

WG8 | Training & Dissemination

RD51 Micro Pattern Gaseous Detectors School

Topical workshops & job opportunities

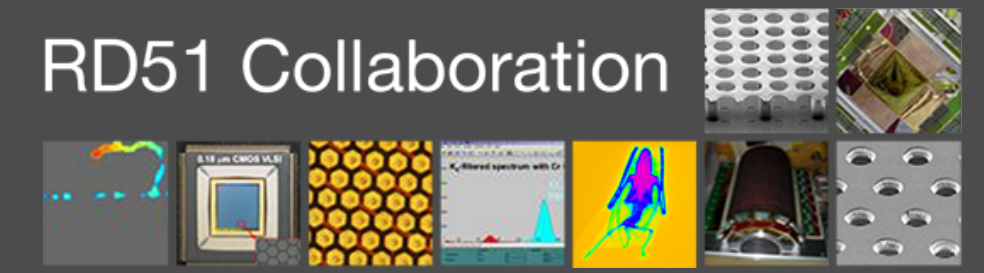
DRD1 WG8

- Several WG8 discussion meetings focused on school organisation
- Next meeting on March 9
- Survey on lab exercises

To follow WG 8 activities incl. detector school organisation

Self-subscribe to WG8 mailing list:

<https://e-groups.cern.ch/e-groups/EgroupsSubscription.do?egroupName=rd51-wg8>

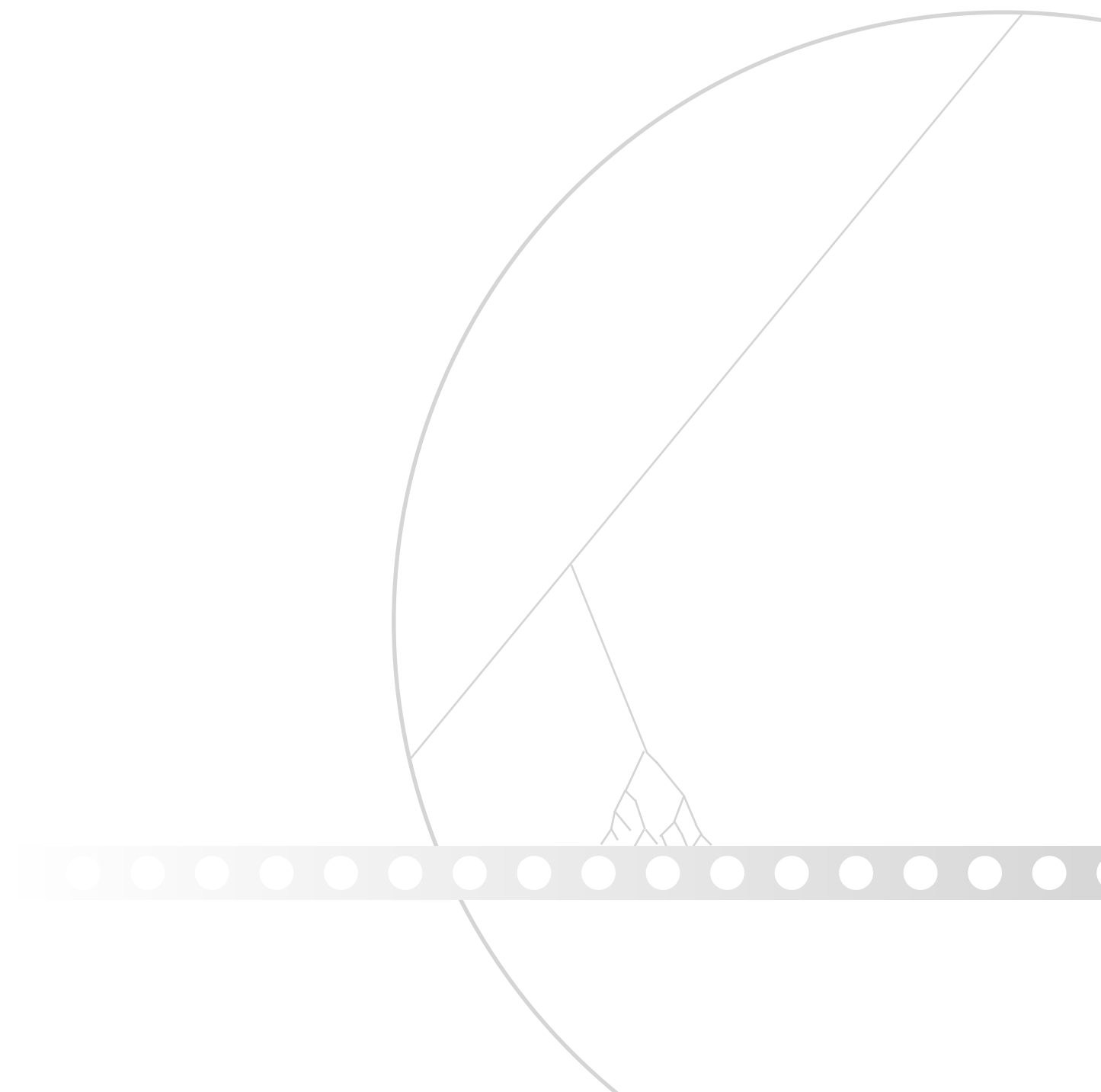


RD51 Detector School

Regular school on Micro Pattern Gaseous Detectors
with lectures and hands-on lab activities

<https://indico.cern.ch/event/1239595/>

February 28, 2023



Overview

Regular school focused on MPGDs and techniques of MPGD development

Goals:

- **Sharing knowledge** and expertise about MPGDs
- Establishing **good practices** and approaches for common tasks and measurements in studying and developing detectors
- Connections to applications

Format:

- **One week** school with lectures and practical laboratory sessions - 50/50%
- Core program on MPGD physics and development + special focus depending on research program of hosting institute

Topics

- **Gas detectors physics**
 - Primary ionisation
 - Charge transport
 - Avalanche multiplication
 - Gas properties
- **MPGD technologies**
 - Detector geometries
 - Resistive elements
 - Stability and ageing
- **Readout technologies**
 - Electronic readout
 - Optical & hybrid readout
- **Simulation and modelling**
