

RD51 Activities At SINP

RD51 Group

*Applied Nuclear Physics Division
Saha Institute of Nuclear Physics
Kolkata, India*

RD51 Mini Week
CERN, 22-24 April, 2013

Ongoing RD51 Activities

Characterization Studies of Bulk Micromegas

- Measurement of detector characteristics (gain, energy resolution, electron transparency) and their dependence on detector design parameters and gas mixtures
- Simulation of detector characteristics to study the effect of different geometry modeling and components

Study of Ion Back Flow in Bulk Micromegas

- Measurement of IBF

Characterization Studies of Single GEM (to be extended to Triple-GEM)

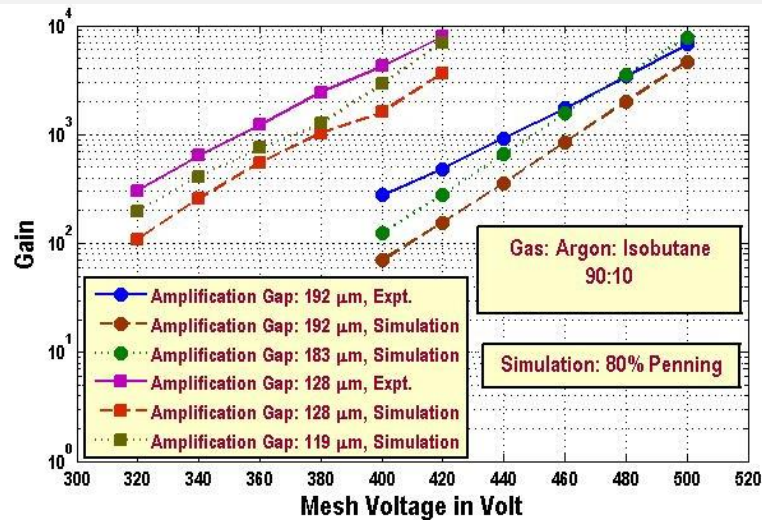
- Simulation of field distribution and drift in single-GEM with staggered array of holes
- Numerical studies on the effect of etching in single-GEM

neBEM Upgrades

- Development of solid modeling in neBEM

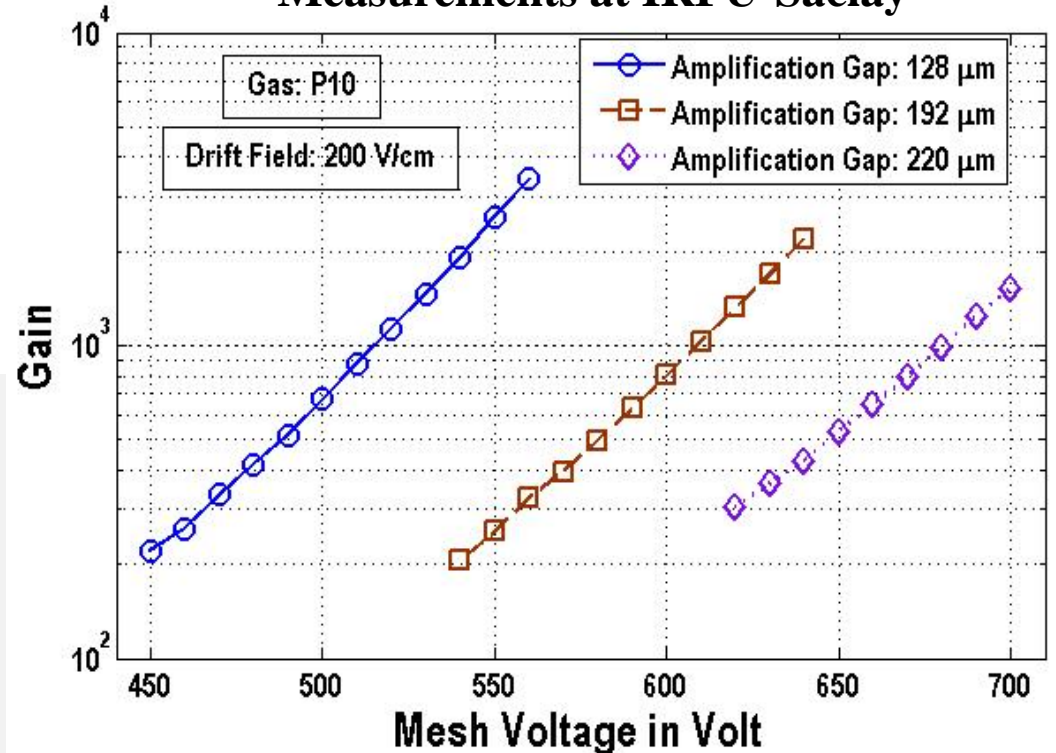
Characterization Studies of Bulk Micromegas (Preliminary)

Measurements at SINP



Mini Week, Jan2013
VCI2013

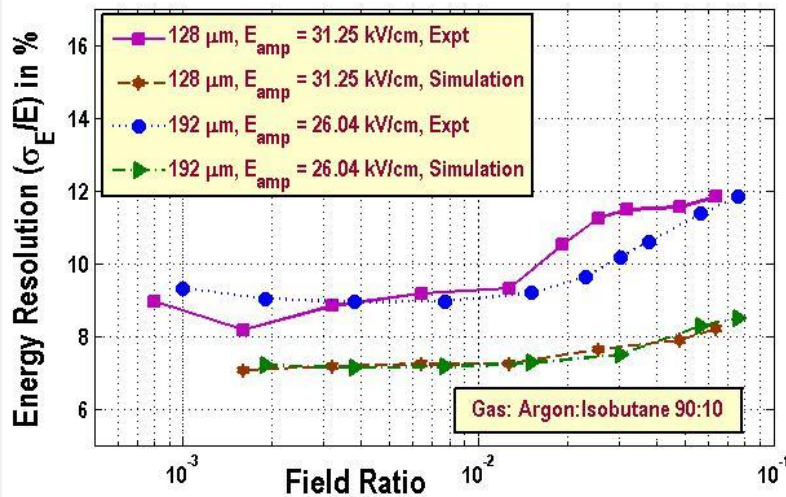
Measurements at IRFU-Saclay



Preliminary measurements for a new set of bulk Micromegas with different amplification gaps in P10 (no preconditioning done).
Maximum gain achieved is higher for smaller gap.

