WG8

Training and Dissemination

Florian Brunbauer (CERN)
Mauro Iodice (INFN Roma 3)
on behalf of WG8

RD51 Collaboration Meeting, December 8, 2023

Working Group 8 - Training and Dissemination

Discussions started ≈1.5 years ago during RD51 Future Day

First activity to organise school with lectures + lab exercises

-> forming of WG8: Training and Dissemination

During 2023:

13 meetings of WG8

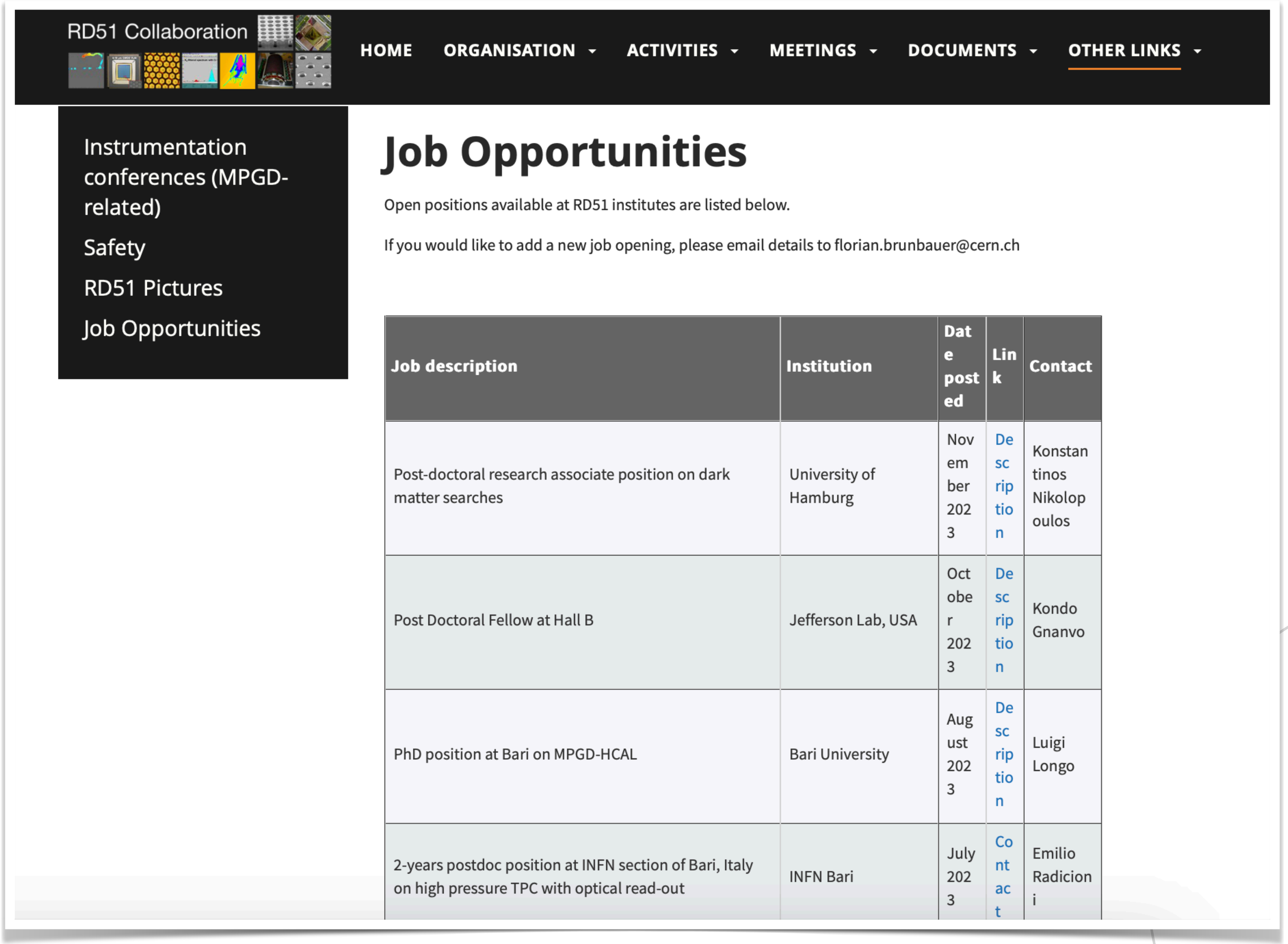
+ numerous smaller meetings dedicated to lab exercise preparations

WG8 mailing list with >50 members

Job opportunities

Posting job opportunities on RD51 website and via mailing list

Please send us any openings you would like to advertise



RD51 Collaboration

HOME ORGANISATION ACTIVITIES MEETINGS DOCUMENTS OTHER LINKS

Instrumentation conferences (MPGD-related)
Safety
RD51 Pictures
Job Opportunities

Job Opportunities

Open positions available at RD51 institutes are listed below.

