CERN & Univ. Bonn,Inst. f. Angewand. Phys.) ; Mr. VILLA, Marco (CERN & Univ. Bonn,Inst. f. Angewand. Phys.) ; Ms. ROCCO, Elena (University of Eastern Piedmont & INFN Torino)

Presenter : Mr. CROCI, Gabriele (CERN & University of Siena)

Track classification :

Contribution type : --not specified--

Submitted by : CROCI, Gabriele

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 17

Abstract Index: 15
Poster

Evaluation of GOSSIP/GridPix performance for the Atlas Upgrade using MC simulations

Content :
Recent MC simulations to evaluate detector efficiency and resolution for the GOSSIP (Gas On Slimmed SIlicon Pixels)/GridPix detector concept are summarized; 1 mm of CO2/DME 50/50 is assumed for the gas layer, which gives ~ 99.5% efficiency to detect a perpendicular MIP in a single GOSSIP layer. At 700 V/mm drift voltage, all electrons are collected within the first 20 ns, and all signals are registered within the 25 ns bunch crossing time. Intrinsic spatial resolution in both the xy plane and the z(time) direction is on the order of 10 μm, and 7 μm or better is achievable by including track angle information from multiple layers. This resolution is limited primarily by transverse and longitudinal diffusion, which is approx. 100 μm root(cm) (which works out to ~ 30 μm after 1 mm of drifting) for both directions at this drift voltage, and can be achieved with pixels of approx. 20 μm X 20 μm in size. The next step in evaluating GridPix performance for the Atlas upgrade is to do larger scale simulations in line with those already done for the ID, as outlined in the ID TDR. Recycling as much of the existing ATLAS ID simulation framework as possible is desirable, in order to maintain close parity with work already done, and thus create a sensible comparison of GridPix to the current technologies specifically in the context of the ATLAS detector. An overview of the framework used for GridPix in ATLAS, as well as current progress and results will be reported.

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Track classification :

Contribution type : --not specified--

Submitted by : ROGERS, Michael

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 18

Abstract Index: 16
Poster

Performance measurements on closed-geometry, GEM-like detectors

Content :
A slight modification applied on GEM-like detectors, closing the exit of the hole against the readout structure, may lead to an improvement of performance in terms of maximum achievable gain, discharge probability, rate capability. This work presents new measurements on a set of such detectors, which differ in several aspects: the geometry and the raw materials (GEM-like or THGEM-like structures); the manufacturing process, which may start from a unique bulk or may involve the glueing of different layers; the addition of a resistive layer in front of the readout electrodes.

Primary authors : Dr. ALFONSI, Matteo (CERN)

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Track classification :

Contribution type : --not specified--

Submitted by : ALFONSI, Matteo

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 19

Abstract Index: 17
Poster

Performances of a GEM-based TPC prototype for new high-rate particle experiments

Content :
Time projection chamber (TPC) has been successfully used as a central tracker and a particle identification device in a number of a high-energy physics experiments. However, the performance requirements on TPC for new high-rate particle experiments greatly exceed the abilities of traditional TPC read out by multi-wire proportional chamber (MWPC). Gas Electron Multiplier (GEM) detector has great potential to improve TPC performances when used as amplification device. In this paper we present the R activity on a new GEM-based TPC (TPG) detector for the inner part of the AMADEUS experiment, a new experimental proposal at DAFNE accelerator at Laboratori Nazionali di Frascati aiming to perform measurements of the low-energy negative kaons interactions in nuclei (searching for the so-called "deeply bound kaonic nuclear clusters"). In order to evaluate the TPG feasibility, a 10x10 cm2 prototype with a drift length up to 15 cm are designed. The performances of a 10x10 cm2 pre-existing prototype with a reduced drift gap, operated with several gas mixtures and successfully tested at various beam test facilities, are presented. The gas mixture properties, such as the electron drift velocity and the diffusion, have been measured and they result comparable with those simulated with Garfield. A good resolution and a high multi-track separation, sufficient for a more large scale TPG in AMADEUS, are achieved.

Primary authors : Dr. POLI LENER, Marco (Laboratori Nazionali di Frascati (LNF)) ; Dr. VAZQUEZ DOCE, Oton (Laboratori Nazionali di Frascati (LNF)) ; Dr. ROMERO VIDAL, Antonio (Laboratori Nazionali di Frascati (LNF))

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Track classification :

Contribution type : --not specified--

Submitted by : POLI LENER, Marco

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 20

Abstract Index: 18
Poster

Bulk-MicroMegas detectors for the readout of the ND280 TPCs

Content :
The T2K experiment is a long-baseline neutrino oscillations experiment, designed to precisely measure ν_{μ} disappearance, ν_e appearance and the corresponding mixing matrix elements. For this pourpose an high-intensity ν_{μ} beam ($\sim$700~MeV peak energy) produced at the JPARC accelerator complex will be directed towards the Super-Kamiokande detector, at a distance of 295~km. A near detector (ND280) is also under construction at 280~m from the production target; it will measure the neutral and charged current interactions of the unoscillated neutrino beam and thus will allow to predict the unoscillated interaction rates at Super-Kamiokande. The ND280 detector includes three Time Projection Chamber (TPC) detectors, immersed in a 0.2~T magnetic field. Large-size bulk-MICROMEGAS detectors with pad readout are used to detect the ionization produced in the TPCs; a total of 72 MICROMEGAS, covering a surface of about 9~m^2 and comprising about 125000 readout channels, will be installed. This represents the first large-size TPC system read out by Micro Pattern Gas Detectors (MPGD). The main design parameters of the ND280 bulk-MICROMEGAS detectors are a dE/dx resolution better than 10\%, a momentum resolution better than 10\% at 1~GeV/c, and a momentum scale uncertainty of less than 2\%. The detectors will be operated with a mixture of Argon, CF$_4$ and Isobutane in the proportions 95:3:2, at a typical gas gain of few thousand. The signals are then amplified, shaped and recorded in the switched capacitor array of custom ASICs before digital readout takes place. The large number of detectors and the stringent requirements in terms of uniformity and stability impose a precise characterization of each of them. Therefore, a semi-automated test system has been developed in order to scan the surface of each detector with a strong ^{55}Fe. An independent measurement of the gas quality is also performed at the same time. The production of the required bulk-MICRMEGAS modules, the assembly and the tests are ongoing, The commissioning of the three TPC will be completed at JPARC by the end of 2009. The design and performance of the MICROMEGAS detectors and associated readout electronics will be described. Details of the detector scanning system will be given, and the results of the tests and characterization will be discussed.

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Co-authors :

Presenter : Dr. FERRERO, Andrea (Université de Genève - DPNC)

Track classification :

Contribution type : --not specified--

Submitted by : Dr. FERRERO, Andrea

Submitted on Monday 30 March 2009

Last modified on : Monday 30 March 2009

Comments :
on behalf of the T2K/TPC group

Status : SUBMITTED

Track judgments :

Abstract ID : 21

Abstract Index: 19
ORAL 11

Time Projection Chamber with Triple GEM and Highly Granulated Pixel Readout

Content :
Due to many favorable properties it is very attractive to use Micro Pattern Gas Detectors as gas amplification stages in Time Projection Chambers (TPCs). Especially the high granularity, intrinsic suppression of ion backflow, high rate capability and almost no distortions due to ExB effects are desirable in future particle physics detectors. To fully exploit the potential of combining MPGDs and TPCs the pad size in the readout plane should be adapted to the structure size of the gas amplification stage. The Timepix chip is well suited for the use as readout chip in gaseous detectors by providing metalized pads to pick up the charge. We have constructed a test chamber with a triple GEM and Timepix readout and a maximum drift distance of 26 cm. With this setup we have studied the performance of the detector in various operation environments. Different setups for tests with cosmic rays, with radioactive sources and for a test beam with high energetic electrons have been constructed. In these environments key detector parameters such as spatial resolution have been studied in dependence on different detector settings. We have seen strong evidence for observation of individual electrons and a spatial resolution of down to 80 µm has been measured. Besides, the independence of the transverse spatial resolution from the track inclination could be demonstrated.

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Track classification :

Contribution type : --not specified--

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Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 22

Abstract Index: 20
Poster

Variation of Penning transfer probabilities for different argon based gas mixtures

Content :
Penning gas mixtures consist of a noble gas and an admixture at lower concentrations. In this work, the Penning transfer probabilities have been calculated for different argon based gas mixtures. Magboltz was used to find Townsend coefficients and collision frequencies for ionisation and excitation. Experimental data have been used to calculate the transfer probabilities. The results show that the Penning transfer probabilities depend on admixtures.

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Track classification :

Contribution type : --not specified--

Submitted by : SAHIN, Ozkan

Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 23

Abstract Index: 21
ORAL 12

Electrostatics of Micromesh-Based Detectors

Content :
Three-dimensional electrostatic field configurations of several micromesh-based detectors have been estimated using the recently developed neBEM field solver. We have tried to estimate accurately, the field uniformity / distortion due to changes in the geometrical parameters of the mesh (shape and dimension of holes) and also due to the changes in the detector configuration (use of multiple layers of mesh). In addition, the effect of the drift volume geometry on the configuration of the drift field has also been estimated. The effect of these parameters on the electrostatic configuration and hence, on the performance of the detectors, will be discussed in the paper / presentation.

