Advanced Detectors for Nuclear, High Energy and Astroparticle Physics

Report of Contributions

https://indico.cern.ch/e/586317

Contribution ID: **1** Type: **Poster**

Simulation of gamma detection using GEANT4

Thursday 16 February 2017 17:50 (5 minutes)

Scintillation detectors are widely used technique in detecting gamma rays through different fields in science and technology. Scintillation detectors are usually coupled with photomultiplier tubes (PMTs) which generate electrical signals in response to light incident upon their faces. NaI(Tl) scintillation detector is simulated and the energy deposited by incoming gamma photons is obtained using GEANT4. Then the scintillation process to produce scintillation photons and the corresponding electrons in the PMT is separately simulated statistically using R which is a programming language for statistical analysis. We compared the obtained energy spectrum with the experimental data for Co60 gamma source. The simulated result along with the comparison with experimental data will be presented.

Presentation type

Poster

Primary author: Mr NAG, Abhishek (Indian Institute of Science Education and Research, Kolkata)

Presenter: Mr NAG, Abhishek (Indian Institute of Science Education and Research, Kolkata)

Session Classification: Poster session

Contribution ID: **2** Type: **Oral**

Sensitivity of ICAL to TeV-PeV Gamma rays at INO

Thursday 16 February 2017 16:50 (20 minutes)

We report the sensitivity of Iron Calorimeter (ICAL) detector to the detection of TeV-PeV Gamma rays from various astrophysical sources at India-based Neutrino Observatory (INO). The ICAL detector is proposed to be of 51 kton with an average magnetic field of $\sim$1.3 T. The electromagnetic showers generated by high energy gamma rays at the atmosphere will produce down going muons through either muon pair-production or pion decay. The gamma rays can be traced by detecting these muons by ICAL. Most of the space and underground based experiments have detect them directly and indirectly but the advantage of using ICAL for their detection is to measure the μ^+ to μ^- ratio, which is 1 in case of pair-production, at very high energy ($\geq$ 50 GeV). Here we have shown its detection ability for the appropriate astrophysical 2FHL sources listed in "The Second Catalog of Hard Fermi-LAT Sources", where the signal to noise ratio is suppressed by factor of 5σ for ICAL running period of 5 years for spectral index of $\leq$ 0.45.

Presentation type

Oral

Primary authors: Dr DASH, Nitali (Post Doctoral Fellow); Dr MOHARANA, Reetanjali (Post Doctoral Fellow)

Presenter: Dr DASH, Nitali (Post Doctoral Fellow)

Contribution ID: **3** Type: **Oral**

Characteristic simulation of stacks of four Gas Electron Multipliers (GEMs)

Friday 17 February 2017 12:00 (20 minutes)

Simulations of propagation and interaction of electrons and ions in Gas Electron Multiplier (GMSs) [1] is performed with Garfiled++ [2] using ANSYS [3] based calculations of potential and structure of GEM stacks. Aim of the simulation study is to optimize the 4-GEM configu- rations to operate a detector in a preferred gain, resolution and ion backflow with gas mixture of Ar:CO2:70:30. The study extends to the effect of various detector geometry structure like rectangular, hexagonal hole positioning and the misalignments of the hole positions from layer to layer. We will present a systematic study of the electron gain, induced signal for electrons and ions, signal shape and resolutions with various transfer fields, induction field and the drift field. A typical working region of the detector is shown in Fig 1. The study would help to understand the behavior of the 4-GEM fabrication in our lab for ALICE-TPC in particular, and a 4-GEM detector in general.

References

[1] F. Sauli, GEM: A new concept for electron amplification in gas detectors, Nucl. Instrum. Meth. A ,386 (1997) 531 - 534

[2] https://cern.ch/garfieldpp

[3] ANSYS Inc., Southpointe. http://www.ansys.com

Presentation type

Oral

Primary author: Dr MONDAL, Mriganka Mouli (Institute of Physics, Bhubaneswar)

Co-authors: Ms SWAIN, Sagarika (Institute of Physics); Dr NAYAK, S. N (Sambalpur University, Sambalpur); Prof. SAHU, Pradip Kumar (Institute of Physics)

Presenters: Dr MONDAL, Mriganka Mouli (Institute of Physics, Bhubaneswar); Ms SWAIN, Sagarika (Institute of Physics); Dr NAYAK, S. N (Sambalpur University, Sambalpur); Prof. SAHU, Pradip Kumar (Institute of Physics)

Contribution ID: **4** Type: **Poster**

Detailed Characteristics of triple GEM detector for future experiments

Thursday 16 February 2017 17:55 (5 minutes)

Gas Electron Multiplier (GEM) detector is one of the most advanced gas detector, being used in many high energy physics experiments. In future experiments like ALICE (run3) and CBM will use GEM detector as a readout to cope up with high rate particle production. In VECC, Kolkata a 10x10 cm^2 triple GEM detector is tested with different Argon based gas mixtures (Ar/CO_2 70:30 & 90:10). The detector is tested for spectrum study with different radioactive sources like ^{55}Fe, ^{106}Ru and Cosmic ray. A detailed characteristic of the detector in terms of effective gas gain, energy resolution, efficiency and time resolution have been studied. Efficiency measurements have been performed using both Cosmic ray and ^{106}Ru source and the efficiency ~95% were obtained for both the cases. The uniform performance over the active area is expected in any detector. Here we have developed a method to study the uniformity. The gain and efficiency over the active area of the detector is uniform with an RMS variation are 8.8% and 1.9% respectively.

Presentation type

Oral

Primary author: Mr PATRA, Rajendra Nath (Variable Energy Cyclotron Centre, HBNI, Kolkata, India)

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Presenter: Mr PATRA, Rajendra Nath (Variable Energy Cyclotron Centre, HBNI, Kolkata, India)

Session Classification: Poster session

Contribution ID: **5** Type: **Oral**

Assembly and tests resuts of a 4-GEM detector

Wednesday 15 February 2017 12:25 (20 minutes)

Gas Electron Multiplier (GEM) detector is one of the most advanced gas detector is being used in many high energy physics experiments. In future ALICE experiment will use GEM as a readout in Time Projection Chamber (TPC) detector to cope up with high collision rate (upto 50 kHz) particle production in run3. In VECC, Kolkata a 10x10 cm^2 4-GEM detector is assembled with a gas gap 4.8-2-2-2-2 mm. The GEM foils and other components are procured from CERN, Geneva. At first quality tests like gas leak and leakage current measurement of the GEM foils are performed. Basic characteristic study of the detector using Ar/CO_2 70:30 gas mixture is going on using different radioactive source like ^{55}Fe, ^{106}Ru and Cosmic ray. Test results of 4-GEM detector and a comparative study with triple GEM will be presented in the conference.