If you would like to add a new job opening, please email details to florian.brunbauer@cern.ch

Job description	Institution	Date posted	Link	Contact
Post-doctoral research associate position on dark matter searches	University of Hamburg	November 2023	Description	Konstantinos Nikolopoulos
Post Doctoral Fellow at Hall B	Jefferson Lab, USA	October 2023	Description	Kondo Gnanvo
PhD position at Bari on MPGD-HCAL	Bari University	August 2023	Description	Luigi Longo
2-years postdoc position at INFN section of Bari, Italy on high pressure TPC with optical read-out	INFN Bari	July 2023	Contact	Emilio Radicioni

School planning - survey

18 responses to survey

Most are interested / available as tutor

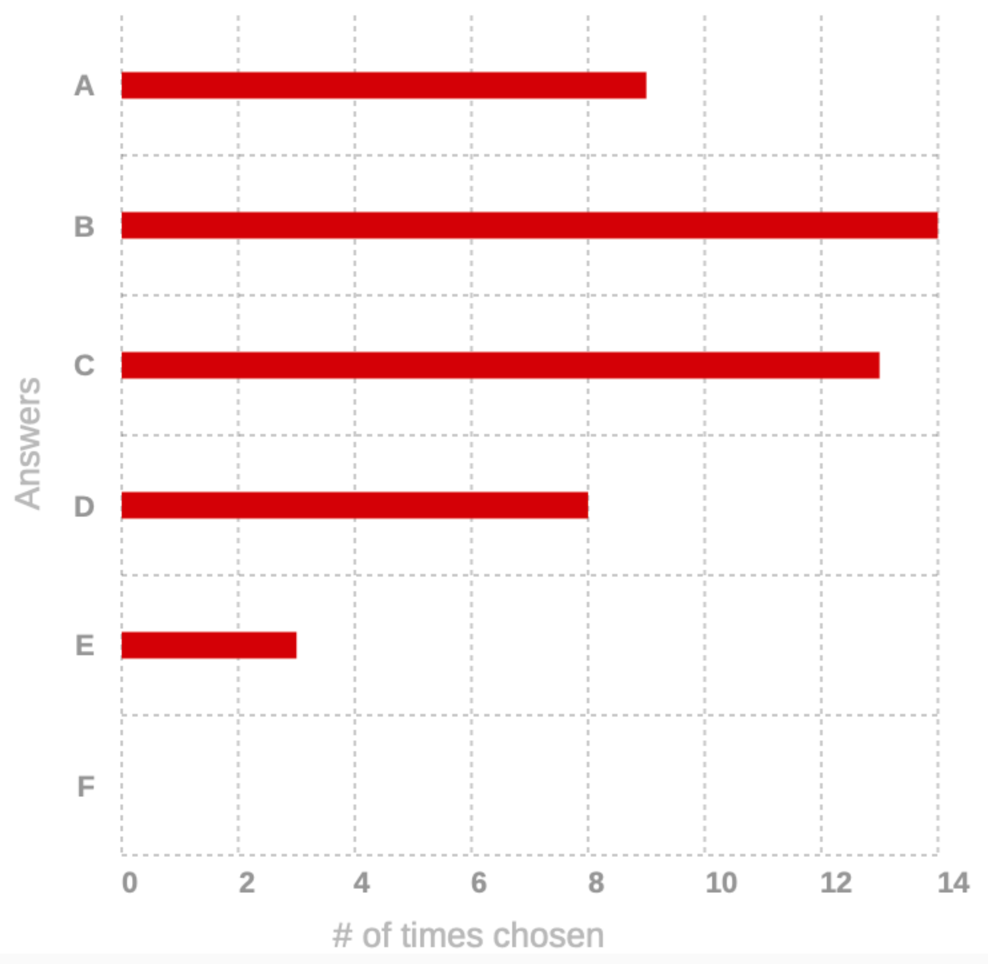
Many available to tutor assembly / operation / characterisation exercises

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%)



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%)