Primary authors : Prof. MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics)

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Track classification :

Contribution type : --not specified--

Submitted by : Prof. MUKHOPADHYAY, Supratik

Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 24

Abstract Index: 22
Poster

3D Field Simulation in GEM-type Structures

Content :
Advancement in photolithographic technique has triggered the development of micropattern gas detectors (MPGD) to meet the ever growing demand of modern science and technology. GEM-type structures belong to a new genre of MPGD which can be used as an amplification booster in a gaseous device. The potential of using these structures in single or cascaded mode has enhanced the scope of designing state of the art detectors as per the requirement of a specific application. This calls for detailed simulation of the field configuration of the GEM-type structures which have already diversified into micro-GEM, THGEM, RETGEM etc. This work will present simulation of three dimensional electric field in these structures where the effect of the specific features and the materials used will be highlighted.

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Track classification :

Contribution type : --not specified--

Submitted by : MAJUMDAR, Nayana

Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 25

Abstract Index: 23
Poster

The Totem T2 GEM detector readout and trigger systems

Content :
We describe the readout and trigger systems developed for the Totem T2 Gem detector. The readout chain starts from the front end CHIP (VFAT) that produce a serial digital output that is directly fed to the DAQ system based on VME boards. While the Trigger chain starts inside the VFAT itself, grouping 15 channels into a trigger super-pad, giving 8 digital outputs per chip. A tracking chip, named Coincidence Chip, performs a majority coincidence among the 10 tracking planes, giving as output a trigger track bit per each super-pad sector. The trigger tracks are fed into the trigger readout boards where algorithms implemented into FPGAs perform the synchronization and the necessary event reconstruction.

Primary authors : Dr. TURINI, Nicola (Universita Siena & INFN Pisa)

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Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 26

Abstract Index: 24
ORAL 13

Beam tests of the Micromegas ILC-TPC Large Prototype

Content :
Inside the ILC-TPC collaboration, a large TPC prototype for the International Linear Collider has been built and operated at DESY in a 1T PC-MAG magnet. Bulk Micromegas modules have been tested in a 5 GeV electron beam. Data have been taken with resistive anodes and standard anode pads at different operation conditions. Preliminary results on the spatial resolution will be presented. In spite of wide pads (3.2x6.8 mm^2) the intended spatial resolution, better than 100 microns, has been achieved. This recent result demonstrates and reinforces the technology potential for the resistive anode Bulk Micromegas.

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Track classification :

Contribution type : --not specified--

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Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :
On behalf of the ILC-TPC collaboration

Status : SUBMITTED

Track judgments :

Abstract ID : 27

Abstract Index: 25
Poster

The TOTEM T2 GEM detector assembly and quality assurance

Content :
TOTEM is a forward physics experiment at the CERN Large Hadron Collider dedicated to the measurement of the total proton-proton cross section and to the studies of elastic scattering and diffractive processes over a large kinematic range. The very forward detector T2 with trigger capabilities measures charged particles at rapidities between 5.3 and 6.5. The assembly and commissioning of the TOTEM T2 telescope consisting of 40 triple-GEM detectors is described in detail with emphasis on quality assurance procedures for the GEM detectors including a scanning system for the GEM foils, an automated capacitance measurement for the readout boards and an extensive stability and gain test for the active area of the detectors.

Primary authors : Mr. HILDEN, Timo Eero (Helsinki Institute of Physics (HIP))

Co-authors :

Presenter : Mr. HILDEN, Timo Eero (Helsinki Institute of Physics (HIP))

Track classification :

Contribution type : --not specified--

Submitted by : HILDEN, Timo Eero

Submitted on Tuesday 31 March 2009

Last modified on : Tuesday 31 March 2009

Comments :
on behalf of the TOTEM collaboration

Status : SUBMITTED

Track judgments :

Abstract ID : 28

Abstract Index: 26
ORAL 14

MicroHole & Strip Plate Based Photosensor Operating in HpXe

Content :
We present an experimental study of a gaseous photosensor based on a MicroHole & Strip Plate (MHSP), having a reflective CsI photocathode coating its GEM-like top- side and operating in high pressure xenon. For the study, a scintillation gap facing the CsI photocathode is used for the production of VUV photons. The MHSP not only presents two independent charge multiplication stages, which result in a high total gain, but also optically decouples the anode-strips charge multiplication region from the electron drift region, thus reducing photon feedback effects. It also presents a high ion-backflow suppression, with up to 80% of the ions produced in the final avalanche, around the anode strips, being trapped, which helps controlling ion- induced feedback effects. These features are significant advantages in photon detection. Results for photosensor gas gain, VUV photodetection efficiency and photoelectron collection efficiency as a function of xenon pressure, will be presented.

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Track classification :

Contribution type : --not specified--

Submitted by : VELOSO, Joao

Submitted on Wednesday 01 April 2009

Last modified on : Wednesday 01 April 2009

Comments :
This work is supported by project PTDC/FIS/65455/2006 under the FEDER and FCT (Lisbon) programs.

Status : SUBMITTED

Track judgments :

Abstract ID : 29

Abstract Index: 27
ORAL 15

DEVELOPMENT OF A THGEM-BASED PHOTON DETECTOR FOR RICH APPLICATIONS

Content :
A THGEM-based detector for single photons is being developed with the aim of overcoming the limitations of the gaseous photon detectors presently used for RICH applications. The main goals of this development are: reducing the ion feedback to the photocathode down to a few per cent level, providing large gain, fast response time, insensitivity to magnetic field and covering large areas at affordable costs. The status of the project and its perspectives will be discussed. Results from a systematic study of THGEM performances versus geometrical parameters, production techniques and gas mixture compositions will be presented. In particular, the measurements of the CsI coated THGEMs response to single photons will be reported and discussed with the help of simulation studies performed to understand the photoelectron extraction and collection efficiencies. The perspectives of the present study and the progress toward larger area THGEM prototypes will be discussed.

Primary authors : Dr. TESSAROTTO, Fulvio (INFN, Sezione di Trieste)

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Track classification :

Contribution type : --not specified--

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Submitted on Wednesday 01 April 2009

Last modified on : Wednesday 01 April 2009

Comments :
on behalf of a CERN - Freiburg - Liberec - Prague - Trieste - Torino Collaboration

Status : SUBMITTED

Track judgments :

Advancements of labelled radio-pharmaceutics imaging with the PIM-MPGD

Abstract Index: 28
ORAL 16

J. Donnard[a], N.Arlicot[b], R. Berny[a], H. Carduner[a], P. Leray[a], E. Morteau[a], N. Servagent[a], D. Thers[a]

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The β autoradiography is widely used in pharmacology or in biological field to study the response of an organism to a certain kind of molecule. The image of the distribution is processed by studying the concentration of the radioactivity into different organs. We report on the development of an integrated apparatus based on a PIM device (Parallel Ionization Multiplier) able to process the image of 10 microscope slides in the same time over an area of 18*18 cm². Thanks to a vacuum pump and a regulation gas circuit, 5 minutes is sufficient to begin an acquisition. All the electronics and the gas distribution are included in the structure leading to a transportable device. Special software has been developed to process data in real time with image visualization. Biological samples can be labelled with β emitters of low energy like ^{3}H / ^{14}C or Auger electrons of ^{125}I / ^{99m}Tc. The measured spatial resolution is 30 µm and the trigger and the charge rate are constant over more than 2 days of acquisition showing a good stability of the device. Moreover, collaboration with doctors and biologists of the INSERM (National Institute for Medical Research in France) has started in order to demonstrate that MPGD's can be easily proposed outside a physics laboratory.

Abstract Index: 29
ORAL 17

Beam tracking with low pressure gaseous detectors in nuclear physics

Author: Pancin

Low pressure gaseous detectors are widely used in nuclear physics from light to heavy ion detection at energies between 10 MeV/n and 30 MeV/n. Actually, the use of low pressures (around 10 mbar) permits to minimize the thickness of the entry foils and hence the material in beam. Moreover, the performances achievable at low pressure are similar or even better than at atmospheric pressure. The fast charge collection leads to excellent timing properties as well as high counting rate capabilities. Large gains are also obtained which allows low energy thresholds (below 1 keV) and good dynamic properties. These detectors, usually MWPC, are used for beam tracking either before the target or behind, at the exit of a spectrometer.
In the framework of the new nuclear facilities like SPIRAL2 (GANIL in France) or FAIR (GSI in Germany), which will deliver medium ions at lower energies (about 5 MeV/n), new detectors with less material in beam are needed. One idea consists in using Secondary Electrons Detectors (SED) working with an emissive foil and low pressure gaseous detectors. The principle of detection of SED will be explained and the results obtained with a MWPC shown. Micromegas detectors at low pressure have been also tested and its performances will be compared to the MWPC. To conclude, possible applications of MPGD in nuclear physics will be mentioned.

Title: The measurement of the basic feature of Thick-GEM and Resistive-GEM

Name: Ryohji Akimoto

Abstract Index: 30
ORAL 18

Co-Authors: H. Hamagaki, T. Gunji, Y.L. Yamaguchi
Affiliation: The center for nuclear study, University of Tokyo

Recently some new types of GEM(Gas electron multiplier) have been developed, such as Thick-GEM(TGEM), whose scale of both thickness and diameter is millimeter, or Resistive-GEM(RETGEM), whose electrode has high electrical resistivity. Active research has been done worldwide for applications, such as liquid Argon detectors, Cerenkov light detectors, sampling elements in calorimeter and so on.
In comparison with GEM, the advantage of TGEM are the robustness against electric discharge, easy to be made, and easy to achieve high gain at low pressure. These features are the weak points of GEM. In spite of its merits, there are some problem like the stability of gain, or energy resolution. Thus, it is needed to study the basic feature of TGEM or RETGEM more precisely.
We made 4 types of TGEMs: two different thickness(0.5mm and 1.0mm), two different diameter(0.3mm and 0.5mm), with or without the rim which is for reducing electric discharge, and measured the basic feature such as the voltage dependence of the gain, the stability of the gain at different gain level or energy resolution. At this measurement, the gain can be achieved about 10000, and the energy resolution(sigma) can be achieved about 12%. In addition, we also made RETGEM and did the same measurement. I'm planning to talk about the result of these measurement.