Presentation type

Oral

Primary author: Mr PATRA, Rajendra Nath (Variable Energy ceyclotron Centre, HBNI, Kolkata, India)

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Presenter: Mr PATRA, Rajendra Nath (Variable Energy ceyclotron Centre, HBNI, Kolkata, India)

Contribution ID: **7** Type: **Oral**

Development of 6-gap Bakelite Multi-gap Resistive Plate Chamber

Thursday 16 February 2017 12:00 (20 minutes)

Multigap Resistive Plate Chambers (MRPCs) are gaseous detectors being used worldwide in high energy physics experiments for charged particle detection. MRPCs are the advanced form of RPCs. RPCs are known to have good time resolution (~1 ns). In order to get even better time resolution, MRPCs were developed. The MRPCs used in experiments are made up of glass electrodes. We have taken an attempt to develop MRPCs using bakelite electrodes. Bakelite sheets of 500 μm thickness, procured from local market, were used to develop the 6-gap MRPC. The dimensions of the developed MRPC is 15 cm x 15 cm having each gas gap of 250 μm. The developed MRPC was tested for its various parameters like I-V test, efficiency, current stability, noise rate, time resolution with cosmic rays. The method of fabrication and test results of the MRPC will be presented.

Presentation type

Oral

Primary authors: GANAI, RAJESH (INO, VECC); MONDAL, Mitali (Variable Energy Cyclotron Centre,Kolkata); Ms MEHTA, Shaifali (Thapar University); Dr AHAMMED, Zubayer (Variable Energy Cyclotron Centre, Kolkata, India); CHATTOPADHYAY, Subhasis (Department of Atomic Energy (IN))

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Contribution ID: **8** Type: **Oral**

Effect of electric field and gas mixture on RPC time resolution

Friday 17 February 2017 12:40 (20 minutes)

The proposed ICAL detector at the India-based Neutrino Observatory [1] will deploy a large number of RPCs in 150 horizontal layers interleaved with iron plates to find the muon tracks, produced in the charged-current interaction of atmospheric neutrinos with the iron. Accurate timing information from each RPC layer will help to distinguish up-going muon tracks from the down-going ones and tag the events. The precision of the timing measurements depends on the time resolution of the RPC. It is important to study various parameters which may affect the timing response of RPC, such as, electric field, gas mixture, device geometry etc., to optimize them for better performance of RPC and analyse the experimental observations.

In the present work, the timing response of a Bakelite RPC of 2 mm gas-gap has been studied using numerical simulation as well as experimental measurements. The Garfield [2] framework has been used to calculate the current signals induced on RPC readout strips due to passage of 5000 muons through the detector. ROOT [3] data analysis framework has been used to analyse the simulated data. A distribution of times corresponding to crossing a signal threshold has been found out for 5000 events which is considered as the timing response of RPC. The variation of the distribution with the said parameters has been studied. Experiments have been performed to measure the timing response of RPC using a three-fold coincidence set-up in identical conditions to compare the numerical calculations.

REFERENCES:

[1] ICAL collaboration, S. Ahmed et al., Physics Potential of the ICAL detector at the India-based Neutrino Observatory (INO), arXiv:1505.07380.

[2] GARFIELD, recent developments, NIM A 419 (1998) p.726-730.

[3] ROOT –Data Analysis Framework, https://root.cern.ch.

Presentation type

Oral

Primary author: Mr JASH, Abhik (Saha Institute of Nuclear Physics)

Co-authors: Mr TRIPATHY, sridhar (Saha Institute of Nuclear Physics); Prof. MAJUMDAR, Nayana (Saha Institute of Nuclear Physics); Prof. MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics (IN)); Prof. SAHA, Satyajit (Saha Institute of Nuclear Physics); Dr CHATTOPADHYAY, Subhasis (Variable Energy Cyclotron Centre)

Presenter: Mr JASH, Abhik (Saha Institute of Nuclear Physics)

Contribution ID: **9** Type: **Oral**

Qualification of Eco-Friendly Gas Mixture forAvalanche-mode Operation of RPCs

Thursday 16 February 2017 17:10 (20 minutes)

INO (India-based Neutrino Observatory) [1] is an underground scientific facility to determine different properties of atmosphericneutrinos. One part of this facility is a 50 kton Iron Calorimeter (ICAL), a sampling calorimeter, which comprises of nearly 30000 Resistive Plate Chambers (RPCs) arranged in 151 layers interspersed with iron plates. The gas mixture used in Bakelite basedRPC is a mixture of R134a (a kind of Freon), Isobutane, and SF6 (Sulphur Hexa-Fluoride).Owing to huge Global Warming Potential (GWP) of this mixture (˜ 1403), this needs to be substituted with any eco-friendly without compromising the performance of ICAL. Several studies for alternative gases with lower GWP have considered HFO-1234ze (another kind of Freon with GWP ˜6) [2].
In this work, we propose to study the qualification of a mixture of Argon (GWP ˜ 0), CO2 (GWP ˜'1) with a small amount of SF6 (˜ 22300) for avalanche-mode operation of RPC. To begin the qualification process, we plan to find out the streamer probability of the new gas mixture at different operating voltages. To estimate the streamer probability, the electronic charge produced in the RPC by the muon will be estimated from the simulation of RPC signal for each operating voltage. That will be compared to the number of electrons when an avalanche transforms to a streamer which is planned to be estimated following a calculation available in [3].

References:
1. ICAL collaboration, S. Ahmed et al., Physics Potential of the ICAL detector at the India-based Neutrino Observatory (INO), arXiv: 1505.07380.
2. Further Gas mixtures with low environment impact, 13th workshop on Resistive plate chambers and related detectors 22-26 Feb. 2016 Ghent, Belgium, 2016 JINST 11 C 09012,
3. A study of the avalanche-to-streamer transition in arbitrary gases by particle simulation M. Rabie, C.M. Franck, J. Phys. D: Applied Phys. 49(2016) 175202

Presentation type

Oral

Primary author: DATTA, Jaydeep

Co-authors: JASH, Abhik (Saha Institute of Nuclear Physics); MAJUMDAR, Nayana (Saha Institute of Nuclear Physics); MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics (IN))

Presenter: DATTA, Jaydeep

Contribution ID: **10** Type: **Invited talk**

PET: a high threshold Nuclear Track Detector (NTD) for rare event search

Thursday 16 February 2017 10:45 (45 minutes)

Nuclear Track Detectors (NTD) have been used in the detection of heavy charged
particles for many years. Their main advantage, apart from low cost and ease of use, is the existence of natural thresholds of registration, which provide a natural and easy way of suppressing the background in an experiment looking for rare events (e.g. Strangelets, Monopoles) in cosmic rays and particle accelerators. In this presentation, I will talk about how an inexpensive, commercially available plastic called Polyethylene Terephthalate (PET), commonly used as a packaging and bottling material, was found to be suitable as a NTD with a threshold much higher than many other materials commonly used as NTDs. I will describe some of the processes used to characterize and calibrate PET and present some results from pilot studies where PET films were given open air
exposures at various high altitude locations.

Presentation type

Invited talk

Primary author: Dr MAULIK, Atanu (Bose Institute)

Presenter: Dr MAULIK, Atanu (Bose Institute)

Contribution ID: **11** Type: **Oral**

An efficient approach to manage DMA descriptors and evaluate PCIe based DMA performance for ALICE Common Readout Unit(CRU)

Thursday 16 February 2017 12:40 (20 minutes)

This paper presents the latest results of performance evaluation of PCIe based DMA engines using advanced Altera Arria X FPGA for the ALICE readout card upgrade.The new card, called CRU, will read out most of the sub-detectors data, process it and store it in the server memory through DMA.The main goal of this paper is to explain the descriptors management of DMA controller such that max DMA performance can be achieved.The DMA performance has been evaluated on various server grade machines using Altera Arria X FPGA kit.The result is around 95% of theoretical Gen3 PCIe based DMA engine bandwidth[7.2 Gbps].