Overview

Regular school focused on MPGDs and techniques of MPGD development

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

Lecture topics

- **Gas detectors physics**
  - Historical introduction: MWPC to MPGD
  - Energy Loss: Coulomb Interactions
  - Drift and Diffusion of Charges
  - Avalanche multiplication
  - Gas properties

- **MPGD technologies**
  - Detector geometries
  - Resistive elements
  - Beyond working point physics
  - Discharges and mitigation in gaseous detectors
  - State-of-the-art MPGDs (high rate, precise timing, resistive elements)

- **Readout technologies**
  - Electronic readout
  - RD51 SRS readout demonstration
  - Optical & hybrid readout

- **Simulation and modelling**
  - Signal formation
  - Modelling approaches
  - Simulation frameworks & tools

- **Manufacturing techniques**
  - Photolithography / etching / drilling
  - Advanced pattern techniques and additive manufacturing

- **Applications**
  - High Energy Physics
  - Applications beyond HEP
  - Beyond fundamental research

Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 - 9:00	Registration				
9:00 - 10:00	Introduction: Gas detectors (F. Sauli)	Gas detector physics 2: beyond working point physics (P. Gasik)	Modelling and Simulation 1 (R. Veenhof)	Electronic readout techniques (M. Lupberger)	MPGDs in HEP applications (P. Iengo)
10:00 - 11:00	Gas detector physics 1 (F. Sauli)	MPGD technologies 2: State-of-the-art MPGDs (E. Oliveri)	Modelling and Simulation 2 (P. Verwilligen)	RD51 SRS readout demonstration (M. Lupberger)	Applications beyond HEP: nuclear physics, dark matter searches, neutrino physics (M. Cortesi)
11:00 - 11:30	Break	Break	ATLAS visits	Break	Break
11:30 - 12:30	MPGD technologies 1 (E. Ferrer Ribas)	Manufacturing techniques (R. De Oliveira)		Optical & hybrid readout techniques (D. Pinci)	Applications beyond fundamental research (J. Bortfeldt)
12:30 - 13:00	MPT visit	Group photo + MPT visit	MPT visit	MPT visit	MPT visit
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
18:00 - 21:00		Student poster session			

Tutors & Lecturers

Huge amount of work in preparing lab exercises, lab book, lectures and visits!

Tutors

Piotr Gasik
Maria Teresa Camerlingo
Givi Sekhniaidze
Luca Moleri
Marco Sessa
Paolo Iengo
Davide Fiorina
Riccardo Farinelli
Gianni Bencivenni
Marco Cortesi
Sara Leardini
Marta Lisowska
Giorgio Orlandini
Piet Verwilligen

and many others during lab book preparation and planning…

Lecturers

Fabio Sauli
Esther Ferrer Ribas
Piotr Gasik
Eraldo Oliveri
Rui De Oliveira
Rob Veenhof
Piet Verwilligen
Michael Lupberger
Davide Pinci
Paolo Iengo
Marco Cortesi
Jona Bortfeldt

Visits, demonstration, organisation

Michael Lupberger
Lucian Scharenberg
Rui De Oliveira
Betrand Mehl
Givi Sekhniaidze
George Iakovidis
Aimilianos Koulouris
Veronique Wedlake

Thank you!

Applications

Opened applications in February with deadline end of July

>60 applications for 24 places, applications reviewed selection done by selection committee

In addition to school applications, registration for lecture program (in-person & remote)
>120 registrations for lecture program

Lecture program

14 lectures of 1h each

Time for discussions and questions
Questions during first day leading also to follow-up discussion of GEM hole geometry by Fabio.

≈40-50 people in Salle Dirac
+ ≈40 people connected via Zoom

All lectures recorded and available on Indico agenda

Registration to event necessary for download

Visit program

Visits to ATLAS cavern and MicroPattern Technologies workshop are organised

ATLAS cavern
organised in 3 groups

MPT Workshop
small group every day

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Poster session

Students were invited to present their current or previous work during dedicated poster session after lab exercises on Tuesday evening.

Lively discussions and exchanges during poster session in Main Building Mezzanine.