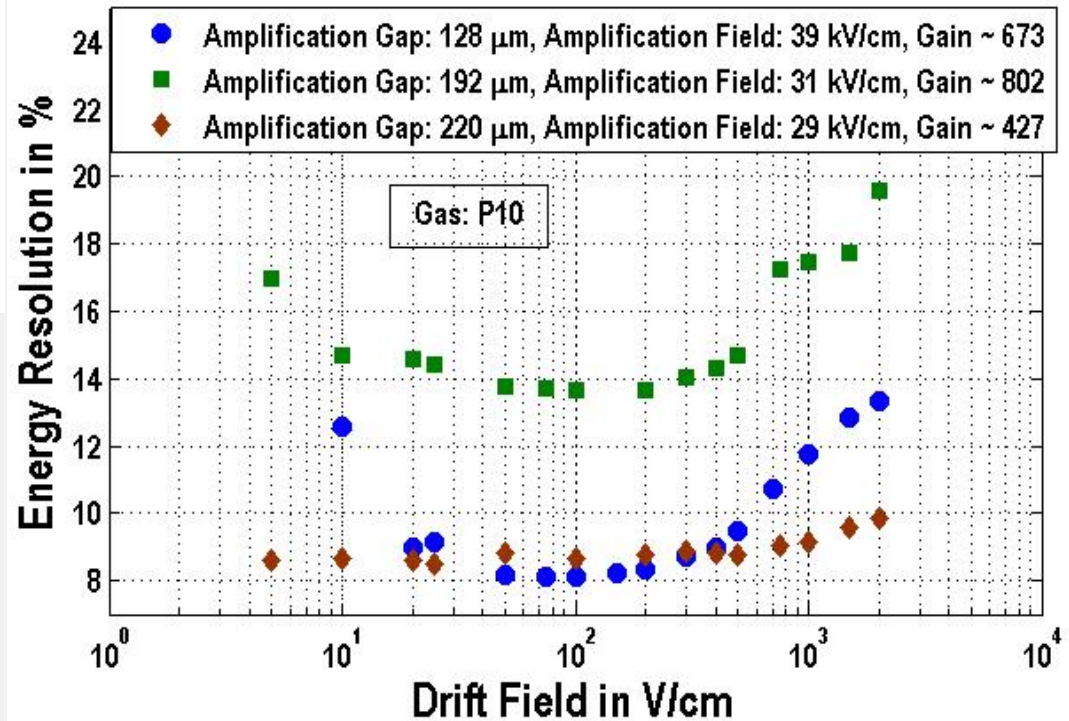
Characterization Studies of Bulk Micromegas (Preliminary)

Measurements at SINP



Mini Week, Jan2013
VCI2013

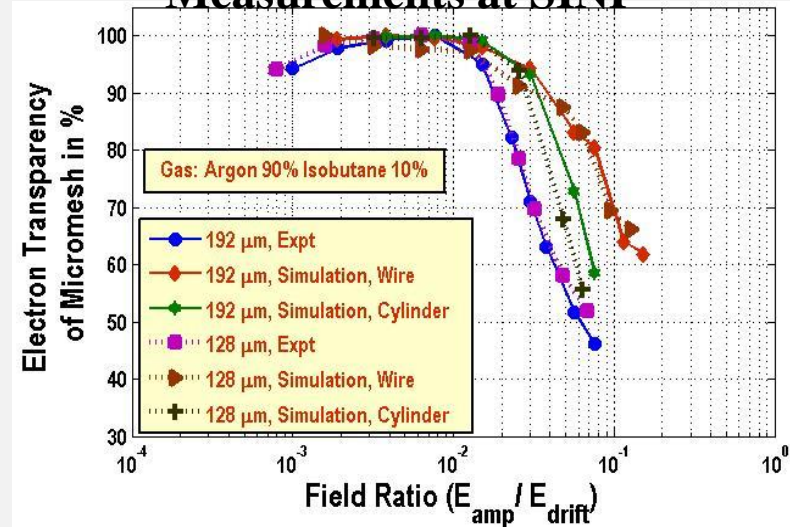
Measurements at IRFU-Saclay



Preliminary results show better resolution for larger gap at higher field with P10. 192 micron shows much worse resolution w.r.t earlier observation with Ar-Iso (90:10).

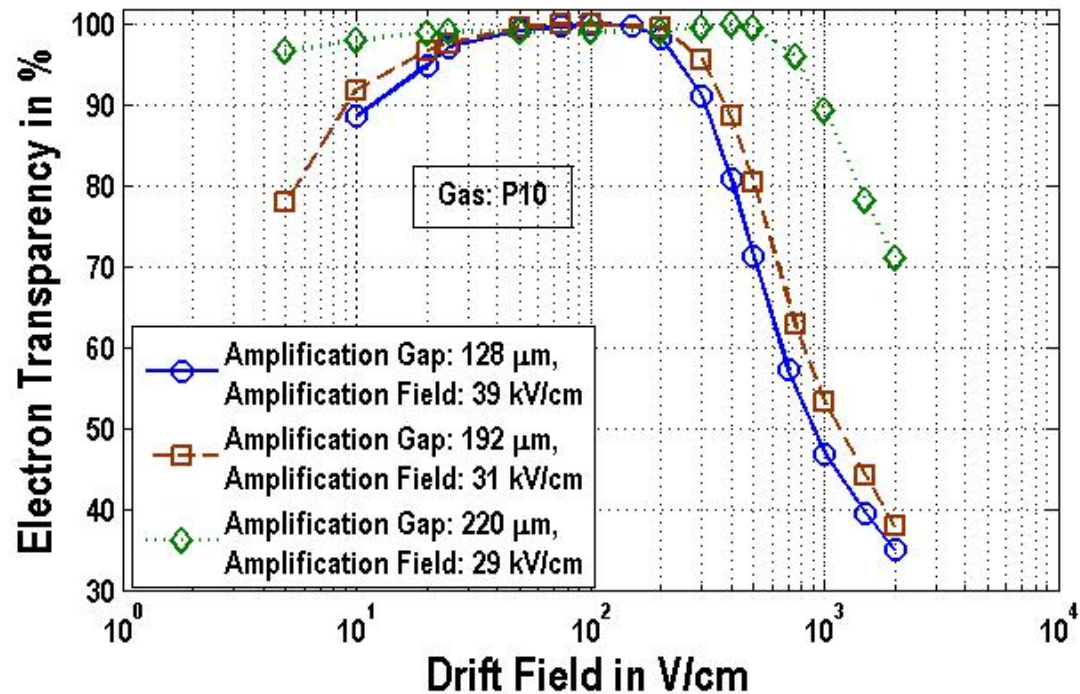
Characterization Studies of Bulk Micromegas (Preliminary)