Presentation type

Oral

Primary author: Mr MUKHERJEE, Sanjoy (Bose Institute)

Co-authors: Dr COSTA, Filippo (CERN); Mr PAUL, Rourab (Calcultta University); Dr CHAKRABARTI, Amlan (Calcutta University); Mr KHAN, Shuaib Ahmad (Variable Energy Cyclotron Centre); Mr MITRA, Jubin (Variable Energy Cyclotron Centre); Dr NAYAK, Tapan Kumar (CERN)

Presenter: Mr MUKHERJEE, Sanjoy (Bose Institute)

Contribution ID: **12** Type: **Oral**

Experimental Studies of ion backflow for a bulk Micromegas Detector using various Argon based Gas mixtures

Wednesday 15 February 2017 17:10 (20 minutes)

The Micro-Pattern Gaseous Detectors (MPGD) are fast radiation detectors capable of operating in high luminosity environment, and offer high gain and good position resolution. Operation of gas detectors is in general often limited by secondary effects, originating from avalanche-induced photons and ions. For example, Ion Back-Flow (IBF), the issue being studied in the present work, can make a detector incapable in high flux scenarios. Gas amplification results in a large number of electron-ion pairs. The ions drift opposite to the direction of electrons in presence of high electric field. The accumulation of these secondary positive ions often leads to significant space charge in high rate experiments, which distorts the electric field locally. Hence, it is important to study the IBF characteristics of detectors proposed to be used in many accelerator based experiments.
Micromegas(MICRO-MEsh GAseous Structure) is one of the successful MPGDs being used(or proposed to be used) for charged particle tracking in high rate environments in many high energy physics experiments. It is a parallel plate detector consisting of a very thin metallic micromesh which separates the low field drift region(~ 200V /cm) from the high field, (~ 50kV /cm) amplification region. The amplification gap between micromesh and the read-out plate(anode) is very small, of the order of ~ 100μm. The drift gap between drift mesh and the micromesh is usually much larger than the amplification gap to ensure sufficient primary ionization. The gas amplification occurs in the amplification region resulting as many number of electron-ion pairs. These positive ions produced by the avalanches
being massive are not affected much by the diffusion and follow the drift field lines. Most of the positive ions are collected at the micromesh giving rise to mesh current and only a small fraction of them drifts back to drift mesh resulting drift current. This IBF depends on the field ratio, detector geometry, gas mixture etc.
During the present study, IBF has been experimentally estimated as the ratio between drift current(I_c) to the total current which includes, the mesh current(I_m) and drift currrent measured, $IBF = I_c/(I_c + I_m)$. The present work involves the measurement of IBF using two drift meshes in the experimental set up. Several Ar-based gas mixtures, in particular, Argon + Isobutane (95:5), T2K gas composed of Argon + Isobutane + CF_4 (95:3:2) and Argon + CO_2 (80:20), have been used for the characterization of a bulk Micromegas detector and measurement of IBF. We will present the effect of various experimental parameters on IBF and discuss optimization of the related experimental setup.
References:[1] P. Colas, I. Giomataris, V. Lepeltier, ION BACKFLOW IN THE MICROMEGAS TPC FOR THE FUTURE LINEAR COLLIDER, Nuclear Instrumments and Methods in Physics Research A 535 (2004) 226-230, arXiv:physics/0412057 .
[2] P. Bhattacharya, D. Sankar Bhattacharya, S. Mukhopadhyay, S. Bhattacharya, N. Majumdar, S. Sarkar, P. Colas and D. Attie, INVESTIGATION OF ION BACKFLOW IN BULK MICROMEGAS DETECTORS, 2015 JINST 10 P09017 IOP Publising, arXiv:1605.02896v1 .

Presentation type

Oral

Primary authors: Mr ROUT, Prasant Kumar (Saha Institute of Nuclear Physics (IN)); BHATTACHARYA, Deb Sankar (Institute of Physics); Dr BHATTACHARYA, Purba (Department of Particle Physics and AstroPhysics, Weizmann Institute of Science); MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics (IN)); BHATTACHARYA, Sudeb (Saha Institute of Nuclear Physics (IN)); MAJUMDAR, Nayana (Saha Institute of Nuclear Physics (IN)); Prof. SARKAR, Sandip (Applied Nuclear Physics Division, Saha Institute of Nuclear Physics); COLAS, Paul (CEA/IRFU,Centre d'etude de Saclay Gif--sur-Yvette (FR)); ATTIE, David (CEA/DSM/DAPNIA/SPP)

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Presenter: Mr ROUT, Prasant Kumar (Saha Institute of Nuclear Physics (IN))

Contribution ID: **13** Type: **Oral**

Test Beam Data Analysis of a Prototype Bakelite Resistive Plate Chamber for Muon Chamber in CBM Experiment

The Compressed baryonic matter (CBM) experiment is one of the major scientific pillars at the future accelerator facility for anti-proton and ion research (FAIR) in GSI Germany. It is a fixed target experiment aimed to explore the QCD phase diagram in the region of very high net-baryon density by colliding heavy ions in the energy range of 2-45 A GeV at an exceptionally high interaction rate of 10 MHz . Resistive Plate Chambers (RPCs) will be one of the active detectors to be used in the 3rd and 4th station in Muon Chamber (MUCH) in CBM. A small prototype (30 cm X 30 cm) RPC with a gas gap of 0.2 cm have been fabricated and tested in H4 beam-line with Pb+Pb collisions having beam energy of 150 A GeV at SPS at CERN, Switzerland. The RPC has also been tested for its efficiency and noise rate with cosmic rays at Variable Energy Cyclotron Centre (VECC), Kolkata. The details of the fabrication, cosmic ray test results and beam-test results will be presented.

Presentation type

Oral

Primary authors: MONDAL, Mitali (Variable Energy Cyclotron Centre,Kolkata); GANAI, RAJESH (INO, VECC); Dr AHAMMED, Zubayer (Variable Energy Cyclotron Centre, Kolkata, India); Dr CHATTOPADHYAY, Subhasis (Variable Energy Cyclotron Centre)

Presenters: MONDAL, Mitali (Variable Energy Cyclotron Centre,Kolkata); GANAI, RAJESH (INO, VECC); Dr AHAMMED, Zubayer (Variable Energy Cyclotron Centre, Kolkata, India); Dr CHATTOPADHYAY, Subhasis (Variable Energy Cyclotron Centre)

Contribution ID: **14** Type: **Poster**

Implementation and evaluation of custom logic for various configuration schemes based on I2C and HDLC protocol for ALICE Common Readout Unit(CRU)

Thursday 16 February 2017 18:00 (5 minutes)

This paper presents the preliminary results of various configuration schemes for on-board and off board components for the new ALICE readout card.The new card, called CRU is a PCIe board based on the Altera Arria X FPGA, will configure itself as well as associated front end electronics board of most of the ALICE sub-detectors.The main aim of this paper is to explain different configuration schemes based on I2C and HDLC protocol.The schemes have been evaluated on different hardware platforms.