X-Ray Polarimetry in Xenon Gas Filled Detectors

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Abstract Index: 31
ORAL 19

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Abstract

The development of polarisation sensitive x-ray detectors has been a subject of growing interest, especially in x-ray astronomy and astrophysics, since polarisation introduces a new observational parameter that will allow the improvement of the models characterising astronomical X-ray emission sources. In this work we will present i) a Monte Carlo and study of the electron clouds produced in Xe when linearly polarised x-rays with energies up to 50 keV are absorbed in the gas and ii) experimental evidence of the polarisation of the x-rays. Cloud profiles show a memory of the polarisation direction and can be used to probe the polarisation of the absorbed x-rays, since the angular distribution of the photoelectrons becomes preferentially aligned with the polarisation vector.

The Monte Carlo code registers the growth of the electron cloud produced in the gas, reproducing in detail the x-ray photoionisation events and the cascade decay of the residual atomic ions (involving the emission of photoelectrons, Auger electrons and fluorescence x-rays) and following the slow-down process of all electrons in the gas to sub-ionisation energies. The angular differential photoionisation cross-sections include non-dipole corrections to the dipole approximation.

The goal of the experimental work was to observe the polarisation-induced anisotropy in the profiles of the electron clouds produced in Xe when polarised x-rays are absorbed in the gas. The experimental results were obtained with a Xe-filled Gridded Microstrip Gas Chamber, using the discrete linearly polarised x-rays obtained from a 25 kV x-ray tube by a 90º reflection on a pyrolytic graphite crystal. The system is aligned by previously observing the characteristic series of graphite lines with a HPGe detector.

Development of a high resolution Micro Pattern Gas Detector with wide readout pads.

Abstract Index: 32
ORAL 20

M. S. Dixit

TRIUMF & Carleton University, Ottawa, Canada

Until recently, the largest Micro Pattern Gas Detector (MPGD) system in an experiment covered an area of about 2 m^2. Several future projects plan to cover much larger areas; e.g. about 9 m^2 with Micromegas for T2K TPCs, 20 m^2 for the TPC at ILC and a staggering 2,500 m^2 for the upgrade of muon chambers based on Micromegas technology and proposed for ATLAS at the Super LHC. For conventional MPGDs with fine-pitched anodes, the total channel count becomes prohibitive and a strong motivation to develop high-resolution detectors which can use relatively wide readout pads. A new form of MPGD with a modified high surface resistivity anode readout structure developed recently is a promising step in that direction. The modified MPGD relies on a controlled 2-dimensional RC dispersion of a charge deposited on a resistive anode film laminated above the normally used readout pad plane. The dispersion of charge over a large area after avalanche gain makes possible the use of wide pads for a precise position determination. The new technology has been proven in a series of prototype tests with GEMs and with Micromegas. A resolution of 50 μm has been achieved with Micromegas with pads as wide as 2.7 mm. A theoretical model can explain observed features of charge dispersion phenomena. An overview of charge dispersion and its model, experimental results and possible future applications will be presented.

Readout electronics for X-ray 2D-imaging using GEM

Y.Hori, S.Sano, H.Hamagaki, T.Gunji, Y.Tanaka[A], T.Fusayasu[A]

Abstract Index: 33
Poster

Center for Nuclear Study, Graduate School of Science, University of Tokyo
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GEM(Gas Electron Multipllier) is one of the MPGD and can be applied to 2D-imaging. We develop a X-ray 2D-imaging device using GEM(Fig.1). Our goal is taking 1000 images per second. If a Boron-coated GEM is used, it can also be used for neutron detection.

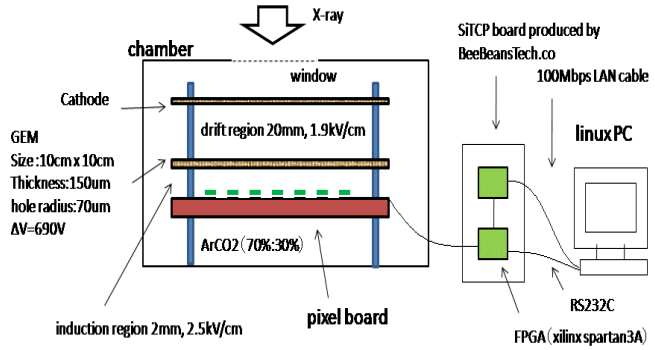

Fig.1 2D-imaging device using GEM

A prototype LSI chip is designed and fabricated with 0.25um CMOS technology. The LSI consists of integrator, multiplexer, and shift register(Fig.2). The charge induced on the readout pixel is integrated for 1ms, then a pre and post value are sampled in order to correct baseline shift(Fig.3). One LSI treats 64 pixel and serially outputs.

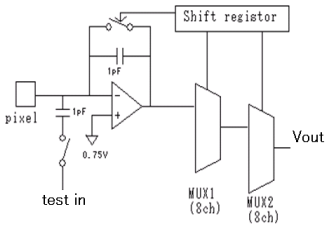

Fig.2 LSI schematic view

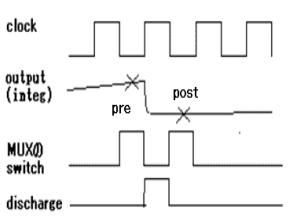

Fig.3 readout timing diagram

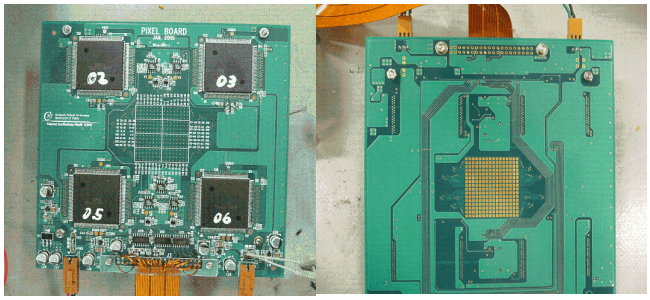

Fig.4 pixel board

Four LSIs and ADCs(12bit,1MSPS, serial output) are on the pixel board(Fig.4). On the back of the pixel board, there are 16 x 16 pixels(2mm x 2mm).

LSIs and ADCs are controlled by the SiTCP board(BeeBeansTech.co) outside a gas chamber. SiTCP board has two FPGAs. One is used for LSI&ADCcontrol , ADC output receiver, and slow control. A CPU core is embedded in the FPGA . It treat slow control command from PC.The other FPGA is called SiTCP. SiTCP enables to transfer data through Ethernet using TCP/IP protocol.

Fig.5 shows a result of a pedestal run. A noise level is less than 1% and a LSI has a good uniformity of the noise. Fig.6 shows a linearity. Linearity is also good.

The current status of this development is summarized in the talk.

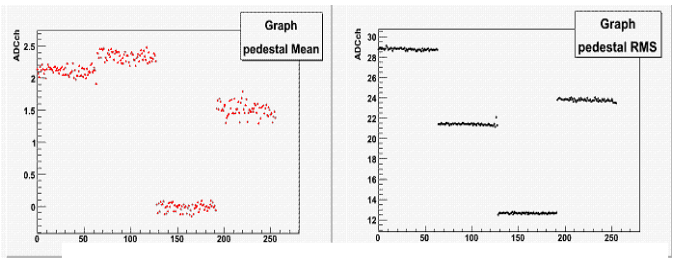

Fig.5 pedestal Mean & RMS vs pixel number

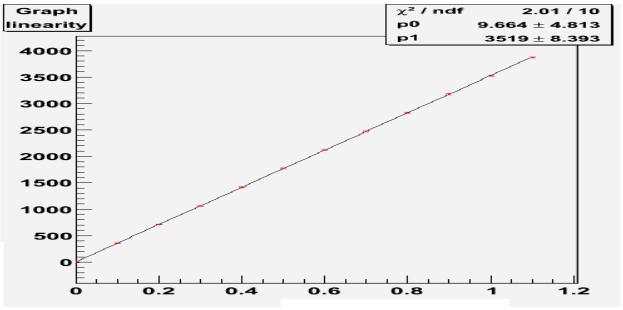

Fig.6 linearity

MICROMEGAS results towards rare events searchers

Alfredo Tomás, University of Zaragoza

Abstract Index: 34
Poster

There is a growing interest on MicroPattern Gas Detectors, in particular MICROMEGAS, for rare events searchers field. Their true application needs the performance of these detectors to progress, as it already happens day by day (specially by the introduction of new manufacturing techniques as microbulk MICROMEGAS) with the improvement of their energy resolution and stability; and also involves that it must be extended to more specific scenarios: higher drift lengths and electric drift fields, high pressure, different mixtures, different energy ranges…

Simultaneously the capabilities of MICROMEGAS, imagined at the service of rare events experiments, are being exploring intensively by Monte Carlo simulations.