Posters uploaded and accessible on Indico page:

https://indico.cern.ch/event/1239595/sessions/485794/#20231128

Lab schedule

Small groups: 4 students each

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

Lab 1 Detector assembly	Lab 2 Detector operation	Lab 3 Detector characterisation	Lab 4 Readout techniques	Lab 5 Detector 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, basic operation and readout	In-depth detector characterisation, voltage scans of drift/transfer/amplification fields, effect of change of operating conditions	Electronic and optical readout techniques, e.g. tracking, imaging, basic reconstruction	Introduction to Garfield++ based simulation, basic modelling, electric field map, microscopic tracking

	Monday	Tuesday	Wednesday	Thursday	Friday
Group 1	Lab 1 Location E	Lab 2 Location A	Lab 3 Location B	Lab 5 Location H	Lab 4 Location D
Group 2	Lab 1 Location F	Lab 2 Location B	Lab 3 Location A	Lab 5 Location H	Lab 4 Location C
Group 3	Lab 1 Location G	Lab 2 Location D	Lab 4 Location D	Lab 3 Location A	Lab 5 Location H
Group 4	Lab 2 Location A	Lab 1 Location E	Lab 4 Location C	Lab 3 Location B	Lab 5 Location H
Group 5	Lab 2 Location B	Lab 1 Location F	Lab 5 Location H	Lab 4 Location D	Lab 3 Location A
Group 6	Lab 2 Location D	Lab 1 Location G	Lab 5 Location H	Lab 4 Location C	Lab 3 Location B

Lab book

https://indico.cern.ch/event/1239595/attachments/2600086/4803190/LabBook-RD51MPGDSchool.pdf

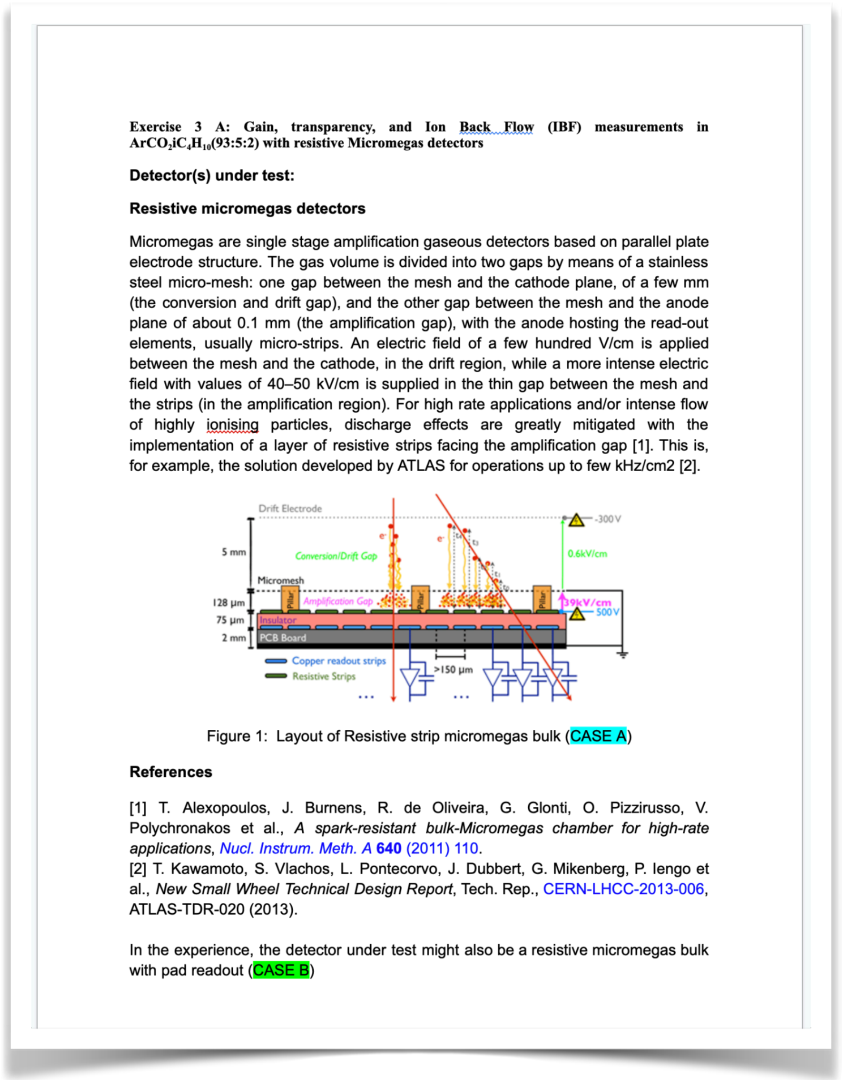
Detailed lab book prepared by tutors

For each lab:

- **Introduction** - background - link to lectures
- **Experiment setup** - detectors / instrumentation used
- **Work plan** - description of exercise including open questions
- Additional (optional) exercises