- **Manufacturing techniques**
- **Applications**
 - High Energy Physics
 - Applications beyond HEP
 - Beyond fundamental research

Organisation

Time: November 27 - December 1, 2023

Location: CERN (RD51 GDD lab + MPT workshop + lecture rooms)

Start of applications: now (RD51 Mini Week Feb 2023)

Application deadline: June 30, 2023

Application requirements:

- Recommendation letter
- Motivation to attend school
- Laboratory experience (incl. instrumentation)

Accommodation:

- Block booking for students in CERN hostel,
- block booking for lecturers/tutors in CERN hostel

CERN access: CONF - visitor badges as part of event attendance

Indico event: <https://indico.cern.ch/event/1239595/>

School schedule (preliminary)

	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 - 10:00	Introduction: Gas detectors	Gas detector physics 2	Manufacturing techniques	Electronic readout techniques	MPGDs in HEP applications
10:00 - 11:00	Gas detector physics 1	MPGD technologies 2: resistive electrodes, spark protection	Visit 1	Optical and hybrid readout techniques	Applications beyond HEP: nuclear physics, dark matter searches, neutrino physics
11:00 - 11:30	Break	Break	Break	Break	Break
11:30 - 12:30	MPGD technologies 1	Modelling and simulation	Visit 2	Visit 3	Applications beyond fundamental research
12:30 - 14:00	Lunch break	Lunch break	Lunch break	Lunch break	Lunch break
14:00 - 18:00	Lab session	Lab session	Lab session	Lab session	Lab session
		Student poster session			