This situation will be exposed paying special attention on MICROMEGAS thought for a double betha decay experiment like NEXT.

MPGDs in Compton imaging with liquid-xenon

Abstract Index: 35
ORAL 21

S. Duval [a], T. Oger [a], E. Morteau [a], H. Carduner [a], P. Leray [a], J-S. Stutzmann [a], J-P Cussonneau [a], J. Lamblin [a], D. Thers [a] and A. Breskin [b]

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The interaction of radiation with liquid xenon, inducing both scintillation and charge signals, is particularly interesting for three-dimensional interaction localization and for Compton-sequences reconstruction. We report on the development and recent results of a liquid-xenon time-projection chamber, dedicated to a novel nuclear imaging technique named "3γ imaging". In a first demonstration prototype, the scintillation is detected by a vacuum photomultiplier tube and the charges are collected with a MICROMEGAS structure; both are fully immerged inside liquid xenon. In view of the final large-area detector, and with the aim of minimizing dead-zones, we are investigating a gaseous photomultiplier for recording the UV scintillation photons. The detector concept will be presented as well as preliminary results in liquid xenon. We will also present the test results with soft x-rays of a gaseous photomultiplier prototype made of a double Thick Gaseous Electron Multipliers (THGEM), at normal temperature and pressure conditions.

Sébastien Procureur (CEA-Saclay)

Abstract Index: 36
ORAL 22

"Thin Bulk Micromegas for CLAS12"

With the 12 GeV upgrade of the CEBAF accelerator at Jefferson Lab, the spectrometer of the Hall B (CLAS) will be largely modified. This project includes in particular the construction of a central tracker, dedicated to the detection of hadrons with momentum around 1 GeV. We will present in this talk the R&D made at CEA-Saclay to build part of this tracker with cylindrical, thin bulk Micromegas. These detectors will have to work in highly unfavourable conditions, due to the presence of a 5 T magnetic field parallel to the strips. However, detailed simulations based on Garfield and Geant4 have shown the interest of Micromegas detectors in such a tracker, and experimental tests in high magnetic fields confirmed the predictions of these simulations.

A proposal for GridPix Tracker for the ATLAS sLHC upgrade.

Abstract Index: 37
ORAL 23

F. Hartjes, M.Fransen, W. Koppert, K.Konovalov, S.Morozov, A.Romaniouk, M. Rogers, H. van der Graaf.

A concept of the GridPix detector as a tracker for the ATLAS Inner Detector proposed for SLHC upgrade is presented. The detector can combine precise vector tracking function and particle identification features using a transition radiation and dE/dX measurements.
Test beam and MC studies of the tracking and the particle identification properties have been performed with the dedicated GridPix prototype. Data was taken with the different gas mixtures. Special accuracy achieved in the test beam is ~30 μm. For one layer of the GridPix detector a vector angular accuracy of about 10 mrad was obtained. It was shown that for one layer of the real detector at very realistic conditions one should expect angular accuracy better than 5 mrad.
For particle identification studies detector was filled with a Xe/CO2(70/30) mixture. A block of a transition radiation radiator of 18 cm was installed in front of the detector. A pion rejection power using a cluster counting and a full dE/dX methods was studied. It was shown that for 5 GeV particles even with one layer of the detector one can obtain a pion suppression by about factor of 7 at an electron efficiency of 90%. Two layers of this detector provide the pion rejection factor of 50 at 90% electron efficiency. A detailed comparison with MC is presented
The benefits using this technology for the ATLAS Inner Detector upgrade for SLHC are discussed. It is shown that already one layer of the GridPix detector can provide momentum measurement accuracy of about 25% for particles with P_t = 20 GeV. A dependence of the tracking properties on the pixel size is discussed. One of the main features of the GridPix Tracker will be L1 track trigger function. Possible ways of the L1 track trigger organization are discussed.

Hiroyuki Sekiya

Abstract Index: 38
ORAL 24

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Title:
Development of a large area VUV sensitive gas PMT with GEM/uPIC.

Abstract:
Recently, large area MPGDs such as, Micromegas, GEM, and uPIC have been developed and successfully operated. These devices with photocathodes can be a low cost large area photon detector with position sensitivity and can be applied not only to large astroparticle
detectors(water Cerenkov detector, liquid Xe scintillator, and so on) but also to material reserches and medical instruments.

Since the activated photocathodes easily react with Oxygen, for the realization of such large size photon detectors, the assembly of photocathodes with MPGDs is the key of the development. Even then, among solid alkali halide photocathodes, Vacuum ultra violet(VUV) sensitive CsI is attractive, because it is hard to be oxidized and its sensitive wavelength range matches the photons from the liquid Xe scintillator or solid VUV Fluoride crystal scintillators.

For the first step, we assembled 10cm x 10cm GEM+uPIC and \phi 5/7cm MgF_2 window with transmissive CsI photocathode into a prototype detector.
Using Ar+ethane (90:10) gas, we achieved the gas gain of 3x10^5 which is enough to detect single photoelectron. We, then, irradiate VUV photons from the newly developed solid Fluoride scintillators, to the prototype detector and we successfully detected the single photo-electron. We also evaluated an imaging capability with uPIC readout systems.

This crystal and the CsI photocathode combination can provide a hard-Xray imaging detector which compensates the low detection efficiency of the MPGD based gas detectors.

Measurement of photoelectron collection efficiency in mixtures of Ne with CH_4, CF_4, CO_2 and N_2

J. Escada[1], L.C.C. Coelho[1], T.H.V.T. Dias[1], J.A.M. Lopes[1,2], J.M.F. dos Santos[1], A. Breskin[3]

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Abstract Index: 39
Poster

When photoelectrons are emitted from a photocathode into noble gases, as in gas photomultipliers or various other types of gas micropattern detectors, back diffusion can significantly reduce the transmission of the photoelectrons [1]-[5]. The addition of selected molecular gases to a noble gas may improve photoelectron transmission, whenever vibrational excitation of the molecules by electron impact competes efficiently with elastic scattering, resulting in a cooling of the released photoelectrons to energies where return to the photocathode becomes unlikely or energetically forbidden. In this work, experimental results are presented for the collection efficiency *f* of the photoelectrons emitted from a reflective 400 nm thick CsI photocathode into mixtures of Ne with the molecular gases CH_4, CF_4, CO_2 and N_2, when the photocathode is irradiated with VUV photons from a Hg(Ar) lamp with a spectral distribution peaked at 185 nm (6.7 eV) with 5 nm *fwhm*. The *f* values are obtained as the ratio between the number of electrons collected in the gas and in vacuum. The dependence of *f* on the reduced applied electric field *E/p*, the added molecular gas and the mixture composition is analyzed, and the results are compared with Monte Carlo simulations.

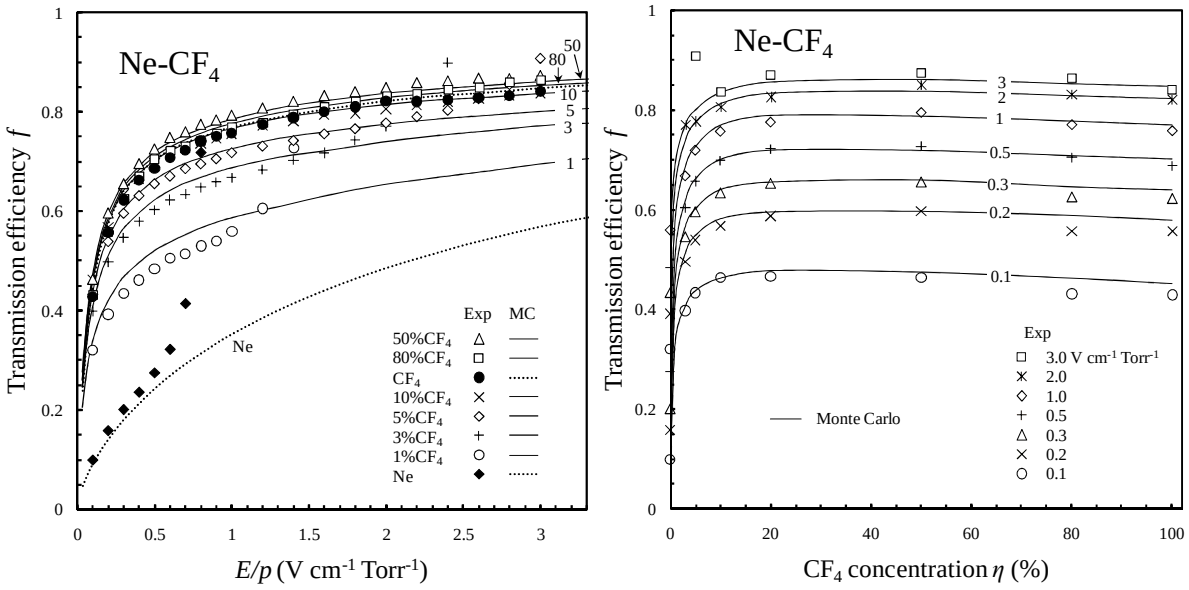

Fig.1. Transmission efficiency *f* for the photoelectrons emitted from CsI into Ne-CF_4 mixtures as a function of reduced electric field *E/p* and CF_4 concentration η for irradiation with a VUV Hg(Ar) lamp (peaked at 185 nm, with 5 nm *fwhm*). Curves are Monte Carlo data and symbols are measured results.