To prepare students ahead of exercise and aid discussions during lab session

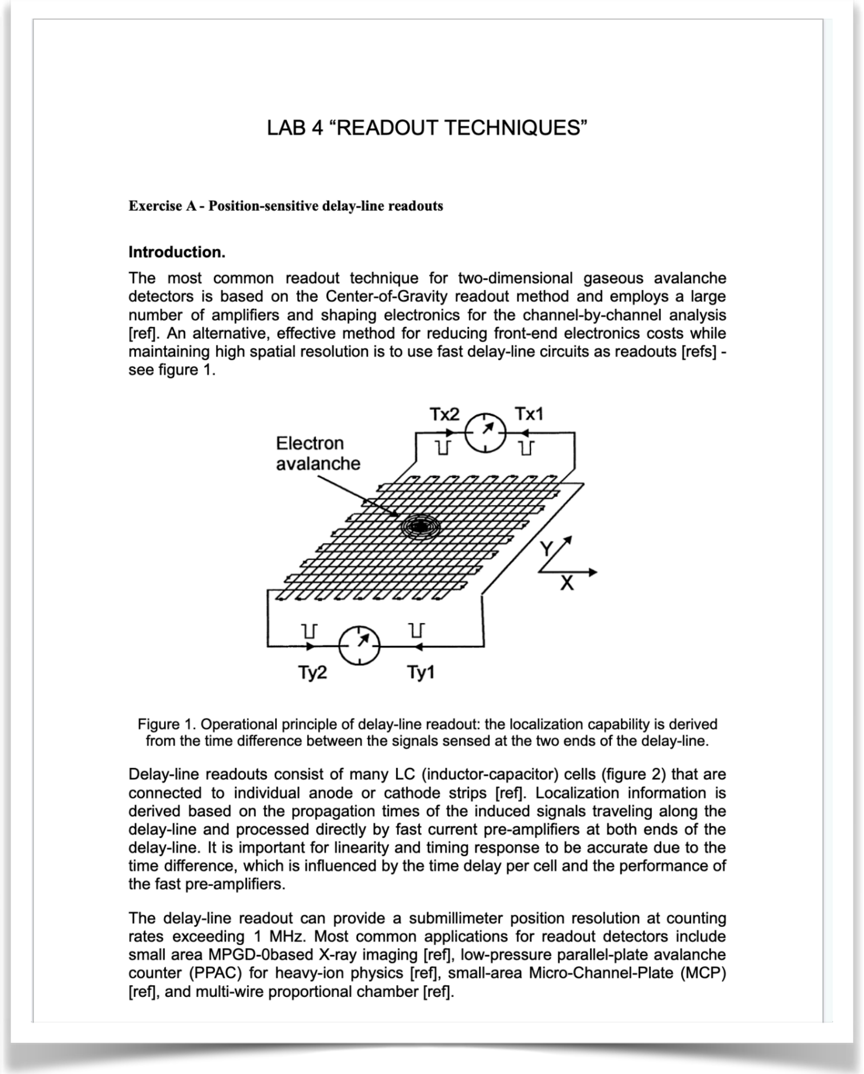
Lab exercises guided by tutors


Detector(s) under test:

Resistive micromegas detectors

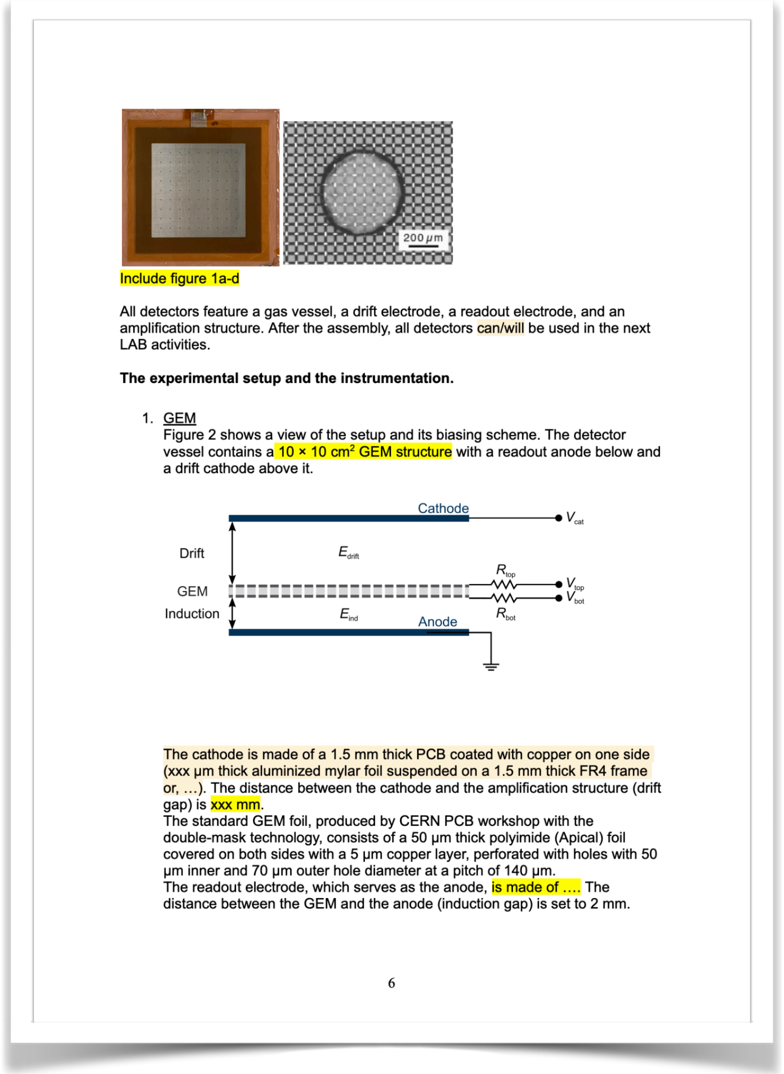
Figure 1: Layout of Resistive strip micromegas bulk (CASE A)

References


LAB 4 "READOUT TECHNIQUES"

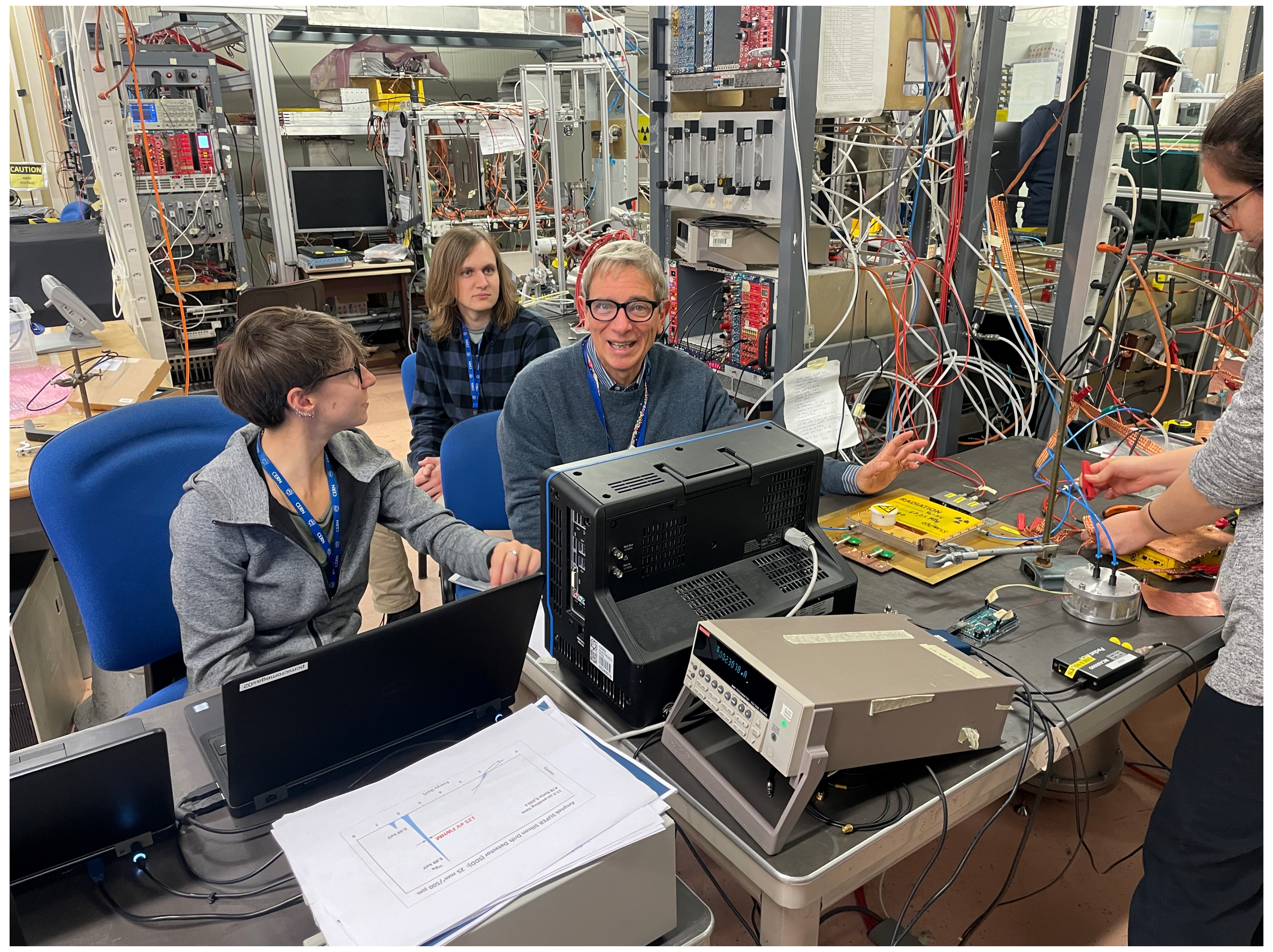
Exercise A - Position-sensitive delay-line readouts