Measurements at SINP



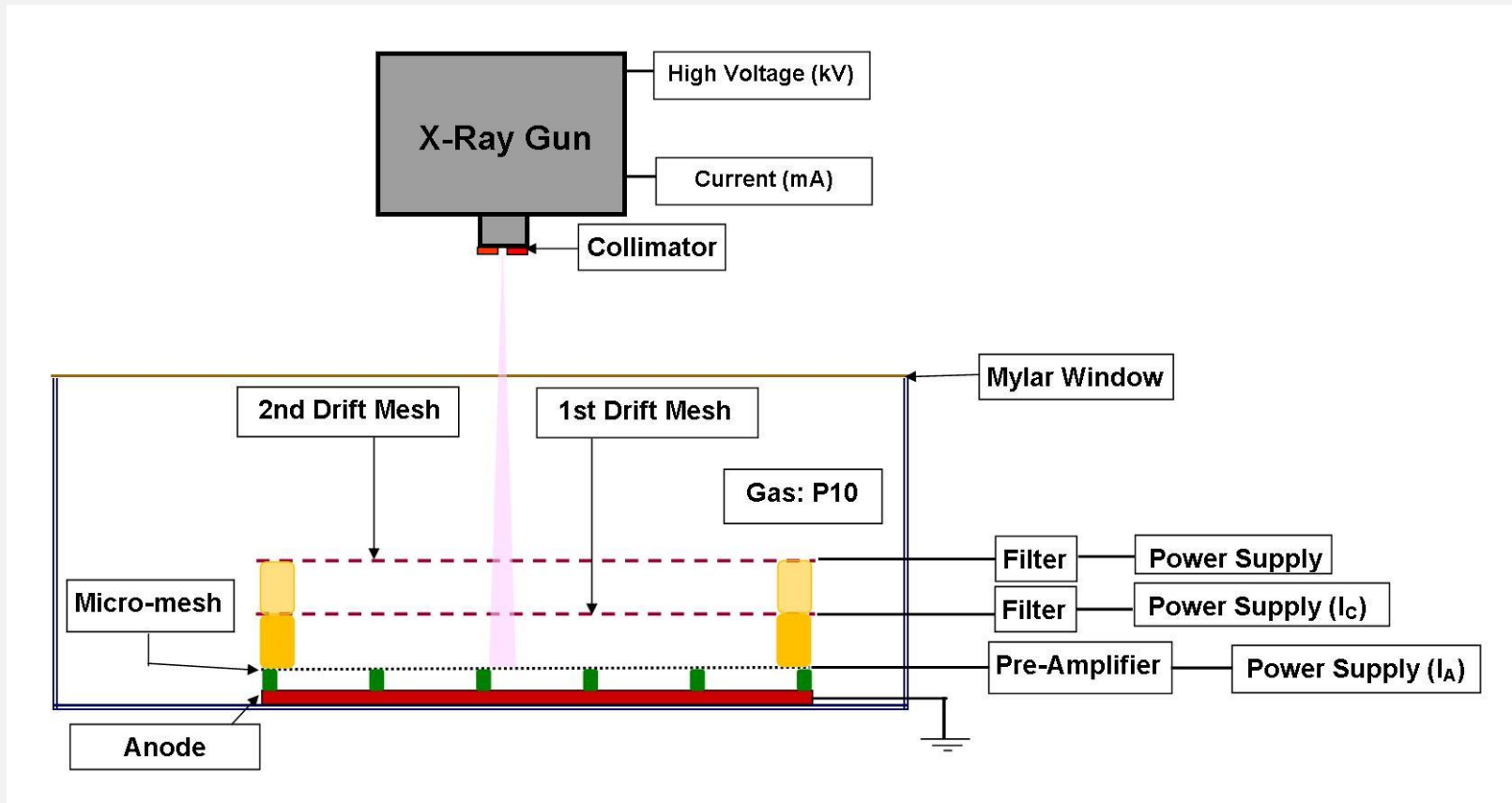
Mini Week, Jan2013
VCI2013

Measurements at IRFU-Saclay



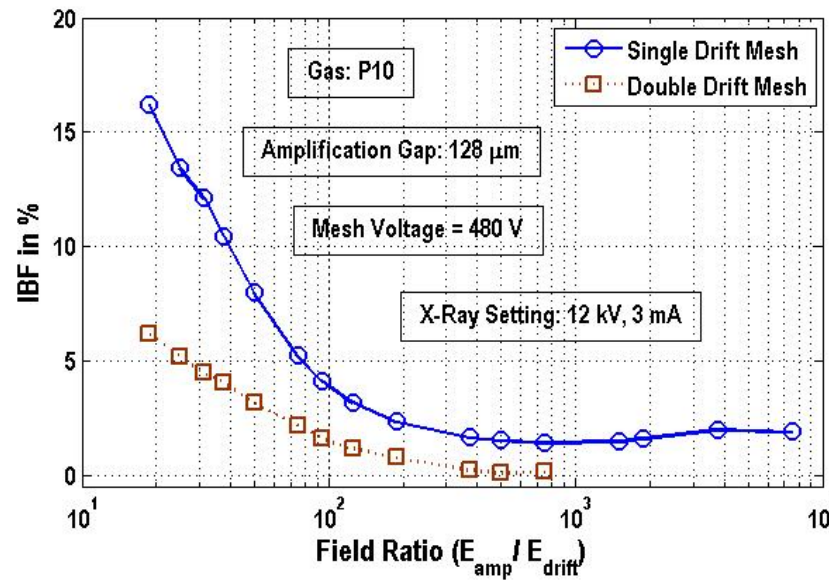
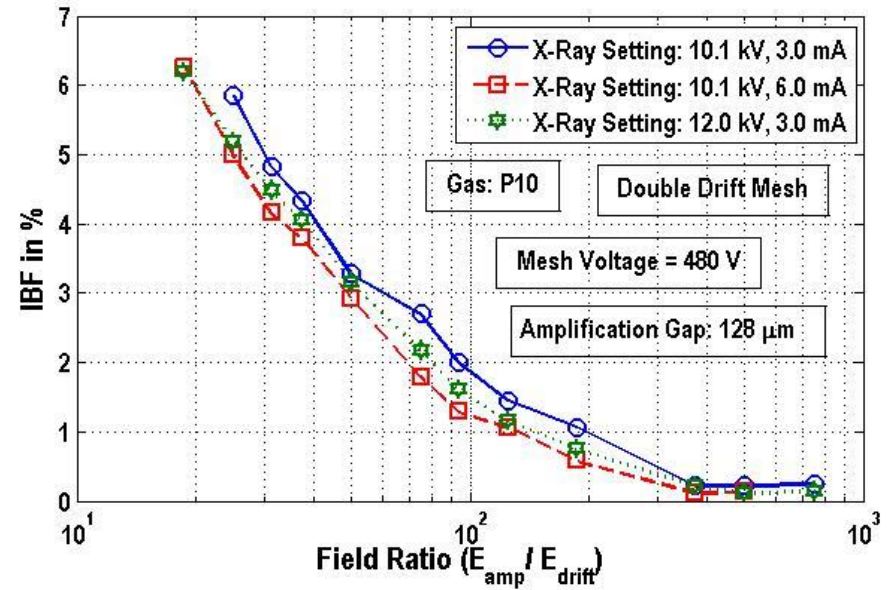
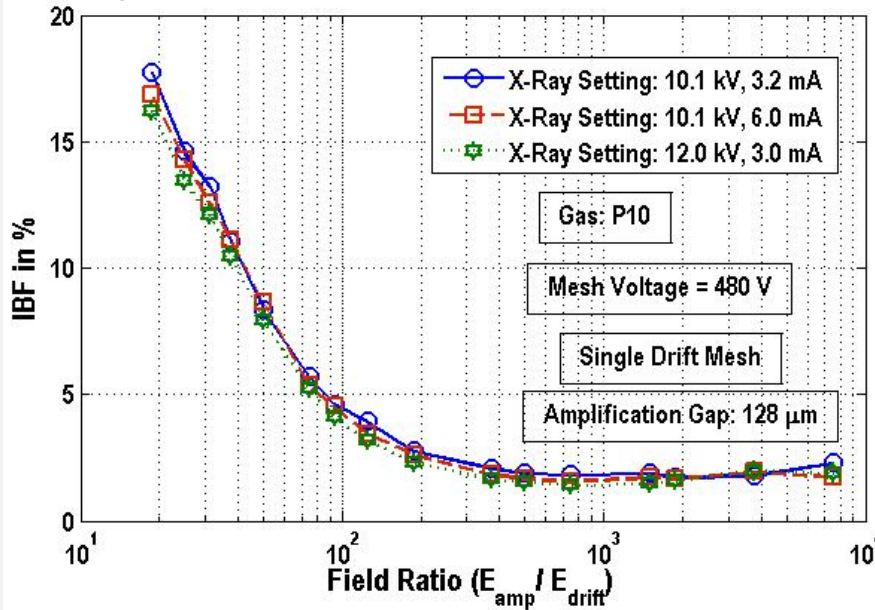
Larger gap shows much better transparency at higher drift field.

Study of Ion Back Flow (IBF) in Bulk Micromegas (Preliminary)