REFERENCES

[1] "Photoelectron backscattering effects in photoemission from CsI into gas media", A. Di Mauro *et al. Nucl. Instr. and Meth.* A 371, pp. 137-142, 1996.

[2] "Advances in gaseous photomultipliers", R. Chechik *et al., Nucl. Instr. and Meth. A* vol. 595, pp. 116-127, 2008.

[3] "The transmission of photoelectrons emitted from CsI photocathodes into Xe, Ar, Ne and their mixtures: A Monte Carlo study of the dependence on *E/N* and incident VUV photon energy", T.H.V.T. Dias *et al., J. Phys. D: Appl. Phys*. vol. 37, pp. 540-549, 2004.

[4] "A Monte Carlo study of backscattering effects in the photoelectron emission from CsI into CH_4 and Ar-CH_4 mixtures", J. Escada *et al., Journal of Instrumentation*, vol. 2, P08001, 2007.

[5] "Measurement of the photoelectron collection efficiency in noble gases and methane", L.C.C. Coelho *et al., Nucl. Instr. and Meth. A* vol. 581, pp. 190-193, 2007.

THGEM operation in Ne and Ne/CH_4 mixtures

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Abstract Index: 40
ORAL 25

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ABSTRACT:

The operation properties of Thick Gaseous Electron Multipliers (THGEM) in Ne and Ne/CH_4 mixtures are discussed. These mixtures have several advantages over other gases, for example high multiplication factors were reached at relatively low operation potentials, with soft x-rays and UV-photons, in single- and double-THGEM elements. The gain limit was often imposed by energetic secondary avalanche-photons; its dependence on the hole-diameter and hole's-rim size is shown. Small N_2 contaminations and CH_4 admixtures dramatically reduced the photon-feedback effects. In connection to possible application of Ne-based mixtures in THGEM RICH detectors data are provided on photoelectron extraction efficiency from CsI photocathodes into the gas, on time stability, pulse-shape and on the localization resolution of a 100x100 mm^2 x-ray imaging detector. Other possible applications are discussed

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Digital Hadron Calorimetry for the International Linear Collider using GEM technology.

Andy White for the ILC/Detector Group at the
University of Texas at Arlington

Abstract Index: 41
ORAL 26

The physics of the ILC requires jet energy resolution significantly better than so far achieved. The combination of small (~1cm x 1cm) cell size and a particle flow algorithm has been shown to be a strong contender for ILC calorimetry. Implementation of this calorimetry in GEM technology is an attractive solution, and will be described in this talk. Details will be given of work on GEM prototype active calorimeter layers, the associated readout electronics, and how such a solution can be implemented in the SiD detector.

Abstract ID : 30

Abstract Index: 42
Poster

Simulation tool for electroluminescence assessment in gaseous avalanche detectors

Content :
Scintillation emitted during avalanche development in gaseous avalanche detectors is useful information for triggering and/or tracking in gaseous detectors. Scintillation gases, like noble gases or CF_4 present high values for electroluminescence yield, emitting mainly in the VUV region. The photons can be used for signal readout, using an appropriate photosensor. It was experimentally demonstrated that statistical fluctuations in the number of photons produced along the avalanche are not higher than those in the number of electrons produced. Together with statistical fluctuations, among others, electroluminescence yields, time properties and photon collection efficiency are important parameters to quantify, in order to understand how to use and take advantage of this additional information. A simulation tool based on Magboltz/Garfield programs is under development to assess these parameters by following the excited states produced along the avalanche. Simulation results by applying the model to different micropattern gas detectors will be presented. Comparison between light and charge collection properties will be performed.

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Presenter : OLIVEIRA, Carlos (I3N-Physics Department, University of Aveiro, Aveiro, Portugal)

Track classification :

Contribution type : --not specified--

Submitted by : VELOSO, Joao

Submitted on Friday 10 April 2009

Last modified on : Friday 10 April 2009

Comments :
This work is supported by project CERN/FP/83487/2008 under the FEDER and FCT (Lisbon) programs.

Status : SUBMITTED

Track judgments :

Abstract ID : 31

Abstract Index: 43
Poster

Simulation of the physics performance of a digital hadron calorimeter

Content :
Digital hadronic calorimeters using the MPGD as active elements are a very promising choice for particle physics experiments at future lepton colliders. These experiments will be optimised for application of the particle flow algorithm and therefore require calorimeters with very fine lateral segmentation. A 1m2 prototype based on Micromegas chambers with 1 cm2 readout pads is currently being developed at LAPP. We report on GEANT4 simulation of the physics performance of a Micromegas calorimeter. The main calorimeter characteristics, such as energy resolution, linearity and shower profile, have been carefully examined with pions and various passive materials over a wide energy range from 3 to 200 GeV. The emphasis is put on comparison of the analog and digital or semi-digital readout.

Primary authors : Dr. BLAHA, Jan (LAPP/CNRS)

Co-authors :

Presenter : Dr. BLAHA, Jan (LAPP/CNRS)

Track classification :

Contribution type : --not specified--

Submitted by : BLAHA, Jan

Submitted on Friday 10 April 2009

Last modified on : Friday 10 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 32

Abstract Index: 44
Poster

DIRAC v2: a DIgital Readout Asic for hadronic Calorimeter

Content :
This mixed-signal circuit is a 64 channels readout R ASIC for Micro-Pattern Gaseous Detectors (Micromegas, Gas Electron Multiplier) or Resistive Plate Chambers. These detectors are foreseen as the active part of a digital hadronic calorimeter for a high energy physics experiment at the International Linear Collider. Physics requirements lead to a highly granular hadronic calorimeter with up to fifty millions channels with probably only hit information (digital calorimeter). Each channel of the chip is made of a 4 gains charge preamplifier, a DC-servo loop, 3 switched comparators and a digital memory, thus providing additional energy information for a hit. For detector characterization, a multiplexed analog readout has been implemented. Configuration and readout are fully digital, indeed six 8-bit DACs are embedded to set comparators thresholds. Power-down circuitry has been included, decreasing the power consumption to 10 μW per channel. To achieve a low cost electronics, a cheap full CMOS 0.35 μm foundry process has been chosen and the floorplan has been designed to reduce Printed Circuit Board costs. The SPS beam tests of the DIRAC first version embedded in a bulk Micromegas will be presented. The second version has just been received and preliminary results will be detailed. Large area detectors equipped with these chips are planned to be put in the PS beam this year.

Primary authors : Dr. GAGLIONE, Renaud (Laboratoire d'Annecyle-Vieux de Physique des Particules - Université de Savoie)

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Track classification :

Contribution type : --not specified--

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Submitted on Monday 13 April 2009

Last modified on : Monday 13 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 33

Abstract Index: 45
ORAL 27

Beam test and X-ray study of a Micromegas DHCAL prototype

Content :
A sampling hadronic calorimeter with gaps instrumented with thin Micromegas chambers of small pad size and single bit readout is a candidate for an experiment at a future linear collider. A small prototype consisting of a stack of four chambers with 672 anode pads of 1 cm2 and analog readout for charaterization was built. We report on measurements on all pads of MIP energy loss distribution, detection efficiency and hit multiplicity performed in a beam test at CERN. In addition, the impact of several variables (pressure, temperature, gas flow and mixing ratio, amplification gap thickness) on the gas gain of one chamber was investigated by means of an 55Fe source. Results will be shown and compared to predictions of a gas gain model. Our findings are also applicable to other MPGDs.

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Track classification :

Contribution type : --not specified--

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Last modified on : Monday 13 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 34

Abstract Index: 46
INVITED

CERN Large size MPGD production status

Content :
CERN PMT workshop (Photo Mechanical Technologies) is presently involved in the production of large size MPGDs. Our goal in the next 6 months is to build a 1.5m x 0.5m Bulk Micromegas detector and a 1m x 0.45m GEM foil. This presentation will give details on the production processes. Since the RD51 collaboration was created some companies had shown a growing interest for the production of these detectors. An otherview of these companies with their capabilities will be presented.

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Co-authors : Mr. DUARTE PINTO, Serge (CERN) ; Dr. ROPELEWSKI, Leszek (CERN)

Presenter : DE OLIVEIRA, Rui (CERN)

Track classification :

Contribution type : --not specified--

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Submitted on Tuesday 14 April 2009

Last modified on : Tuesday 14 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 35

Abstract Index: 47
ORAL 28

The triple-GEM detector of the LHCb Muon System

Content :
The inner region of the first station of the LHCb Muon chambers is equipped with 20x24 cm**2 triple-GEM detectors. The detector is now installed and under commissioning. The design, construction, main performance beam and cosmics tests will be discussed and a preliminary analysis of the detector performance in the LHCb cavern will also be presented.

Primary authors : Dr. BONIVENTO, Walter (INFN CAGLIARI)

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Presenter : Dr. CARDINI, Alessandro (INFN CAGLIARI/ CERN)

Track classification :

Contribution type : --not specified--

Submitted by : Dr. BONIVENTO, Walter

Submitted on Tuesday 14 April 2009

Last modified on : Tuesday 14 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 36

Abstract Index: 48
Poster

Large Area GEM Detectors for Cosmic Ray Muons Tomography: Application to Nuclear Material Contraband Detection.