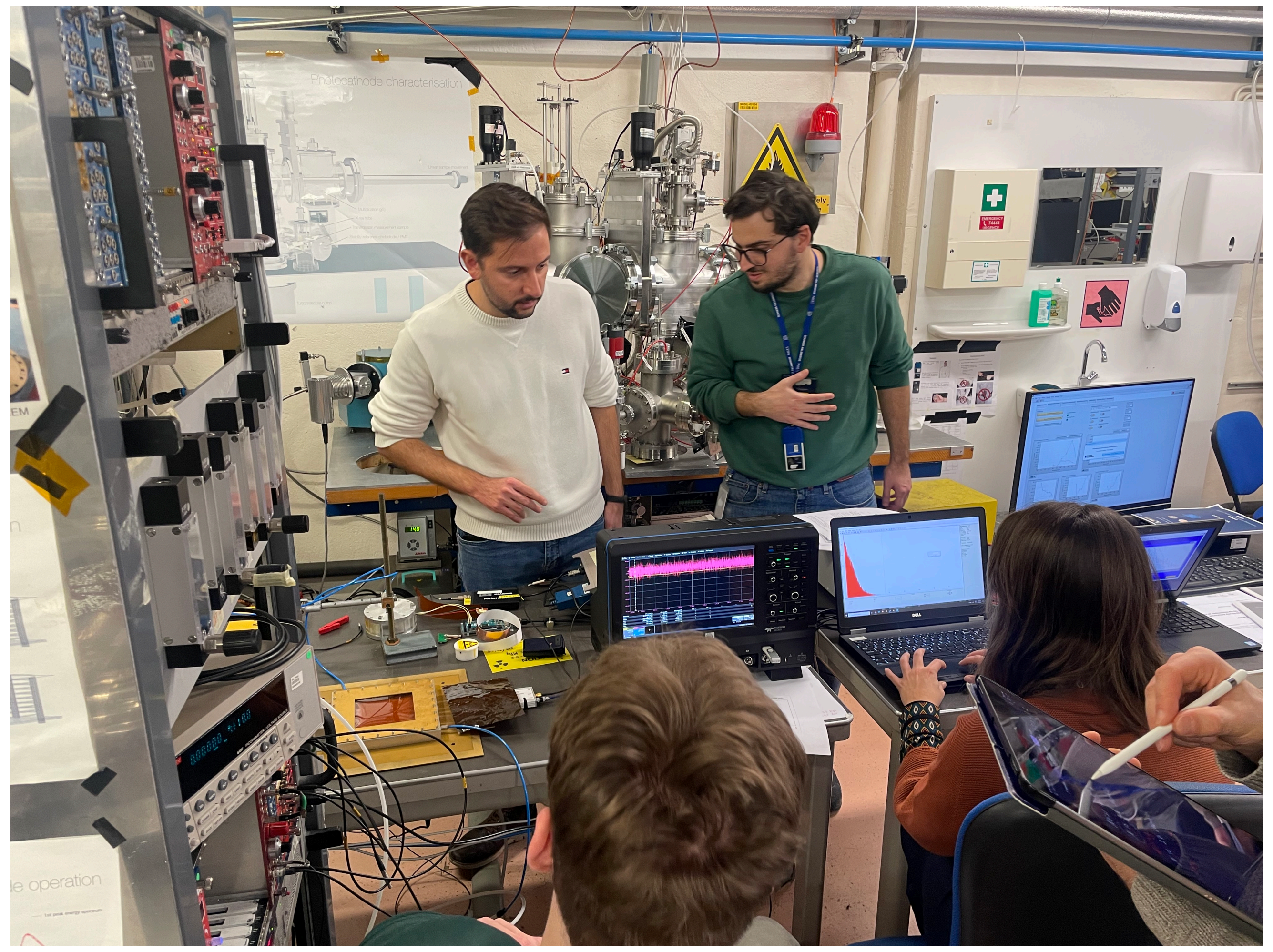
Introduction.