Presentation type

Oral

Primary author: Mr MUKHERJEE, Sanjoy (Bose Institute)

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Presenter: Mr MUKHERJEE, Sanjoy (Bose Institute)

Session Classification: Poster session

Contribution ID: **15** Type: **Oral**

Performance study of the realistic Muon Detector system in detection of low mass vector mesons in CBM experiment at FAIR

Friday 17 February 2017 12:20 (20 minutes)

The Compressed Baryonic Matter (CBM) experiment at the Facility for Antiproton and Ion Research (FAIR) in Darmstadt, Germany is an upcoming fixed target experiment which will perform the precision measurement of di-lepton pairs in the full mass region (low mass to charmonium) in the energy range 10 - 40 AGeV using high-intensity (~10^9 ions/ sec) heavy-ion beams. Leptons being weakly interacting, remain unaffected by the final state interactions, and act as one of the cleanest channel to explore the fireball created in heavy ion collisions. The objective of the MUon CHamber (MUCH) detector in the CBM experiment is to study the di-muon spectra at different mass regions. One of the major experimental challenges for the CBM experiment in the FAIR energy regime is the identification of low momentum muons, originating from the decay of low-mass vector mesons (LMVM), in a very high particle density environment. At low invariant masses, di-leptons offer valuable information on the in-medium modification of vector mesons which is a promising observable for the chiral symmetry restoration. Till date, no di-lepton measurements are available for heavy-ion collisions in the FAIR energy range. Here we will report the performance of the latest CBM MUCH detector, characterized by the detection efficiency and signal-to-background ratio for LMVM (ρ, ω, φ, η).

Presentation type

Oral

Primary authors: Ms NANDY, EKATA (VARIABLE ENERGY CYCLOTRON CENTRE); Prof. CHATTOPADHYAY, SUBHASIS (VARIABLE ENERGY CYCLOTRON CENTRE)

Presenters: Ms NANDY, EKATA (VARIABLE ENERGY CYCLOTRON CENTRE); Prof. CHATTOPADHYAY, SUBHASIS (VARIABLE ENERGY CYCLOTRON CENTRE)

Contribution ID: **16** Type: **Oral**

Pitfalls in calculating charge response parameter from etch pit

Thursday 16 February 2017 16:30 (20 minutes)

An etch pit is formed inside a Nuclear Track Detector (NTD) on chemical etching of a latent track, marking the passage of a charged particle through the detector medium. Generally, there are two well known methods which are being used while determining the charge response parameter. Here the applicability of these two methods and their suitability in different regime of stopping power S(E) is investigated.‘

Presentation type

Oral

Primary author: Mr BHATTACHARYYA, Rupamoy (Bose Institute)

Presenter: Mr BHATTACHARYYA, Rupamoy (Bose Institute)

Contribution ID: **17** Type: **Oral**

GEANT4 Simulation for Imaging of High-Z Materials using Cosmic-Ray Muons

Friday 17 February 2017 13:00 (20 minutes)

High-energy muons generated from cosmic-ray particle showers have been found to exhibit properties suitable for imaging the interior of large structures due to their high penetrating power. Based on the absorption or the scattering of muons in the target object, a technique for producing three-dimensional image of the object, known as Muon Tomography, has been widely in practice for several decades for various applications in the fields of geology, industry, homeland security etc.
In the present work, we attempt to produce shadow of different materials on a detector plane placing it under muon shower using GEANT4 [1] simulation framework. The typical muon flux reaching the Earth's surface at a rate of about ten thousand muons per minute per metre square vertically. Muons of such rate with fixed energy will be emulated using Monte-Carlo technique from a plane placed above the material under inspection. A cubical box of different materials like Al, Fe, Pb, U will be placed symmetrically under the particle generation plane to allow most of the muons pass through it. A detecting plane will be kept below it at a fixed distance to record the muon hits. The hit positions on the detector will be plotted to study the image pattern produced for different materials individually. It is planned to present also a study on the effect of various parameters, such as dimension of the box, muon energy etc. on the produced images.
References:
[1] S. Agostinelli, et al., "GEANT4 –a simulation tool kit,"Nuclear Instruments & Methods A506 (2003) 250303.
[2] M. Hohlmann, et al., "GEANT4 Simulation of a Cosmic Ray Muon Tomography System with Micro Pattern Gas Detectors for the Detection of High Z Materials", IEEE Transactions on Nuclear Science 56 (2009) 1356.

Presentation type

Oral

Primary author: TRIPATHY, sridhar

Co-authors: JASH, Abhik (Saha Institute of Nuclear Physics); MAJUMDAR, Nayana (Saha Institute of Nuclear Physics (IN)); MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics (IN)); Prof. SARKAR, Sandip (Applied Nuclear Physics Division, Saha Institute of Nuclear Physics); Prof. SAHA, Satyajit (Saha Institute of Nuclear Physics)

Presenter: TRIPATHY, sridhar

Contribution ID: **18** Type: **Oral**

Characterization of quadruple GEM with Am^{241} source at different gas flowrates

Wednesday 15 February 2017 17:30 (20 minutes)

The Gas Electron Multiplier (GEM) detector is proposed to be used as a readout for ALICE TPC upgrade in LHC experiment, at CERN [1]. The existing Multiple Wire Proportial Chamber (MWPC) will be replaced by GEM based readout which provides intrinsic ion blocking capability with out any gating grid system [2]. So a generous study involving GEM characteristics and performance is needed for its further operations. Here we did the characteristics study for a 10×10 qudruple gem detector prototype, irradiated with Am241gamma source. First the callibration is done for Am241 with the Fe55 source. The result we got from the callibration is used in the further study of GEM. Since GEM detector operates in a gas flow mode, the gas property could play a major role upon detector performance. In this study, we investigate the performance of GEM detector in Ar/CO2:70/30 medium with a variation of flow rate from 25 to 150 SCCM measured from a mass flow monitor built in house [3].

References

[1] F. Sauli, et al., Nuclear Instruments and Methods 805 (2016) 224
[2] G. Charpak, et al., Nuclear Instruments and Methods 62 (1968) 262
[3] S. Sahu, et al., Proceedings of the DAE-BRNS Symp. on Nucl. Phys. 61 (2016), 1002

Presentation type

Oral

Primary authors: SWAIN, Sagarika (Institute of Physics (IN)); SAHU, Sanjib Kumar (Institute of Physics (IN)); BHATTACHARYA, Deb Sankar (Institute of Physics); SAHU, Pradip Kumar (Institute of Physics (IN)); BISWAS, Saikat (Bose Institute (IN))

Presenter: SWAIN, Sagarika (Institute of Physics (IN))

Contribution ID: **19** Type: **Poster**

A simulation study for designed triple GEM detector at IOP

Thursday 16 February 2017 18:05 (5 minutes)