Content :
Standard radiation detection techniques currently employed by portal monitors at international borders and ports are not very sensitive to high-Z radioactive material (U, Pu) if the material is well shielded to absorb the emanating radiation. Muon Tomography (MT) based on the measurement of multiple scattering of atmospheric cosmic ray muons traversing cargo or vehicles is a promising technique for solving this problem. Various groups propose to use the Drift Tube (DT) chambers as tracking detectors for Muon Tomography Station for cargo inspection. The relatively poor spatial resolution (200 to 400 micron) as well as additional scattering of the incident muons by the chambers both strongly affects the precision of the scattering angle measurement and therefore affect the performance of the MT station in detecting high-Z material. We propose to use low mass, high spatial resolution (~50 micron) large area Gas Electron Multiplier (GEM) detectors for the tracking of the cosmic muons MT to overcome the intrinsic limitations of drift tubes chambers. After a brief overview of simulation results on the compared performances of Drift Tube and GEM based MT station. We then talk about the ongoing effort to build the first prototype of MT station based 33 cm × 33 cm GEM detectors. The assembly of 10 chambers in collaboration with CERN is presented and we discuss the challenges on the electronic and readout system. We finally, discuss our plan to design and build large area GEM detectors (1m × 1m) for the final MT prototype.

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Presenter : GNANVO, Kondo (Florida Institute of Technology, Melbourne, Fl, USA)

Track classification :

Contribution type : --not specified--

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Submitted on Tuesday 14 April 2009

Last modified on : Tuesday 14 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 37

Abstract Index: 49
ORAL 29

New pixellized Micromegas detector for the COMPASS experiment

Content :
COMPASS is a fixed target experiment on the CERN M2 muon and hadron beam, dedicated to hadron structure and spectroscopy studies. COMPASS, starting in 2002, was the first major physics experiment to use micropattern detectors, both Micromegas and GEMs. In particular with an active area of 40x40 cm², the Micromegas detectors have been the largest used in a particle physics experiment. They achieve very good performances with a spatial resolution below 100µm, although they operate in a high radiation environment. COMPASS future plans involve a possible increase of the particle rates by a factor 2 to 5, and a regular use of hadron beams. R is being started in order to adapt the Micromegas detectors to these demanding requirements. The main goals are the following: - to decrease the discharge rate per incident hadron by a factor 10, by using a resistive layer on top of the read-out strips - to instrument the center of the detector, presently blind, with rectangular pixels in order to track beam particles - to use highly integrated electronics (possibly APV25-S1 chips) - to make use of the "bulk" technology First characterizations were done with detectors intercepting the full COMPASS muon and pion beams. In addition, two new large prototypes were built with a pixellized area in the center, using either bulk or classical technology, and read by an APV electronics. These two detectors will be compared in the COMPASS environment. Finally, in collaboration with other teams of Saclay using Micromegas detectors, we plan to test several small prototypes with various types of resistive foils. First results obtained with the present detectors and the pixellised prototypes will be shown.

Primary authors : Dr. NEYRET, Damien (CEA Saclay IRFU/SPhN)

Co-authors :

Presenter : Dr. NEYRET, Damien (CEA Saclay IRFU/SPhN)

Track classification :

Contribution type : --not specified--

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Submitted on Wednesday 15 April 2009

Last modified on : Wednesday 15 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 38

Abstract Index: 50
Poster

Study of Micromegas detectors for the sLHC environment

Content :
With the tenfold luminosity increase envisaged at the sLHC, the background (photons, neutrons, ...) and the event pile-up probability are expected to increase in proportion in the different experiments, especially in the forward regions like, for instance, the muons chambers of the ATLAS detector. Detectors based on the Micromegas principle should be good alternatives for the detector upgrade in the sLHC framework because of a good spatial (<100µm) and time (few ns) resolutions, high-rate capability, radiation hardness, good robustness and the possibility to build large areas. The aim of this study is to demonstrate that it is possible to reduce the discharge probability and protect the electronics by using a resistive anode plane in a high flux hadrons environment. Several prototypes of 10x10 cm2, with different pitches (0,25 to 2 mm) and different resistive layers (2 to 20 MΩ/⊠) will be tested at CERN (π+@SPS). The influence of the resistive layer on the spatial and time resolution will be evaluated, as well as the discharge rate and the behaviour of the different resistive anode planes at high rate. Results of tests performed previously at laboratory, during the preparation phase, are presented here along with preliminary results of the beam test.

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Track classification :

Contribution type : --not specified--

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Submitted on Wednesday 15 April 2009

Last modified on : Wednesday 15 April 2009

Comments :
Abstract submitted for a poster presentation. Preliminary results.

Status : SUBMITTED

Track judgments :

Abstract ID : 39

Abstract Index: 51
Poster

The 2D-Micro Hole & Strip Plate in CF4 atmosphere aiming neutron imaging

Content :
The Micro Hole & Strip Plate (MHSP) achieves gains above 400 in tetrafluoromethane (CF4) at 2.6 bar, making it suitable for neutron detection. Over the past few years, the imaging capabilities of the MHSP have been developed, leading to the 2D-MHSP. In this device, the position coordinates are determined using the principle of resistive charge division. The GEM-side was specially patterned in strips interconnected by a resistive strip for one of the coordinates and, in the MS-side, the thin strips were also interconnected by another resistive strip. By applying a trivial center of mass algorithm it is possible to obtain both coordinates and the energy of each event detected. The ability to register position and energy for each event can be very useful for event validation in neutron detection. In this work, the 2D-MHSP will be studied in CF4 up to 2.6 bar. The Modular Transfer Function (MTF) will be presented and some considerations on the position resolution achieved will be made. It was also demonstrated that resolutions below the proton range (1mm) are possible at 2.6 bar, allowing concluding that the MHSP could be a cost effective choice for neutron imaging.

Primary authors : NATAL DA LUZ, Hugo (University of Aveiro)

Co-authors : GOUVêA, Andrêa Leite (University of Coimbra) ; DOS SANTOS, Joaquim Marques Ferreira (University of Coimbra) ; VELOSO, João Filipe Calapez Albuquerque (University of Aveiro)

Presenter : NATAL DA LUZ, Hugo (University of Aveiro)

Track classification :

Contribution type : --not specified--

Submitted by : NATAL DA LUZ, Hugo

Submitted on Wednesday 15 April 2009

Last modified on : Wednesday 15 April 2009

Comments :
This work is supported by project CERN/FP/83487/2008 under the FEDER and FCT (Lisbon) programs.
H. Nata

Status : SUBMITTED

Track judgments :

Abstract ID : 40

Abstract Index: 52
ORAL 30

Study on transparent electrode ITO-MSGC for Gas Proportional Scintillation Counter

Content :
We present a novel transparent gaseous radiation detector; ITO-MSGC. MicroStrip Gas Counters (MSGCs) are still useful micropattern gas detectors because of their uniform response, high counting rate capability, fine resolution, etc. We are now trying to develop a new hybrid detector system with the optical image and the charge image by using see-through gaseous radiation detectors. When CF_4 are used in gas mixture, it is known that scintillation photons will come out near the avalanche region. Since our new detector is fabricated with transparent electrode material, Indium Tin Oxide (ITO), instead of using normal metals such as Cr or Au, those photons can be detected from the backside of the plate with PS-PMT (position sensitive photomultiplier). We have operated the plate in Ar and CF_4 gas mixture (1 atm), and the detector has been irradiated with X-rays from a Fe-55 source. The plate is operated in a clear chamber and a photomultiplier tube (Hamamatsu R928) is placed behind the plate. Optical photons are transmitted through the glass substrate and the optical signal is taken with the PMT. Through this experiment, up to 340 photons are detected with 5.9keV X-rays, and the gas gain of ~2800 was successfully achieved at the anode voltage of 700 V. We have successfully demonstrated the position measurement with visible photons from the ITO-MSGC.

Primary authors : Prof. TAKAHASHI, Hiroyuki (Department of Nuclear Engineering and Management, The University of Tokyo)

Co-authors : Dr. FUJIWARA, Takeshi (Department of Nuclear Engineering and Management, The University of Tokyo) ; Dr. KAORU, Fujita (Japan Atomic Energy Agency) ; Dr. NAOKO, Iyomoto (Department of Nuclear Engineering and Management, The University of Tokyo)

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Track classification :

Contribution type : --not specified--

Submitted by : FUJIWARA, Takeshi

Submitted on Thursday 16 April 2009

Last modified on : Thursday 16 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Abstract ID : 41

Abstract Index: 53
ORAL 31

Micro Capillary Technology for Fast Neutron Detection and Imaging

Content :
Advancements in micro-fabrication are enabling the manufacture of high pressure micro-capillaries for fast neutron detection and imaging. Each individual capillary acts as a unique micro-sensor, and the net result is the pixilation of a bulk gaseous neutron scatter detector. The current research uses natural helium-4 gas at very high pressure to populate numerous micro-scattering chambers. Micro-electrodes are used to measure the energy transferred to an ionized helium molecule in each scatter chamber. From coincident scattering events, existing algorithms can be used to reconstruct the energy and cone direction of a fast neutron event. We will present the proof-of- principle results from the first prototype system being constructed in calendar year 2009.

Primary authors : Mr. GROHMAN, Mark (Sandia National Laboratory)

Co-authors : Dr. DERZON, Mark (Sandia National Laboratory) ; Mr. RENZI, Ronald (Sandia National Laboratory)

Presenter : Mr. GROHMAN, Mark (Sandia National Laboratory)

Track classification :

Contribution type : --not specified--

Submitted by : GROHMAN, Mark

Submitted on Thursday 16 April 2009

Last modified on : Thursday 16 April 2009

Comments :

Status : SUBMITTED

Track judgments :

Development of GEM Readout Electronics for Particle Tracking and X-ray Imaging

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Abstract Index: 54
Poster

Two readout electronics system for GEM (Gas-Electron-Multiplier)[1] detector have been under developing for particle tracking and X-ray imaging respectively in our department. Detailed design and current status will be described in this paper.