Speakers

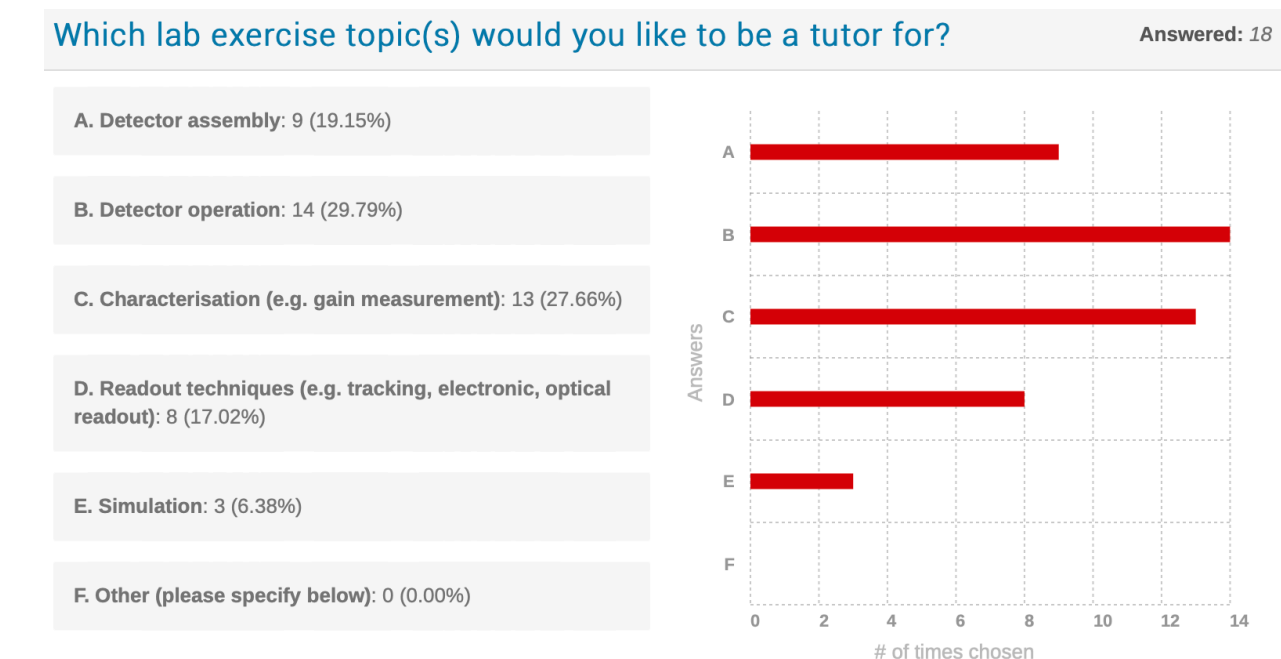
- Fabio Sauli (CERN)
- Piotr Gasik (GSI)
- Rui De Oliveira (CERN)
- Rob Veenhof (CERN)
- Davide Pinci (INFN Roma I)
- Paolo Iengo (CERN)
- Marco Cortesi (MSU)
- Jona Bortfeldt (LMU)
- ... others to follow shortly

Tutors

>15 interested to tutor lab exercise

Effort started to prepare lab exercises and define activities

Some speakers also available as tutors



Lab exercises

Small groups: 3-4 students each

Split in 6 groups, each group will perform 5 different lab exercises

≈ 12 tutors to follow groups during exercises

Preparation of **lab book** describing lab exercises

+ using Fabio Sauli's **Gaseous Detector Handbook** as reference (<http://fabio.home.cern.ch/fabio/publications.res/HANDBOOK.pdf>)

Lab schedule (preliminary)