The GEM is one of the Micro Pattern Gas Detector (MPGD) proposed to be used as a readout for ALICE TPC upgrade in LHC experiment, at CERN [1]. The existing Multiple Wire Proportial Chamber (MWPC) will be replaced by GEM based readout which provides intrinsic ion blocking capability without any gating grid system [2]. For R&D purpose we have assembled a 10cm × 10cm triple GEM detector in IOP High Energy Detector (HED) laboratory. In this study we have performed a simulation for triple GEM detector using Garfield++ package [3]. ANSYS script is used to solve the electric fields inside the detector as well as for the graphical visualization of potentials [4]. A systematic calculation is done for gain, transparency, collection and extraction effieciency and signal distribution both for electrons and ions for this particular detector setup. Here we will present a comparison of experimental data with simulation results.
References
[1] F. Sauli, et al., Nuclear Instruments and Methods 805 (2016) 224 [2] G. Charpak, et al., Nuclear Instruments and Methods 62 (1968) 262 [3] https://garfieldpp.web.cern.ch/garfieldpp/
[4] http://www.ansys.com/

Presentation type

Oral

Primary author: SWAIN, Sagarika (Institute of Physics (IN))

Co-authors: MONDAL, Mriganka Mouli (Institute of Physics (IN)); Prof. NAYAK, Surya Narayan (Sambalpur University); SAHU, Pradip Kumar (Institute of Physics (IN))

Presenter: SWAIN, Sagarika (Institute of Physics (IN))

Session Classification: Poster session

Contribution ID: **20** Type: **Poster**

Fast TTL counter for gas detector

Thursday 16 February 2017 18:10 (5 minutes)

We developed an ARM Cotex M-3 based 84MHz counter. This counter is having a programmable timer, which can be varied manually from a few seconds to a few hours. The designed counter presently is operating with LV TTL (0 –3.3 V) to count pulses and display in the LCD. The counter has two modes of operation, one is manual mode and other one is remote mode. In the manual mode, the scalar counts the pulses for a time interval set manually and display in the LCD. After the interval, the scalar needs to be manually reset to start again. In the remote mode, a program is developed on LabView platform to start the counter and also it can be programmed for a number of loops and interval of loops. The detail fabrication process and calibration result for this counter will be presented.

Presentation type

Oral

Primary authors: Mr SAHU, Sanjib (Institute of Physics); Prof. SAHU, Pradip (Institute of Physics); Ms SWAIN, Sagarika (IOP); Mr BHATTACHARYA, Deb Sankar (IOP); Dr BISWAS, Saikat (Bose Institute)

Presenter: Mr SAHU, Sanjib (Institute of Physics)

Session Classification: Poster session

Contribution ID: **21** Type: **Oral**

Preliminary results of ion back flow study for a single GEM detector

Wednesday 15 February 2017 16:50 (20 minutes)

Among many other Micro Pattern Gaseous Detectors (MPGD), the Gas Electron Multiplier (GEM) is specially remarkable for very good spatial, temporal and energy resolution, stable high gain as well as low ion feedback. For its excellent performance, the GEMs are being adopted in many HEP experiments such as ALICE, CMS, CBM etc. ALICE has reported to upgrade the gas-amplification technology of their Time Projection Chamber (TPC) from Multi Wire Proportional.
The high-multiplicity environment of Pb–Pb collisions at 50 kHz after LS2, leads to a significant accumulation of positive ions from the gas-amplification regions to the drift volume of the ALICE TPC. This gives rise to a considerable non-uniformity of electric field in the TPC for a high-event rate experiment. Therefore the upgrade demands a robust detector for the TPC endplate which has convenient geometry for intrinsic ion suppression.

We study the basic properties of the GEM. We have started from stretching a single GEM foil and studying its properties like gain, collection efficiency and most importantly the ion backflow for different gas mixtures. The report describes the behavior of a GEM foil and it also presents a comprehensive comparison of single GEM with the GEM stacks.

Presentation type

Oral

Primary authors: BHATTACHARYA, Deb Sankar (Institute Of Physics); SAHU, Pradip Kumar (Institute of Physics (IN))

Co-authors: SWAIN, Sagarika (Institute of Physics (IN)); Mr SAHU, Sanjib (Institute of Physics)

Presenter: BHATTACHARYA, Deb Sankar (Institute Of Physics)

Contribution ID: **22** Type: **Poster**

Measurement of angular variation of cosmic ray flux with plastic scintillator

Thursday 16 February 2017 18:15 (5 minutes)

We have fabricated several plastic scintillator paddle detectors to build a cosmic ray trigger set up required for our R&D with particle detectors. The plastic scintillator material and photomultiplier tube are commercially procured. All other components such as Perspex light guide, coupler of light guide are made in proper dimension at Bose Institute workshop. Two such modules are built initially and tested with cosmic rays and different radioactive sources. Using these detectors a preliminary study has been carried out to measure the angular variation of cosmic ray flux. To do this one detector is kept fixed in position and the position of the other one is changed and the coincidence count is measured. The details of the fabrication of the modules and the experimental result will be presented.

Presentation type

Poster

Primary authors: ROY, SHREYA (BOSE INSTITUTE); ADAK, Rama Prasad (Bose Institute); BISWAS, Rathijit (Bose Institute (IN)); Dr BISWAS, Saikat (Bose Institute, 93/1 APC Road, Kolkata, INDIA); DAS, Supriya (Bose Institute (IN)); Mr DAS, S; NAG, Dipanjan (Bose Institute); Mr PAUL, D; RUDRA, Sharmili

Presenters: ROY, SHREYA (BOSE INSTITUTE); ADAK, Rama Prasad (Bose Institute); BISWAS, Rathijit (Bose Institute (IN)); Dr BISWAS, Saikat (Bose Institute, 93/1 APC Road, Kolkata, INDIA); DAS, Supriya (Bose Institute (IN)); Mr DAS, S; NAG, Dipanjan (Bose Institute); Mr PAUL, D; RUDRA, Sharmili

Session Classification: Poster session

Contribution ID: **23** Type: **Poster**

Some aspects of characterization of GEM detector

Thursday 16 February 2017 18:20 (5 minutes)

We have studied the variation of the gain of a triple GEM detector as a function of the relative humidity. The temperature/pressure (T/p) corrected normalized gain has been found to decrease with decrease in relative humidity. The uniformity of gain over the entire surface of the detector has also been studied measuring the anode current. The details of the measurement process and the experimental results will be presented.

Presentation type

Oral

Primary authors: NAG, Dipanjan (Bose Institute); Dr BISWAS, Saikat (Bose Institute, 93/1 APC Road, Kolkata, INDIA); DAS, Supriya (Bose Institute); GHOSH, Sanjay Kumar (Bose Institute (IN)); Mr PAUL, Dipankar; PRASAD, Sidharth Kumar (Bose Institute (IN)); Mr RAHA, Sibaji; ROY, SHREYA (BOSE INSTITUTE)

Presenters: NAG, Dipanjan (Bose Institute); Dr BISWAS, Saikat (Bose Institute, 93/1 APC Road, Kolkata, INDIA); DAS, Supriya (Bose Institute); GHOSH, Sanjay Kumar (Bose Institute (IN)); Mr PAUL, Dipankar; PRASAD, Sidharth Kumar (Bose Institute (IN)); Mr RAHA, Sibaji; ROY, SHREYA (BOSE INSTITUTE)

Session Classification: Poster session

Contribution ID: **24** Type: **Oral**

Comparison of Silicon, Germanium and Diamond Sensors for Using it in HEP Detector Applications

Thursday 16 February 2017 12:20 (20 minutes)

Silicon detectors are widely used in High Energy Physics Experiments for high precision tracking and reconstruction of primary and secondary vertices with good resolution. These detectors are close to the interaction points so they suffer very high fluence of particles and can be infected with radiation damage which can cause in the reduction of signal to noise ratio which is a very important quantity. In this talk We will compare some of the important quantities of Si, Ge and diamond and will try to investigate which one will be better for future collider experiments, where the luminosity and energy of the collision will be very high. I will also show the results on growth of diamond film and testing of the films and will compare the following properties of the detector material.