The readout electronics for a GEM-based TPC consists of a 16-channel frontend ASIC, named CASA (Charge sensitive Amplifier and Shaper Amplifier)[2], a multi-channel ADC and a FPGA performing DSP (Digital Signal Processing) to extract amplitude and timing information from the signal waveforms. CASA provides amplification and shaping of the detector signals. The gain and the shaping time can be adjusted. The specifications are summarized in Table I and the preliminary test results show that it fully satisfies the requirements. A low cost digitizing and processing board has been developed using a commercial pipeline ADC (AD9212) and Xilinx Virtex-4.

In order to fully exploit the high spatial resolution of GEM detector for imaging, we developed an integrating ASIC to readout pad array with size in 1mm x 1mm. Each cell integrates input charge for a period of time, which is proportional to the X-ray flux. Then it can be selected to read out column by column and to reset hereafter. Each cell uses simple 3-T structure, as shown in Fig.1 and the test results of the linearity is shown in Fig.2. A maximum charge of 27.17pC can be integrated in one cycle and the noise level is below 15fC.

Custom designed BGA package is also developed to improve the inter-connection density between the detector and the frontend ASIC.

TABLE I THE SPECIFICATIONS OF CASA

Input Charge	10-1500 *f*C
SNR for MIP	>20:1
Gain (differential)	1-28 mV/*f*C, digitally programmable
Shaping Time (τ)	25–100 ns, digitally programmable
Output Swing	2 V p-p, differential
Drive Load	10pF
Crosstalk	<1%
Power Consumption	<10 mW/ch

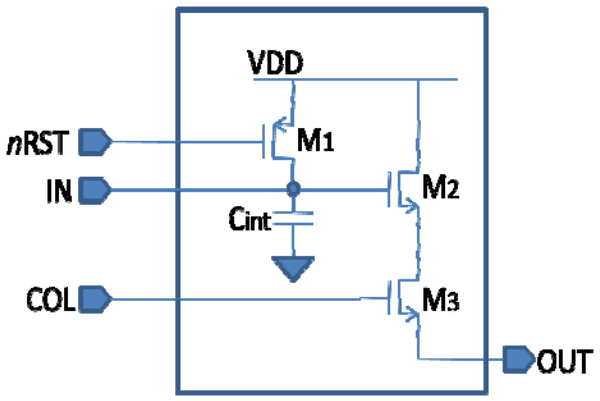

Fig.1 Diagram of one cell in the integrating ASIC

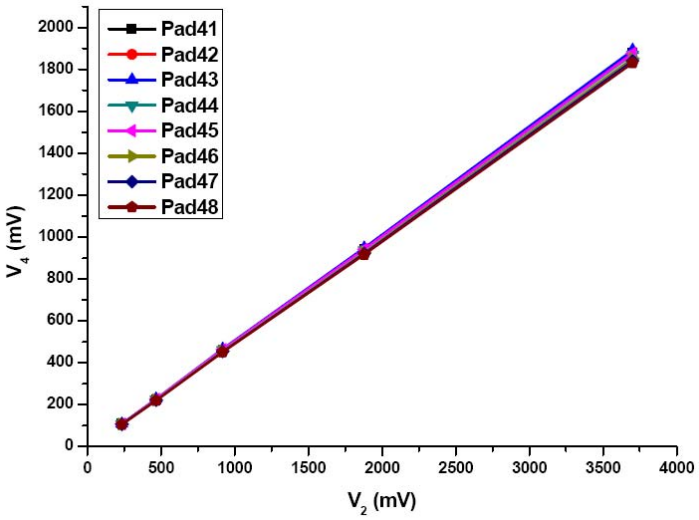

Fig.2 Linearity test of one row

REFERENCES

[1] F. Sauli, "GEM: A new concept for electron amplification in gas detectors," *Nucl. Instr. and Meth. A*, vol.386, no.2-3, pp.531-534, Feb. 1997.

[2] Z. Deng, et al., "CASA: a Readout ASIC for Gas Detectors with Self-Amplification", IEEE NSS-MIC Conference Record, n30-22, 2008

The DICE experiment: the application of a GridPix TPC

Abstract Index: 55
Poster

F. Hartjes, J. Timmermans, W. Koppert, M. Fransen, H.v.d. Graaf, T. Ketel,
R. Kalter, A. van der Kooij, A. Taal, F. de Boer, J. Konijn

With the Delft Internal Conversion Experiment (DICE) we intent to measure the angular distribution of e+e- Internal Conversion, occurring in some nuclii. For this, a small GridPix TPC was constructed in which a TimePix chip was applied. By means of a guard electrode and a fine strip electrode geometry as field cage, a homogeneous drift field was realised.
We have detected and analyzed e+e- events from a ^{24}Na source which was suspended, by means of a thin insulating wire, in the centre of the drift volume. The TPC was placed in a magnetic field (0.3 T) which was created by means of two small but powerful permanent magnets. The track curvature could be accurately measured.

The application of GridPix detectors in bi-phase Xe WIMP and ββ-0υ experiments

H. van der Graaf

Abstract Index: 56
Poster

With GridPix, single electrons, drifting a gas-filled volume, can be detected with a high efficiency and with an extremely low noise. The energy deposits from ββ events can we measured accurately, as well as the smallest ionization by recoil nuclii (one single electron). The information of free drifting electrons, combined with coincident (fluorescent) photons can be used for background recognition and suppressing. GridPix detectors can be made from all-metal and ceramic materials and can be low radio-active.

Title:
Beam test results of a GEM Large TPC Prototype readout by a new ATRLO electronics.

Abstract Index: 57
ORAL 32

Abstract:
As a part of TPC R&D for ILC by the LC TPC collaboration, GEM detector modules of two layers of thick (100 micron) GEM were built for the ILC Large TPC prototype facility and tested with 5 GeV/c electron beam at DESY in a 1T superconducting solenoid (PCMAG). Standard pads of 1.2mm wide of the GEM modules were readout by the ALTRO readout electronics with a new programmable charge amplifier PCA16. Preliminary results of space resolution better than 100 micron have been found. More results including an early trial of momentum measurement will be reported.

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A prototype of a directional detector for non-baryonic dark matter search: MIMAC (Micro-tpc Matrix of Chambers)

Daniel Santos

Abstract Index: 58
ORAL 33

We have developed a micro-tpc using a pixelized micromegas bulk coupled to a specially designed electronics as a read-out allowing to reconstruct the three dimensional track of a few keV recoils. The prototype has been tested with the Amande facility at the IRSN-Cadarache providing monochromatic neutrons. The first results concerning electrons of a few keV and proton and 4He recoils will be shown.

The STAR Forward GEM Tracker

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Abstract Index: 59
ORAL 34

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The STAR collaboration is preparing a tracking detector upgrade, the Heavy Flavor Tracker (HFT) and the Forward GEM Tracker (FGT) to further investigate fundamental properties of the new state of strongly interacting matter produced in relativistic-heavy ion collisions at RHIC and to provide fundamental studies of the proton spin structure and dynamics in high-energy polarized proton-proton collisions at RHIC.

The FGT will focus on novel spin physics measurements in high-energy polarized proton-proton collisions at a center-of-mass energy of 500 GeV, determining the flavor dependence ($\Delta\bar{u}$ versus $\Delta\bar{d}$) of the polarized sea. STAR plans to probe these polarized distribution functions using parity violating W production in the electron/positron decay mode.

This upgrade will consist of six triple-GEM detectors with two dimensional readout arranged in disks along the beam axis. The FGT project has completed an extensive R&D program of industrially produced GEM foils at Tech-Etch Inc. in comparison to GEM foils produced at CERN based on optical measurements, testbeam and ^{55}Fe source measurements of a triple-GEM prototype detector using $10 \times 10\text{cm}^2$ GEM foils. The FGT project requires large GEM foils which are currently being tested.

The FGT design, the status of large GEM foil tests, the performance of triple-GEM prototype detectors based on industrially produced GEM foils along with the status of the FGT construction and the installation schedule will be presented.

The study of response linearity of GEM detector under x-ray exposure

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Abstract Index: 60
Poster

A linear detector based on GEM was proposed for x-ray imaging, shown in Fig.1. First, the detector was set up with 3 GEMs (10 cm × 10cm, CERN standard foil), and the whole area was read out as a channel by Keithley 6517A Electrometer/High Resistance Meter. Severe saturation phenomenon was observed, and the linearity range was too small for a practical x-ray imaging detector, shown in Fig.2.