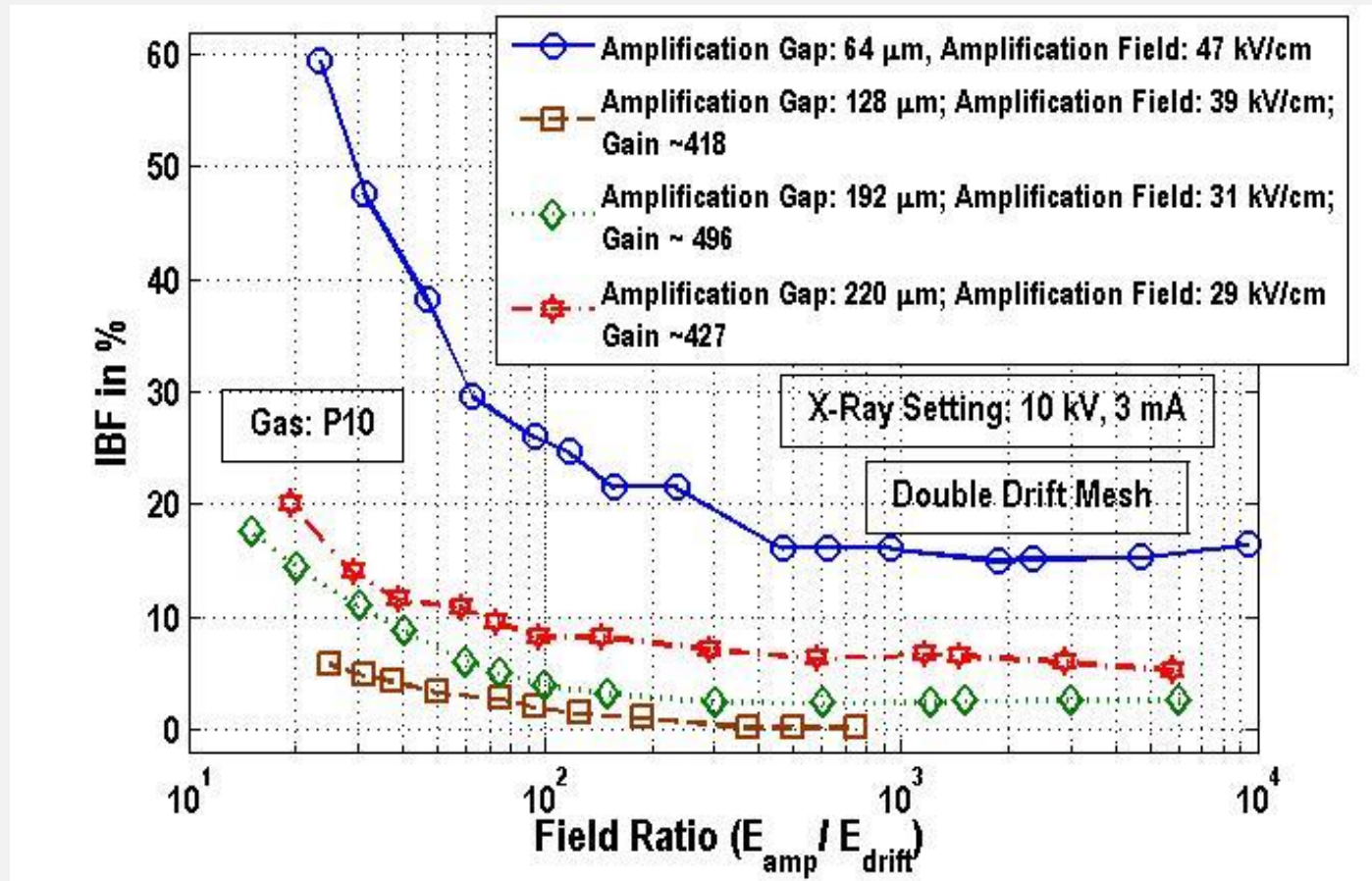
Setup of IBF measurement at IRFU-Saclay

Study of Ion Back Flow (IBF) in Bulk Micromegas (Preliminary)



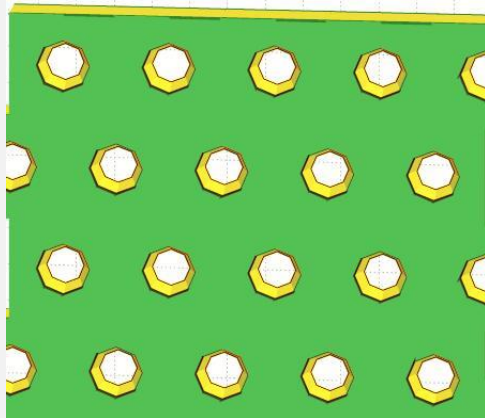
IBF in double drift mesh is much lower w.r.t single one.

Study of Ion Back Flow (IBF) in Bulk Micromegas (Preliminary)



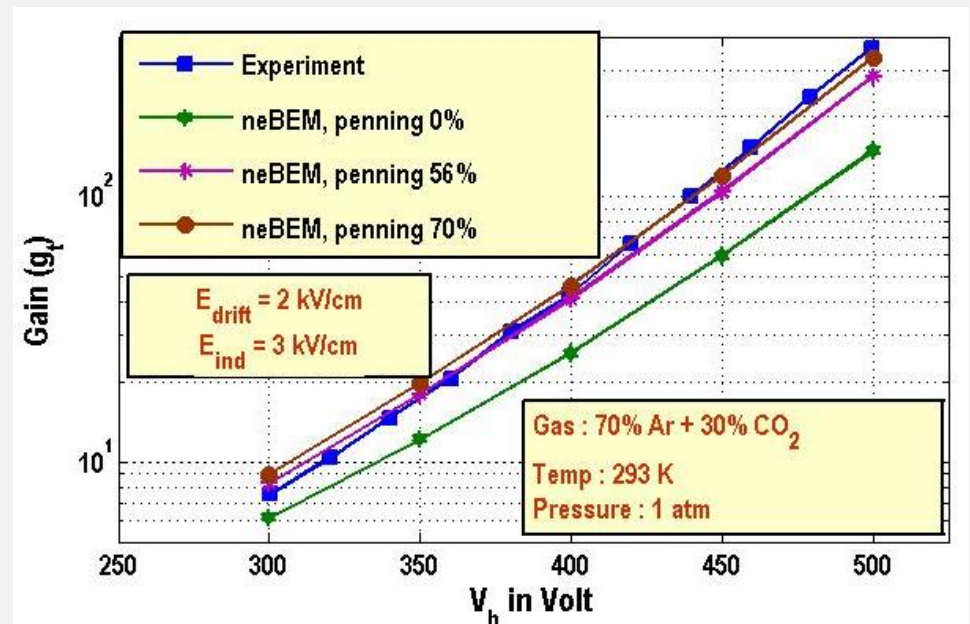
IBF shows lower value for smaller gap except 64 micron case which exhibits the largest IBF.