1. Energy loss, charge for MIP
2. Noise levels in Si, Ge and Diamond
3. Material Budget of materials (Multiple scattering)
4. Radiation damage of sensors simulated in fluka
5. Capabilities of Particle Identification

Presentation type

Oral

Primary authors: VARMA, Raghava (IIT- Indian Institute of Technology (IN)); KUMAR, Shyam (IIT- Indian Institute of Technology (IN))

Presenters: VARMA, Raghava (IIT- Indian Institute of Technology (IN)); KUMAR, Shyam (IIT- Indian Institute of Technology (IN))

Contribution ID: **25** Type: **Oral**

Test and Characterization of a Silicon-Tungsten Sampling calorimeter prototype with SPS at CERN

Wednesday 15 February 2017 11:45 (20 minutes)

A steady advancement of measurement techniques to handle large amount of produced particles and to probe new regime of physics is of absolute necessity specifically now and beyond LHC era. Silicon-Tungten sampling calorimeter is one of the most viable option to serve the purposes of high multiplicity environments created in high energy collider experiments. A full-length calorimeter prototype have been developed and fabricated as a successor of a miniature version with 4 layers of detectors. The prototype was constructed using 19-layes of silicon detector arrays (1cm*1cm*300um on a single wafer) and tungsten absorber/convertor. The test with the prototype has been performed at Super Proton Synchrotron (SPS) facility at CERN. Data analysis shows a very good response to both minimum ionizing particle as well as to electromagnetic shower (initiated by electron) for a wide range of incident energy (5 to 60 GeV). A detailed discussion about relevant calorimetric performances like longitudinal profile, incident to measured energy calibration, energy resolution will be reported in the conference.

Presentation type

Oral

Primary authors: Mr MUHURI, Sanjib (VECC); Mr MUKHOPADHYAY, Sourav (BARC); Mr SAHA, Sumit (VECC); Ms THAKUR, Sanchari (VECC); Dr CHANDRATRE, V. B. (BARC); Mr SINGARAJU, R. N. (VECC); Mr SAINI, J. (VECC); Mrs SUKHWANI, M. (BARC); Prof. NAYAK, Tapan K. (VECC and CERN)

Presenter: Mr MUHURI, Sanjib (VECC)

Contribution ID: **26** Type: **Oral**

Performance of an Automated Water Based Cooling System for CBM MuCh

Thursday 16 February 2017 13:00 (20 minutes)

The CBM experiment at FAIR aims to explore the QCD phase diagram in the region of high baryon densities using high-energy nucleus-nucleus collisions. A Triple GEM Muon Chamber (MuCh) detector, built in India, will be installed in the experiment for Muon detection. The MuCh Front End Boards (FEBs) dissipate heat ˜90W per sector and removal of this heat is essential for their reliable operation. We have designed an automated water based cooling system for the continuous removal of this heat so that the temperature of the boards lies in the favorable range of 20˜25 degrees centigrade. We will present mechanical design, installation and performance of the cooling system during the test beam experiment conducted at CERN, SPS in November, 2016.

Presentation type

Oral

Primary authors: NAG, Dipanjan (Bose Institute); Dr BISWAS, Saikat (Bose Institute, 93/1 APC Road, Kolkata, INDIA); Dr CHATTOPADHYAY, Subhasis (Variable Energy Cyclotron Centre); DAS, Supriya (Bose Institute (IN)); DUBEY, Anand Kumar (Department of Atomic Energy (IN)); SAINI, Jogender (Department of Atomic Energy (IN)); Mr KUMAR, Ajit (Department of Atomic Energy (IN)); Mr GHOSH, Chandrasekhar (VECC); PRASAD, Sidharth Kumar (Bose Institute (IN))

Presenter: NAG, Dipanjan (Bose Institute)

Contribution ID: **27** Type: **Invited talk**

Gaseous Ionization Detectors: Device Physics Simulations

Friday 17 February 2017 10:45 (45 minutes)

Gaseous ionization detectors depend on the ionization of the gaseous media due to the passage of ionizing radiation. The primary electrons / ions are transported and amplified through the application of suitable electromagnetic configuration and, finally, registered in the form of electronic signal. They are relatively inexpensive and found applications in wide-ranging fields related to fundamental studies and industrial applications because of their excellent spatial, temporal and energy resolution leading to reliable particle identification.
An evolution of more than a century has seen the emergence of a large variety of gaseous detectors, starting from the Geiger-Muller counters to the recent crop of Micro-Pattern Gaseous Detectors (MPGD). An array of complex physical and chemical processes occurring inside these devices determine their characteristics and demands close inspection prior to the development of proper insight into them. In its turn, a thorough understanding can help a) in better interpretation of acquired data, b) in improved experiment planning, c) in proposing more optimized design of the detectors and d) in more realistic simulation of the entire experiment based on codes such as Geant4, that rely on device response specified by the user, without trying to estimate the detector response by itself.
In this presentation, we will discuss recent advances in numerical simulation of the detailed device physics of gaseous ionization detectors. Related experimental efforts will also be mentioned since neither can be dealt alone. Discussions on the mathematical formulations, algorithms and simulation frameworks will be presented. Application of the simulation tools to investigate several physics issues of current interest will also be discussed.

Presentation type

Invited talk

Primary author: MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics (IN))

Presenter: MUKHOPADHYAY, Supratik (Saha Institute of Nuclear Physics (IN))

Contribution ID: **28** Type: **Oral**

LaBr$_3$(Ce): a new generation detector for timing spectroscopy

Wednesday 15 February 2017 16:30 (20 minutes)

A LaBr$_3$(Ce) scintillation detector is found to be the best among all other available scintillation detectors for timing spectroscopy work.
This has a very high light output and produces the best energy resolution ($\sim$ 4% at 662 keV). For a LaBr$_3$(Ce) detector, a glass
window PMT is found to be suitable and a much lower voltage is required compared to a BaF$_2$ detector. The timing performance of LaBr$_3$(Ce) is found
to be comparable to BaF$_2$. Prompt time resolutions of $\sim$ 300 and $\sim$ 210 ps have been obtained for a LaBr$_3$-BaF$_2$ detector combination
for 511 keV annihilation γ-rays of ^{22}Na and 1173-1332 keV γ-rays of ^{60}Co, respectively. Standard slow-fast coincidence assemblies using a four detector LaBr$_3$(Ce)-BaF$_2$ set up have been employed for measurements of crystalline electric field gradient (EFG)
in intermetallic compounds (e.g. HfNi$_3$) by time differential perturbed angular correlation (TD-PAC) spectroscopy. In this timing spectroscopy, angular correlation of a γ-γ cascade
of the probe nucleus (^{181}Hf) is perturbed by the interaction of nuclear quadrupole moment of the probe nucleus with the EFG present
in the investigated material. Sensitivity of
this technique in determining weak EFG in a material depends on the time resolution of the coincidence set up. In the present report, we have
investigated EFG in binary alloy HfNi$_3$ by this technique. The excellent energy and time resolutions of LaBr$_3$(Ce)-BaF$_2$ detector set
up help to resolve five
electric quadrupole interactions in the investigated sample. The details of the measurement and the results obtained will be described.