Lab 1	Lab 2	Lab 3	Lab 4	Lab 5
Detector assembly	Detector instrumentation and operation	Detector characterisation	Readout techniques	Simulations
Survey of different MPGD technologies with microscope, electrical testing of amplification structures, assembly of detector stack	Familiarity with typical lab instrumentation, gas systems, HV supplies, readout chains, signal shapes with different preamps, basic gain measurement	In-depth detector characterisation, voltage scans of drift/transfer/amplification fields, effect of change of operating conditions	Electronic or optical readout techniques, can be tracking, imaging, incl. some limited reconstruction	Introduction to Garfield based simulation, basic modelling, electric field map, tracking, possible link to detector characterisation lab

	Monday	Tuesday	Wednesday	Thursday	Friday
Group 1	Lab 1	Lab 2	Lab 3	Lab 5	Lab 4
Group 2	Lab 1	Lab 2	Lab 3	Lab 5	Lab 4
Group 3	Lab 1	Lab 2	Lab 4	Lab 3	Lab 5
Group 4	Lab 2	Lab 1	Lab 4	Lab 3	Lab 5
Group 5	Lab 2	Lab 1	Lab 5	Lab 4	Lab 3
Group 6	Lab 2	Lab 1	Lab 5	Lab 4	Lab 3

RD51 Micro Pattern Gaseous Detectors School

Applications are open
(Deadline: June 30)

<https://indico.cern.ch/event/1239595/>

Interested to participate in organisation, tutoring, ...? Let us know!

WG8 mailing list

<https://e-groups.cern.ch/e-groups/EgroupsSubscription.do?egroupName=rd51-wg8>

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WG8 | Topical Workshops

- Next RD51 Collaboration Meeting in June
- Possibility to organise topical workshop in this context
- Interest from groups involved in Common Projects?

Job opportunities

- Circulating job opportunities via mailing list
- Listings on webpage: <https://rd51-public.web.cern.ch/jobs>
- Forward to Florian, Mauro, Eraldo if you want to post

The screenshot shows the RD51 Collaboration website's 'Job Opportunities' page. The navigation bar includes 'HOME', 'ORGANISATION', 'ACTIVITIES', 'MEETINGS', 'DOCUMENTS', and 'OTHER LINKS'. A sidebar on the left lists 'Instrumentation conferences (MPGD-related)', 'Safety', 'RD51 Pictures', and 'Job Opportunities'. The main content area features the title 'Job Opportunities', a note that open positions are listed below, and a contact email: florian.brunbauer@cern.ch. Below this is a table of job openings.

Job description	Institution	Date posted	Link	Contact
PhD position in experimental neutrino physics	IFIC, IGFAE	Feb 2023	Description	Diego Gonzalez Diaz
Temporary contract on optical readout MM development for BABYIAXO	DRF/IRFU	Jan 2023	Description	Esther Ferrer-Ribas
Temporary contract on optical readout MM for beta imaging and neutron radiography	DRF/IFU - DRT/LIST	Jan 2023		Esther Ferrer-Ribas
Research Scientist	Occidental College, US	November 2022	Description	Daniel Snowden-Ifft
PhD Fellowship in Physics	University of Mainz, DE	December 2022	Description	Kira Karabut
La Caixa INPhINIT PhD Fellowships 2023	University of Madrid, ES	December 2022	Description	Elias Lopez
Post-doctoral position on uRWELL-PICOSEC	JLab, US	November 2022		Kondo Gnarvo

WG8 in DRD1

Common challenges

- Training
 - Training and exchange of experience on topics of common interest (gases and materials, simulation techniques, electronics, ...)
- Career development
 - Common challenges of attracting and retaining young researchers as well as recognition of experimental work
 - Common interest in strategies to recognise and support young researcher careers
- Outreach - demonstrations

Exchange of experience

- School and training events open to all can serve to share knowledge
- Interest of training events also for senior researches to be exposed to other gaseous detector technologies
- Training events for technicians (motivating detector designs and sharing technical experience - materials, mechanics, support structures, ...)
- Link to WG7 - Common facilities are great opportunity for training and exchange

Other (new) ideas and initiatives

- Awards recognising (young) researchers
- Technical training events
- Database of expert contacts available to discuss and share experience on specific topics

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Backup

Survey results

18 responses to survey

Most are interested / available as tutor

Many available to tutor assembly / operation / characterisation exercises

Many ideas / comments for lab sessions on detector characterisation

Some suggestions for readout lab exercise

Which lab exercise topic(s) would you like to be a tutor for?