Characterization Study of GEM (to be extended to Triple-GEM)



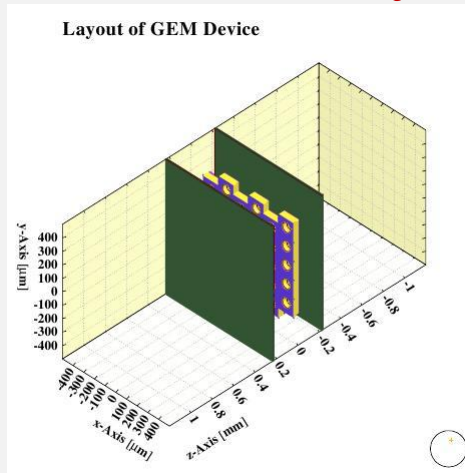
Regular array of holes

(Expt. Ref. Ph.D Thesis of G. Croci)

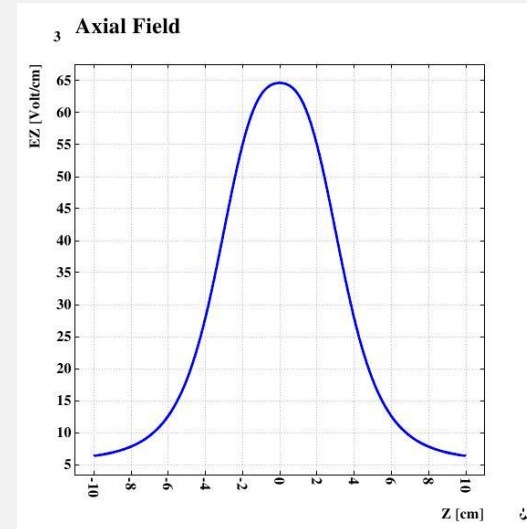


Collaboration Meeting, SBU
Oct2012

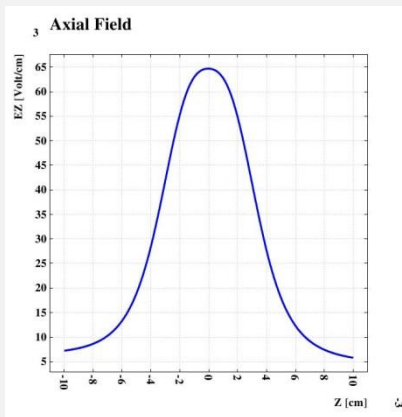
Characterization Study of GEM (to be extended to Triple-GEM) (Preliminary)