Presentation type

Oral

Primary authors: Mr DEY, Sourav Kumar (Saha Institute of Nuclear Physics); Prof. DEY, Chandi Charan (Saha Institute of Nuclear Physics); Prof. SAHA, Satyajit (Saha Institute of Nuclear Physics)

Presenter: Mr DEY, Sourav Kumar (Saha Institute of Nuclear Physics)

Contribution ID: **29** Type: **Invited talk**

Silicon Sensors in Experimental High Energy Physics Experiments.

Wednesday 15 February 2017 10:15 (45 minutes)

In high energy physics experiments, complex detector systems are widely used to harvest major physics discoveries. This talk will give an overview of the fundamental design of detectors in colliding beam experiments. The silicon detectors were used as spectrometers in fifties and later as vertexing and tracking detectors since early eighties as integral part of high energy physics experiments. A brief description of the historic evolution of such systems, the advantages, basic principle of operation, different designs and radiation damage issues will be presented. Also due to the proposed increase in luminosity in future HL-LHC, an overview of present upgrade choices of sensor designs for CMS experiment will also be covered.

Presentation type

Invited talk

Primary author: BHARDWAJ, Ashutosh (University of Delhi (IN))

Presenter: BHARDWAJ, Ashutosh (University of Delhi (IN))

Contribution ID: **30** Type: **Poster**

Study of Neutron response of PARIS phoswich detector

Thursday 16 February 2017 18:25 (5 minutes)

A Photon Array for the Studies with Radioactive Ion and Stable beams (PARIS) is being developed for studying the high energy γ-rays from the decay of highly collective sates in atomic nuclei [1,2]. The array consists of ˜ 200 phoswich element, each of which is made up of 2" x 2" x 2" LaBr3(Ce) crystal coupled with 2" x 2" x 6" NaI(Tl) crystal followed by single PMT readout [3]. The study of neutron response of this detector is very important for the rejection of neutron contamination in the high γ-ray measurement as well as to optimize the distance between detector and centre of the target chamber. We have studied the neutron response of the PARISphoswich detector and compared with the GEANT4 simulation [4]. The measurement has been carried out at TIFR, Mumbai by time-of-flight (TOF) technique using three different neutron sources 252Cf , 241Am-9Be and 239Pu-13C. The relative neutron detection efficiency of LaBr3 and NaI components of the phoswich detector has been measured in the energy range of En = 1 −9 MeV and compared with the GEANT4 simulations. It was found that for En > 3 MeV, ˜ 95% of neutrons have the primary interaction in the LaBr3 crystal, indicating that a clear n-γ separation can be achieved even at ˜ 15 cm flight path (TOF ˜ 6 ns). At low energies En < 3 MeV, the corresponding TOF is sufficiently large (TOF > 6 ns for L ˜ 15 cm) to enable the n-γ discrimination even in case of primary interaction in NaI. Hence, an overall neutron rejection probability of ˜ 95 % can be achieved with flight paths of ˜ 15 cm in the phoswich detector.

References [1] paris.ifj.edu.pl [2] A Maj et al., The PARIS project, Acta Phys Pol B 40, 565 (2009). [3] C. Ghosh et al., JINST, 11, P05023 (2016). [4] S Agostinelli et al., NIMA 506 (2003) 250.

Presentation type

Oral

Primary author: Dr DEY, Balaram (Tata Institute of Fundamental Research)

Presenter: Dr DEY, Balaram (Tata Institute of Fundamental Research)

Session Classification: Poster session

Contribution ID: **32** Type: **Invited talk**

GEM Detectors in CBM and other High Energy Physics Experiments

Wednesday 15 February 2017 11:00 (45 minutes)

Presentation type

Presenter: DUBEY, Anand Kumar (Department of Atomic Energy (IN))

Contribution ID: **33** Type: **not specified**

Inaugural Session

Contribution ID: **35** Type: **Oral**

Testing of Real-Size Prototype GEM detectors for CBM-MUCH with Pb+Pb Collisions at SPS CERN

Wednesday 15 February 2017 12:05 (20 minutes)

The Compressed Baryonic Matter (CBM) experiment is one of the core experiments of the upcoming FAIR facility in Darmstadt, Germany. This fixed target heavy ion experiment, is designed to explore the phase diagram of strongly interacting matter at high net baryonic density. CBM has been designed to handle unprecedented interaction rates (10 MHz) of Au+Au collisions in an energy range of up to 11 AGeV. The Muon Chamber (MUCH) system being developed at VECC, consists of layers of instrumented muon absorbers with detector stations sandwiched between them. A trapezoidal shaped, large size, Gas Electron Multiplier (GEM) detectors would be employed to perform the job of high rate tracking in the first few stations. In this regard, we have tested real-size prototypes of MUCH chambers in Pb+Pb collisions at CERN SPS. For the first time, almost full module aceptance was populated with realistic self-triggered electronics. The entire active area consisting of about 1900 readout pads having progressively increasing sizes was exposed to spray of particles arising out of the collisions of Pb beam with a 1 mm thick Pb target. The effect of absorber in front of the GEM chmaber was also studied using a 20 cm thick small iron plate. The data acquired using new CBM DAQ chain involving several AFCK (AMC FMC Carrier Kintex) boards with time synchronisation between them in a free streaming readout. The test results such as the hit spill structure, time correlation between hits in different detectror planes etc. will be discussed in detail.

Presenter: KUMAR, Ajit (Department of Atomic Energy (IN))

Contribution ID: **38** Type: **Invited talk**

Detectors for Nuclear Physics

Wednesday 15 February 2017 14:30 (45 minutes)

The talk will emphasize the detector requirements for nuclear physics study using the accelerator facilities in the country. An overview of the indigenous development of gas detectors (PPAC, MWPC, Hybrid gas-Si detectors), Charged Particle Detector Array (CPDA) and Neutron Detector array at VECC and their utilisation will be presented.

Presentation type

Presenter: GHOSH, Tilak Kumar

Contribution ID: **39** Type: **Invited talk**

Detector development activities at IUAC

Wednesday 15 February 2017 15:15 (45 minutes)

Inter University Accelerator Centre (IUAC), New Delhi provides facilities for nuclear physics experiments, focused at energies around Coulomb barrier, using the Pelletron-LINAC accelerator system. The heavy-ion induced fusion and fusion-fission reactions are characterized by performing measurements such as fission mass and angular distributions, fusion cross-section and barrier distributions, multi-nucleon transfer, neutron and charged particle multiplicity, Coulex etc. To execute these experiments, detector systems [1] based on position sensitive and fast timing proportional counters, particle identification telescopes based on gas ionization chambers and gas-silicon detectors, and scintillators for light charged particle and neutron detection have been developed. The detectors are routinely used in experiments involving facilities of mass spectrometers [2], scattering chamber, gamma [3] and neutron array [4] at IUAC. New detector systems are being planned and developed for these facilities as well as for the future facilities such as FAIR and SPIRAL2. An overview of developments in detector instrumentation at IUAC will be presented.