Answered: 18

A. Detector assembly: 9 (19.15%)

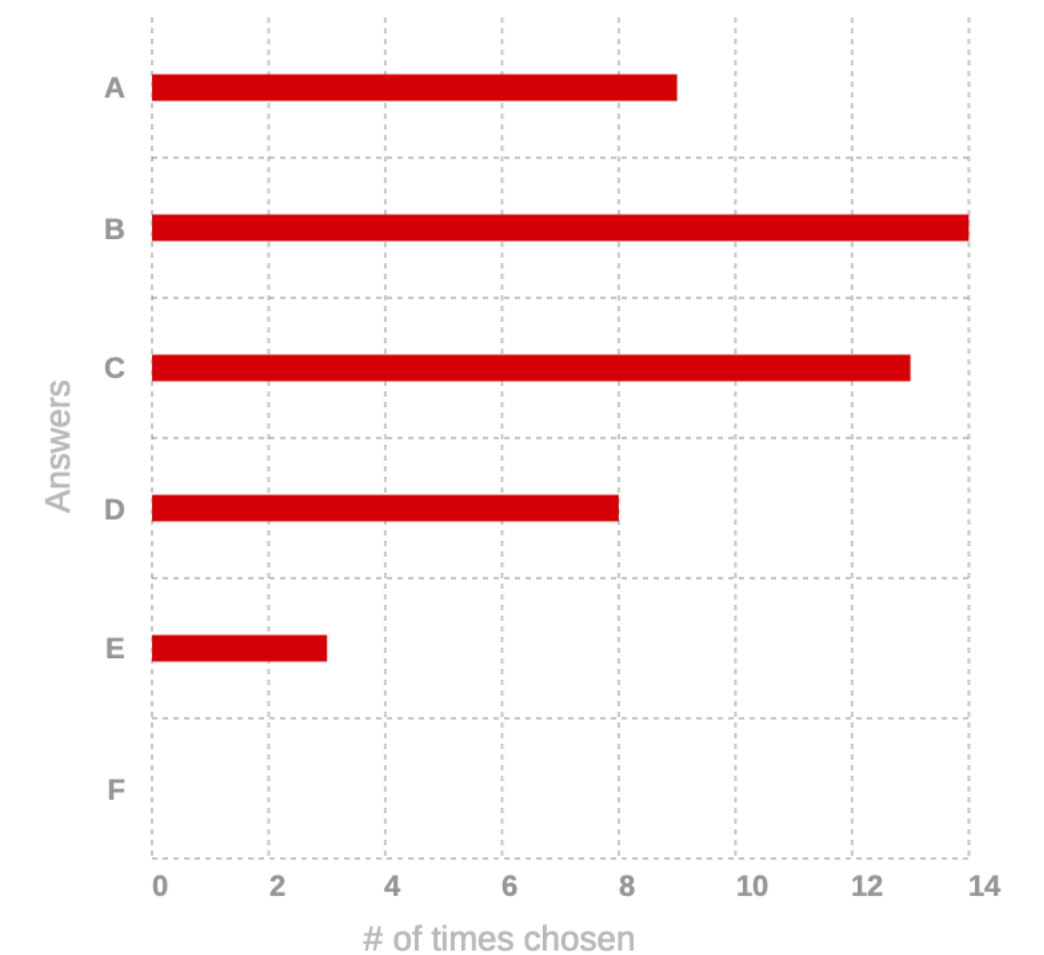
B. Detector operation: 14 (29.79%)

C. Characterisation (e.g. gain measurement): 13 (27.66%)

D. Readout techniques (e.g. tracking, electronic, optical readout): 8 (17.02%)

E. Simulation: 3 (6.38%)

F. Other (please specify below): 0 (0.00%)



Survey results - organisation

Comments on group size:

- Better to have 3, 4 might be too much

Do you consider a group size of 3-4 students reasonable for lab exercises?