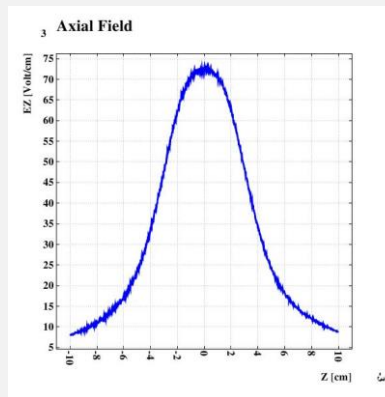
**GEM Device
Staggered array of holes**



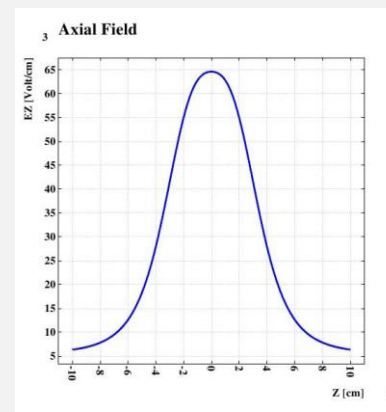
Axial Field Distribution with Hole Array



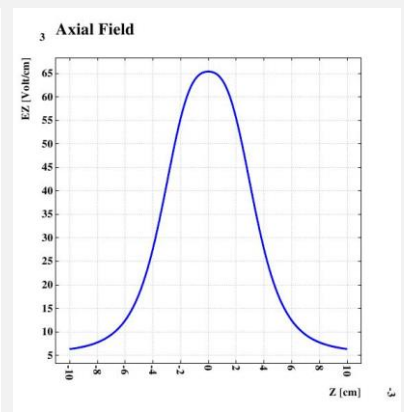
LU-1x5, t=0s



LU-5x11, t=3395s



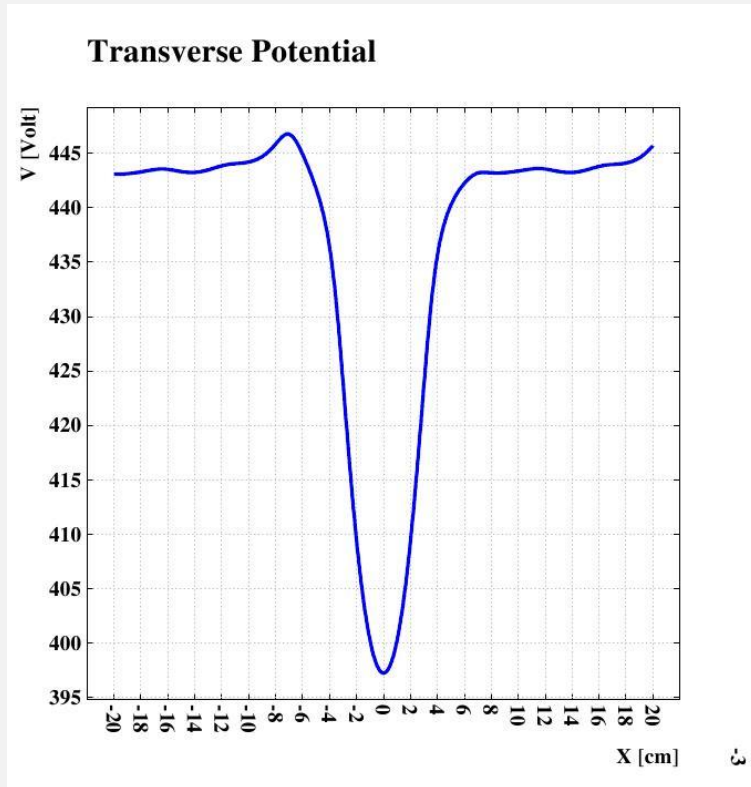
SVD-1x5, t=14s



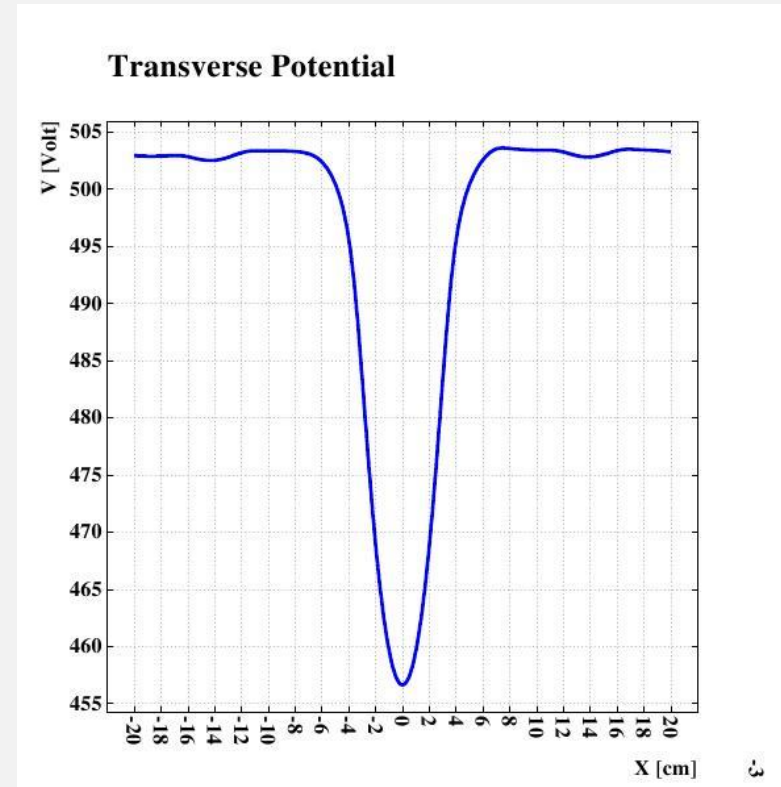
SVD-5x11, t=41000s

Characterization Study of GEM (to be extended to Triple-GEM) (Preliminary)