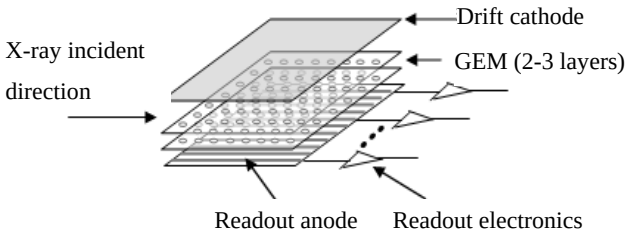

Fig.1 the scheme of the proposed detector

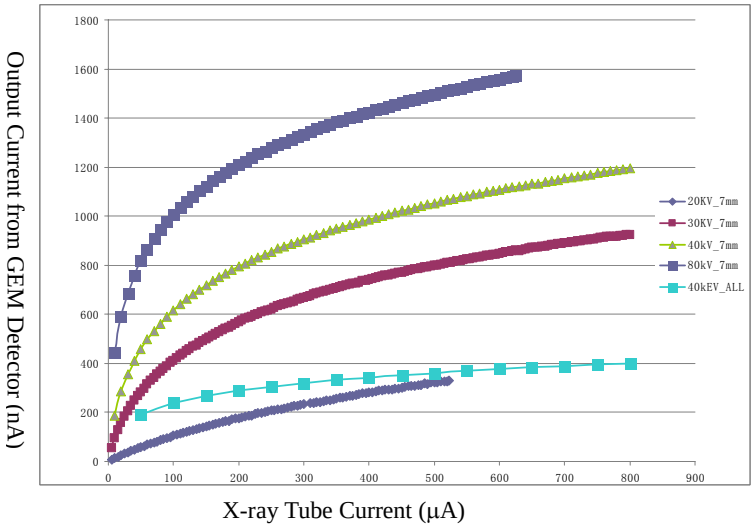

Fig.2 the output current of the GEM detector under x-ray exposure

Then systematic studies were carried out to optimize the working condition and extend the linear range of the detector, include:

- layer number,
- potential difference across each GEM,
- field distribution in drift, transfer and induction region,
- protection resistor,
- gas pressure,
- exposure area,
- width of readout strip.

This paper will present the test result and some discussion concerning the application of GEM detector in x-ray imaging.

The Thick-MHSP: a New Electron Multiplier Structure for Gaseous Detectors

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Abstract Index: 61
Poster

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A new micro-patern structure, the Thick-MHSP, merging the Thick-GEM and the MHSP, is proposed as an electron multiplier for gaseous detectors. In fact, it is a MHSP structure based on the Thick-GEM technology. Like the MHSP, this new structure also presents two almost independent multiplication stages: one through the holes and; a second one near the anode strips, allowing achieving very high gains in a single structure. The tested Thick-MHSP is made of a 0.3 mm thickness G10 plate, similar to the ones used for the production of the Thick-GEM, has an active area of 1.5x1.5 cm^2, a pitch of 0.87 mm and a distance between centers of the holes of 1 mm. The holes (0.21mm diameter with a 0.1 mm rim) running along the 0.4 mm wide cathode strips and the anodes are 0.28 mm wide. First experimental results were obtained for P10 at atmospheric pressure in both, current and pulse mode. Gas gain as high as 10^5 for P10 mixture were obtained for 22keV x-rays; preliminary results with single electrons, in pulse mode, yielded gains above 10^5. These promising results of high-gain in a single-multiplier element, with several potential applications, pave ways to more elaborated studies. Among them: electron collection, ion blocking, pulse-height resolution etc.

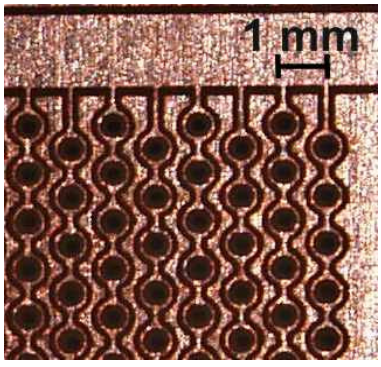

Photo of the structure taken from the strip side.
Hidden side is a THGEM like structure.

This work is supported by project CERN/FP/83487/2008 under the FEDER and FCT (Lisbon) programs.

Present status of R&D for the GEM-TPC of PANDA *

Abstract Index: 62
ORAL 35

Xiaodong Zhang[1]†, Heinz Angerer[1], Felix Böhmer[1], Sverre Dørheim[1], Christian Höppner[1], Bernhard Ketzer[1], Igor Konorov[1], Sebastian Neubert[1], Stephan Paul[1], Quirin Weitzel[1], Lisa Wörner[1], Maxence Vandenbroucke[1], Jörg Hehner[2], Andreas Heinz[2], Markus Henske[2], Jochen Kunkel[2], Christian Schmidt[2], Sandra Schwab[2], Daniel Soyk[2], Bernd Voss[2], Reinhard Beck[3], K. -T. Brinkmann[3], Chr. Funke[3], David Kaiser[3], Michael Lang[3], Roman Schmitz[3], Ulrike Thoma[3], Dieter Walter[3], Alexander Winnebeck[3], H. -G. Zaunick[3], Paul Bühler[4], Michael Carnegie[4], Johann Marton[4], Ken Suzuki[4], Eberhard Widmann[4], Johann Zmeskal[4], Matthias Danner[5], Laura Fabbietti[5], Alexander Schmah[5], and Martin Berger[5]

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April 22, 2009

Abstract

Owing to its excellent tracking performance and particle identification capabilities, combined with a small material budget, a TPC is an ideal candidate for the central tracking device inside the target spectrometer of PANDA at FAIR. Its operation in the antiproton storage ring HESR at a rate of 2×10^7 $\bar{\text{p}}$-p annihilations per second, however, requires a continuous sampling of incoming signals. The use of GEM technology for charge amplification provides the means to achieve the required resolution and to suppress the accumulation of space charge in the drift volume. A small-size GEM-TPC (Ø200 mm×80 mm) prototype whose readout plane consists of rectangular pads with a pitch of $1.0\times6.2\,\text{mm}^2$ has been built and tested with the PASA-/ALTRO electronics using cosmic muons. The average spatial resolution is about 200 μm along the short side of readout pad. In the region of drift lengths less than 10 mm, the spatial resolution is better than 140 μm. For further studying influences of different factors on the performance of the small prototype, we have set up a tracking telescope system with four silicon strip detectors and two GEM detectors, each providing two projections of a track penetration point, at the bent electron beam of the photon tagging system at ELSA (Bonn). In addition, two important upgrades of the small prototype have been done. The readout plane with

*Supported by the 6th Framework Program of the EU (Contracts No. RII3-CT-2004-506078, I3 Hadron Physics, and No. 515873-DS, DIRAC-secondary-Beams), the German Bundesministerium für Bildung und Forschung, the Maier-Leibnitz-Labor der LMU und TU München, and the DFG Cluster of Excellence "Origin and Structure of the Universe".

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rectangular pads has been replaced by one with hexagonal pads, yielding a more uniform spatial resolution. The second upgrade concerns a new readout electronics based on the AFTER ASIC digitized by a custom-made ADC module, which can be operated at sampling rates between 10 and 50 MHz. First tests of the new electronics showed an excellent noise performance of $600\,e^-$ at 10 pF input capacitance, much lower than the one of PASA-/ALTRO electronics at $1900\,e^-$. Equipped with 1728 channels of readout electronics, distributed over two regions of different hexagonal pad sizes (1.5 mm and 1.25 mm outer radius, respectively), detailed studies of the performace under different conditions will be performed with this chamber at ELSA. During the first commissioning of the setup in December of 2008, first electron tracks have been observed, showing that both the external track definition and the TPC work well. In parallel to these studies, a medium size GEM-TPC ($\varnothing 300\,\mathrm{mm} \times 650\,\mathrm{mm}$) prototype is being built, and will be tested in the FOPI experiment at GSI and at ELSA in the near future. In this talk, test results of two versions of the small size GEM-TPC prototype and the design and present status of the medium size one will be presented.

Title:

X-ray polarimetry in Astrophysics with Gas Pixel Detectors

Authors:

Abstract Index: 63
ORAL 36

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Title:

X-ray Polarimetry in Astrophysics with Gas Pixel Detectors

Abstract

The Gas Pixel detector, recently developed and continuously improved by Pisa INFN,in collaboration with IASF-Roma of INAF, can visualize the tracks produced within a low Z gas by photoelectrons of few keV. By reconstructing the impact point and the original direction of the photoelectrons, the GPD can measure the linear polarization of X-rays, while preserving the information on the absorption point, the energy and the time of individual photons. Applied to X-ray Astrophysics, in the focus of grazing incidence telescopes, it can perform angular resolved polarimetry with a huge improvement of sensitivity, when compared with the conventional techniques of Bragg diffraction at 45° and Compton scattering around 90°. This configuration is the basis of POLARIX and HXMT, two pathfinder missions and is included in the baseline design of IXO, the very large X-ray telescope under study by NASA and ESA.

Development of Hard X-ray Detector with GEM

Abstract Index: 64
ORAL 37

Shoji Uno, KEK

We are developing a hard X-ray detector with Gas Electron Multiplier (GEM) as a detector for the material structure analysis and non-destructive inspection. Usually, expensive Xenon gas has been filled in a chamber to obtain high detection efficiency for X-ray. But, the efficiency is not good enough for hard X-ray. Also, closed gas system is required and usable material is restricted inside the chamber. In our case, a solid converter (gold) is used for the detection of hard X-ray instead of Xenon gas. The hard X-ray is absorbed in gold layer and the electron is produced. The electrons can be detected in the gas volume. The detection efficiency is saturated with rather small thickness in one gold layer, since the range of produced electron in the gold layer is very short. Many gold layers are necessary in order to obtain higher efficiency. Gold-coated GEM foils were manufactured and a simple test was carried out to confirm the principle. In order to know the performance of the prototype chamber, X-ray irradiation test was performed with a medical X-ray generator. Results show iron bars can be seen inside 10cm concrete block and small deficit of iron plate can be detected as shown in the figure. More tests will be done before the conference.