[1] Akhil Jhingan Pramana J. Phys. 85 (2015) 483

[2] N. Madhavan et al., Pramana J. Phys. 75 (2010) 317.

[3] S. Muralithar et al., Nucl. Inst. And Meth. Phys. Res. A 622 (2010) 281.

[4] P. Sugathan et al., Pramana J. Phys. Vol. 83 (2014) 807

Presentation type

Presenter: JHINGAN, Akhil (Unknown)

Contribution ID: **44** Type: **Invited talk**

GRAPES-3 observatory: A sensitive probe in high energy astroparticle physics

Thursday 16 February 2017 14:30 (45 minutes)

Presentation type

Presenter: GUPTA, Sunil (Tata Inst. of Fundamental Research (IN))

Contribution ID: **50** Type: **Invited talk**

Detectors and Detection Techniques for Dark Matter Search Experiments

Thursday 16 February 2017 10:00 (45 minutes)

From the astronomical observations involving terrestrial telescopes as well as space borne observatories, such as Hubble Space Telescope (HST) to WMAP and Planck, it is inferred that more than 83% of the gravitating matter in the Universe is Dark Matter (DM). Apart from only a few experimental endeavours, it has eluded direct or indirect detection in the terrestrial experiments involving possible interaction of the particle dark matter candidates with active mass of a detector under observation. This is primarily because the DM candidates do not interact with normal matter by any form of known interactions other than gravitational interaction. Direct detection of the DM candidates, conjectured as some kind of Weakly Interacting Massive Particles (WIMPs), with mass spanning in the range of a few GeVs to several TeVs, is one of the most challenging goals in contemporary physics, which involves multidisciplinary endeavours and involve development of new and challenging strategies in detectors, electronics, signal processing and data analysis. Current status of DM search results will be discussed in this talk, followed by review of laboratory based dark matter search experiments through observation of the signal trails left behind by the interaction of WIMPs with the nuclei of suitable detector materials.

Presentation type

Presenter: Prof. SAHA, Satyajit (Saha Institute of Nuclear Physics)

Contribution ID: **51** Type: **Invited talk**

Detectors for non-accelerator particle physics

Thursday 16 February 2017 15:15 (45 minutes)

Non-accelerator experiments played a long and major role in some of the major discoveries in and development of particle physics. These traditionally included cosmic ray, nucleon decay, neutrino, double-beta decay, dark matter and magnetic monopole experiments. There is a large overlap between detectors used in non-accelerator and accelerator physics experiments. Some of the well known examples of this kind are scintillators, photomultipliers, drift chambers, Resistive Plate Chambers and so on. However, some of the non-accelerator physics experiments employ contrastingly different detection techniques or instrumentation compared to their counter parts. Massive water Cherenkov detectors (used in Super-Kamiokande and IceCube), ultra cold solid state detectors (used in CDMS) and magnetised iron calorimeter (proposed by ICAL) are some of the prominent examples. While typically the accelerator physics experiments are built using more than half a dozen different types of detector layers, non-accelerator experiments are usually designed using a single type or at best using a couple of types of detector elements. Even though many of the non-accelerator detector elements are fabricated using commonly available and inexpensive materials, there is also a demand for ultra-pure and exotic materials for building many of the modern non-accelerator detector elements as well.

In this talk, we will discuss some important detectors which are special to terrestrial non-accelerator experiments. Indigenous efforts for development of various detectors for many of successful past and current non-accelerator experiments as well as for home-grown mega science experiments of the future will be highlighted. Other related design and development activities concerning electronics, data acquisition systems as well as other instrumentation will be mentioned.

Presentation type

Presenter: BHEESETTE, Satyanarayana (Tata Institute of Fundamental Research, Mumbai, INDIA)

Contribution ID: **55** Type: **Oral**

Ultra High Energy Atmospheric Muons Measurement at INO-ICAL Detector Using Pair Meter Techniques.

Thursday 16 February 2017 17:30 (20 minutes)

Cosmic rays primarily composed of high energy protons and atomic nuclei interact with the earth' s atmospheric nuclei and produce pions and kaons, these particles further decay to muons, which carries bundel of information as they travel in the atmosphere such as (i) pi/k hadronic production ratio (ii) Composition of cosmic ray primaries (iii)Contribution of charmed hadrons (iv) Neutrino flux at very high energies etc.
The proposed ICAL detector at INO is a large underground magnetized iron detector. This detector is shielded by 1.2km of rock(aprox). When the muons produced in the atmosphere pass through the rock, low energy muons gets stopped in the rock but the high energy muons will reach the detector. ICAL being a magnetized detector can reconstruct muon energy for a limited energy range using magnetic spectrometry techniques but for higher energy range we can not use this techniques because the tracks will be straight. We can use an alternative techniques to reconstruct energy of muons in higher energy range which is called as Pair-Meter techniques. This techniques is well tested at NuTeV/CCFR experiment.
In this work we have done the preliminary analysis for iron plates and demonstrate the observational feasibility of very high energy muons (1 TeV- 1000 TeV) in a large mass underground detector operating as a pair-meter. This energy range corresponds to surface muon energy of (5 TeV- 5000 TeV) and primary cosmic ray energy of (50 TeV- 50000TeV). That much wide range of energy spectrum will be helpful for studing the cosmic ray in the Knee range and understanding of atmospheric neutrino flux for the future and present ultra high-energy neutrino experiment.

Presenter: SINGH, Jaydip (Lucknow University)

Contribution ID: **56** Type: **Invited talk**

CBM Silicon Tracking Station and the CBM-related ASIC developements

Friday 17 February 2017 10:00 (45 minutes)

Presentation type

Presenter: SCHMIDT, Christian Joachim (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

Contribution ID: **62** Type: **Oral**

Summary

Friday 17 February 2017 14:30 (1 hour)

Presenter: Prof. VIYOGI, Yogendra Pathak (Variable Energy Cyclotron Centre, Kolkata, India)

Contribution ID: **72** Type: **not specified**

Inaugural Address

Wednesday 15 February 2017 09:30 (5 minutes)

Presenter: Prof. ROY, Siddhartha (Bose Institute)

Contribution ID: **73** Type: **not specified**

Welcome Address

Wednesday 15 February 2017 09:35 (10 minutes)

Presenter: Prof. RAHA, Sibaji (Bose Institute)

Contribution ID: **74** Type: **not specified**

Vote of thanks

Wednesday 15 February 2017 09:45 (5 minutes)

Presenter: BISWAS, Saikat (Bose Institute (IN))

Contribution ID: **75** Type: **not specified**

Presentation by winner of the best poster award

Friday 17 February 2017 14:20 (10 minutes)