SVD versus LU in Periodic Array



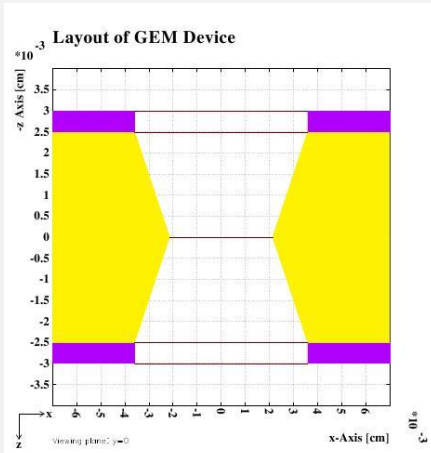
LU-1x5



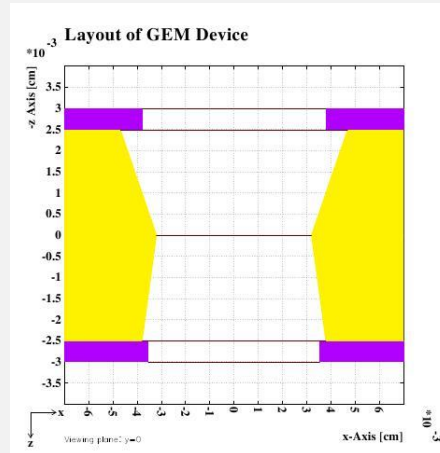
SVD-1x5

Transverse potential 10 micron above the upper surface

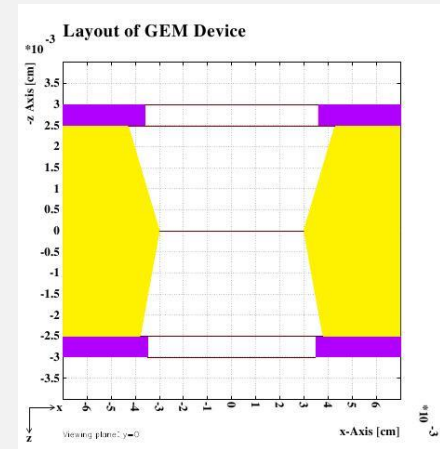
Characterization Study of GEM (to be extended to Triple-GEM) (Preliminary) Study on flourine etching in single-GEM



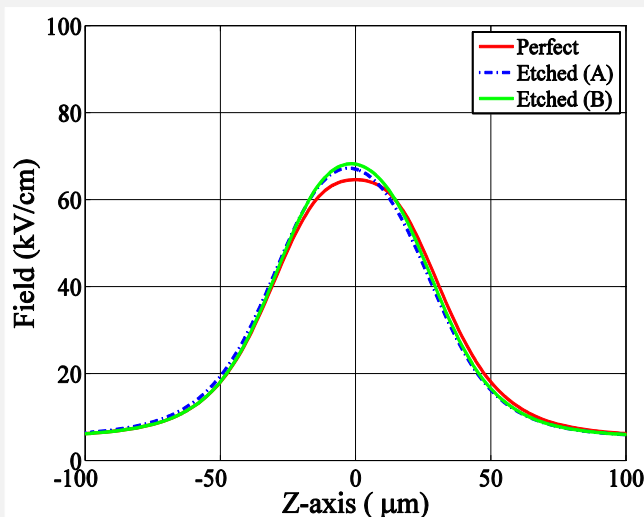
Perfect GEM



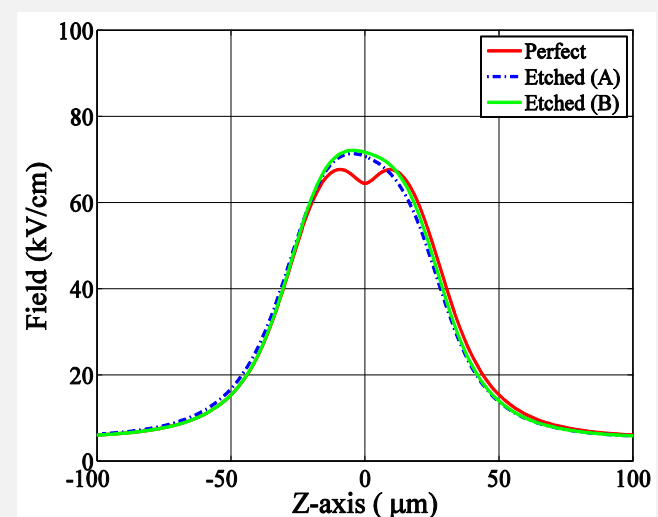
Etched GEM (Model A)



Etched GEM (Model B)

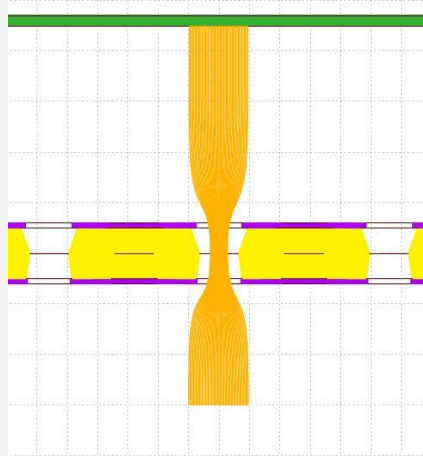
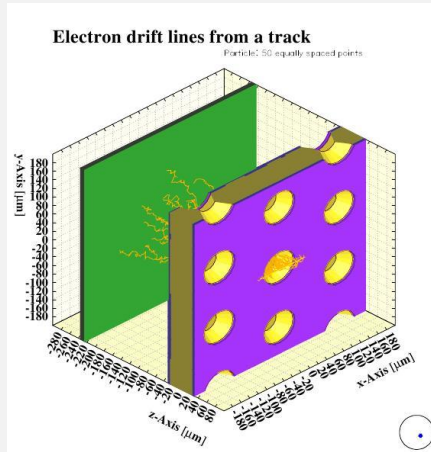