Answered:
18

A. Yes: 17 (94.44%)

B. No: 1 (5.56%)



Comments on presentation/report:

- Presenting slides 1-2 weeks later in Zoom session / otherwise too packed program - risk of low-quality presentations
- No time for any report or slides during school
- Homework of one exercise of choice to improve on what was done in lab + presentation
- Presentations is better - more interactive - questions / discussions
- Report: should be a group report and get feedback
- Presentation can be interesting recap for everyone including feedback and highlighting topics less understood

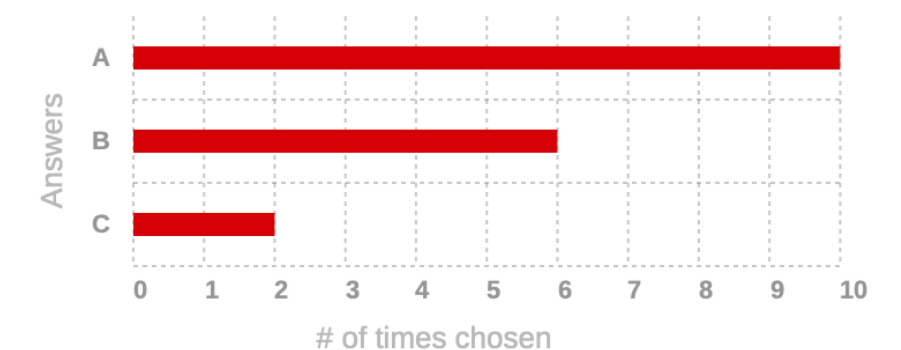
Do you think students should prepare presentation or report on lab exercises after the school?

Answered:
: 18

A. Yes, present slides: 10 (55.56%)

B. Yes, prepare report: 6 (33.33%)

C. No, neither slides nor report: 2 (11.11%)



Survey results

Ideas for lab exercises

Assembly

- GEM prototype assembly & operation, tips and tricks for a successful assembly and operation
- Tour to the CMS-GEM production site, participation in assembly, participation in the QA/QC of the assembled detector (e.g. gas leak measurement, HV test, gas gain measurement, etc.)
- Cleaning a GEM with high current flow
- Searching gas loss with a bubble spray
- Good experience with lab sessions during EDIT school with focus on detector operation and characterisation

Operation

- Noise measurement with different grounding and shielding scheme

Characterisation

- GEM prototype characterisation
- Measurement of gas gain with different gas mixtures and comparison with simulations
- Gas gain as function of T and P - compare with simulations - Change the pressure of the gas with a bubbler
- Ion backflow measurement
- Energy spectra measurement and energy calibration
- Estimate of the number of primary electrons and comparison with simulations
- Calibration of the readout electronics with pulse generator and capacitor injector scheme
- Ion Back Flow measurements in different detectors (e.g. GEM vs MM)

Survey results

Ideas for lab exercises

Operation / readout schemes:

- mini-TPC: observe primary (S1) and secondary scintillation (S2) with PMT, S1-S2 drift velocity, S2 the shape the energy loss profile
- Readout: gain uniformity measurement: cosmic setup with detector and scintillators running during school to acquire data
- Imaging reconstruction in detectors - Fourier analysis to remove artefacts such as GEM holes, pillars of the MM, ...
- Reconstruction details could be also discussed in lecture

Simulation

- Simulation with link to other lab activity, e.g. gain scan / field variation / gas mixture or pressure variation
- Simulation of an optical TPC in GEANT4 and Garfield++