Axial Field

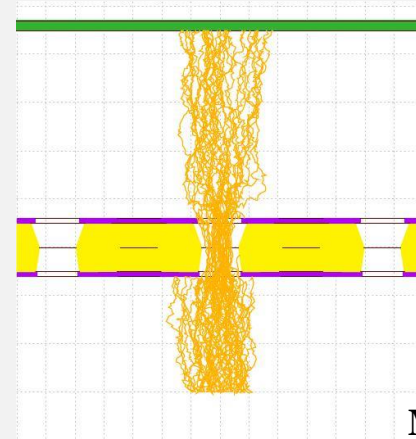


Off-Axial Field

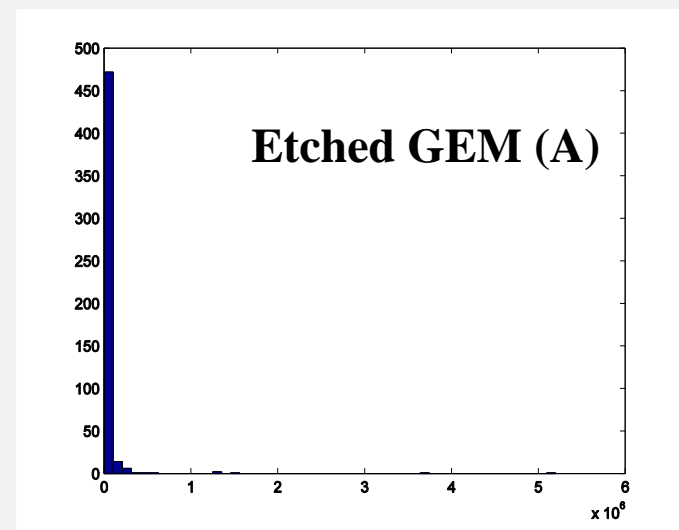
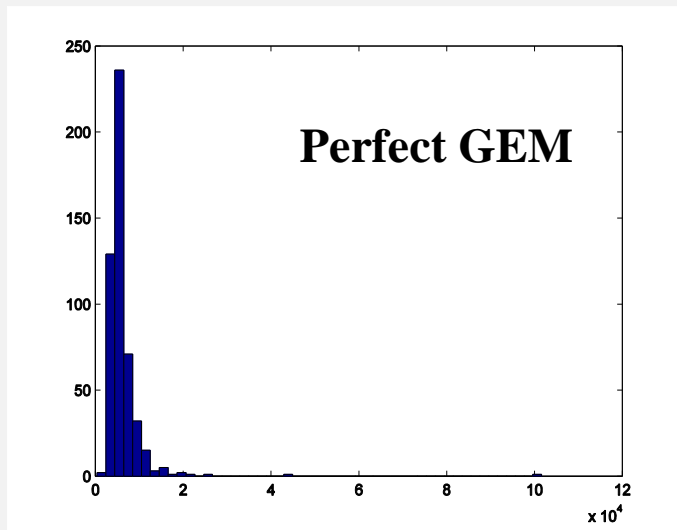
Characterization Study of GEM (to be extended to Triple-GEM) (Preliminary)



RKF



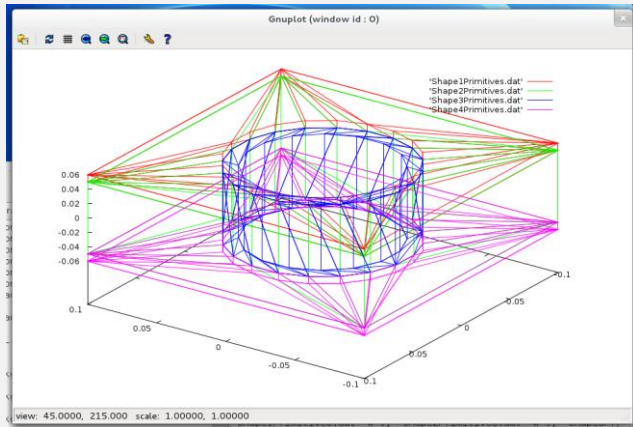
Monte-Carlo



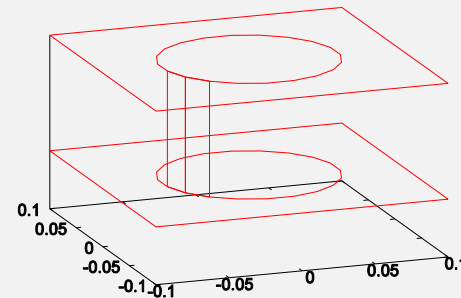
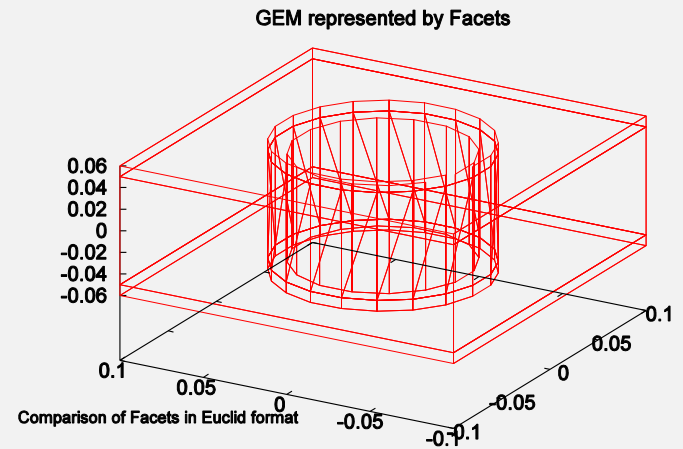
Gain distribution using MC method

Upgrade of neBEM

Development of solid modeler using BRL-CAD is underway.



X3D representation of a GEM



EUCLID representation of a GEM

EUCLID format in BRL-CAD will be opted for solid representation.

Future Plans

- **Continuation of detailed characterization of Bulk Micromegas with different amplification gap using experimental and numerical investigations.**
- **Setup of well planned IBF test at Kolkata and its measurement in Micromegas.**
- **Initiation of experimental characterization of GEM and its extension to Triple-GEM.**
- **Continuation of numerical simulation of GEM and Triple-GEM in future to compare with experiments.**
- **Continuation of numerical simulation to study the effects of defects, artifacts and other components (spacer, frame) in Micromegas and GEM.**
- **Initiation of simulation on space charge and charging up effects.**
- **Development of solid modeler and interface of neBEM with GARFIELD++.**

Acknowledgement:

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RD51 Collaborators
Scientific Assistants at SINP
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