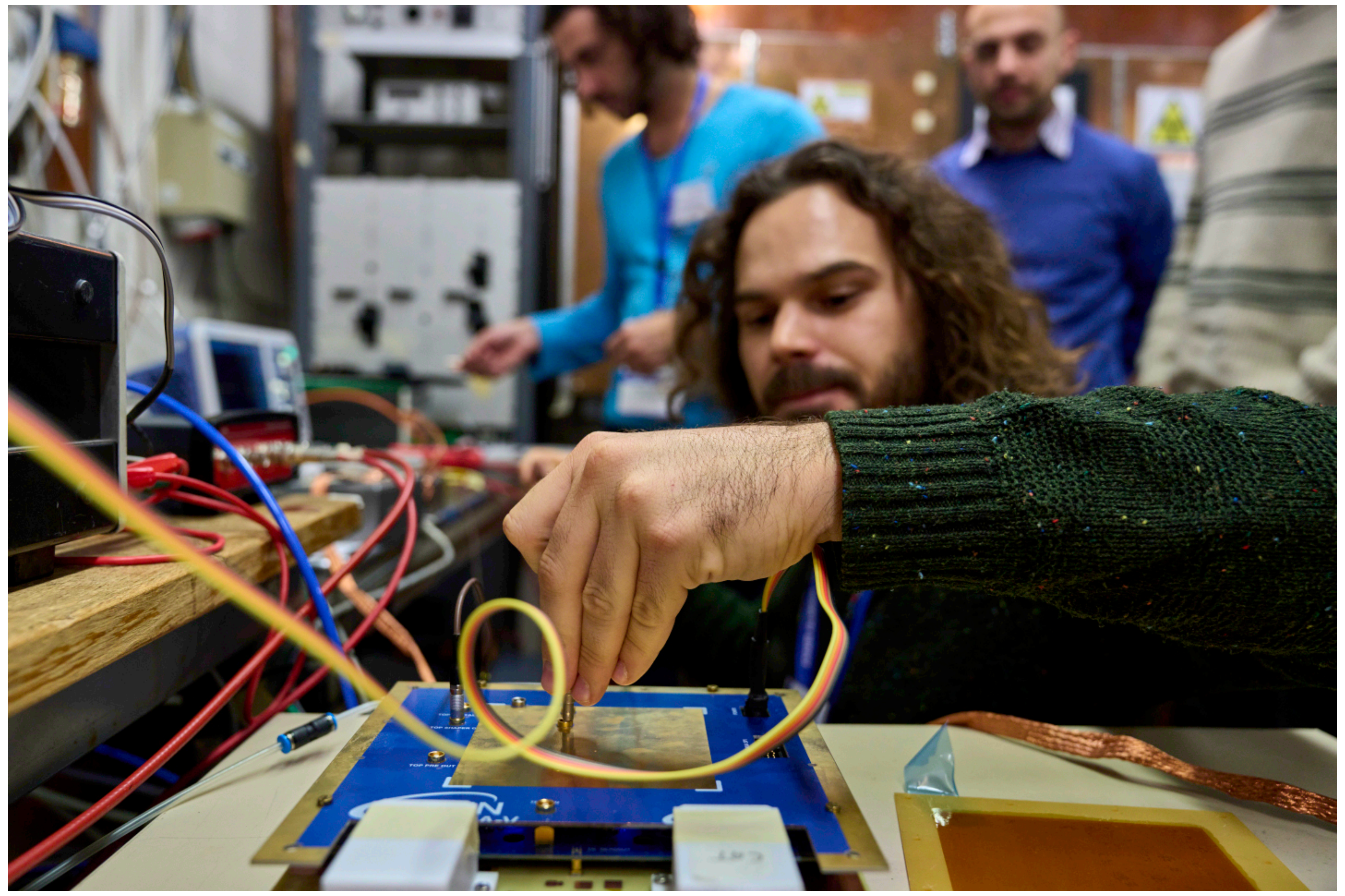
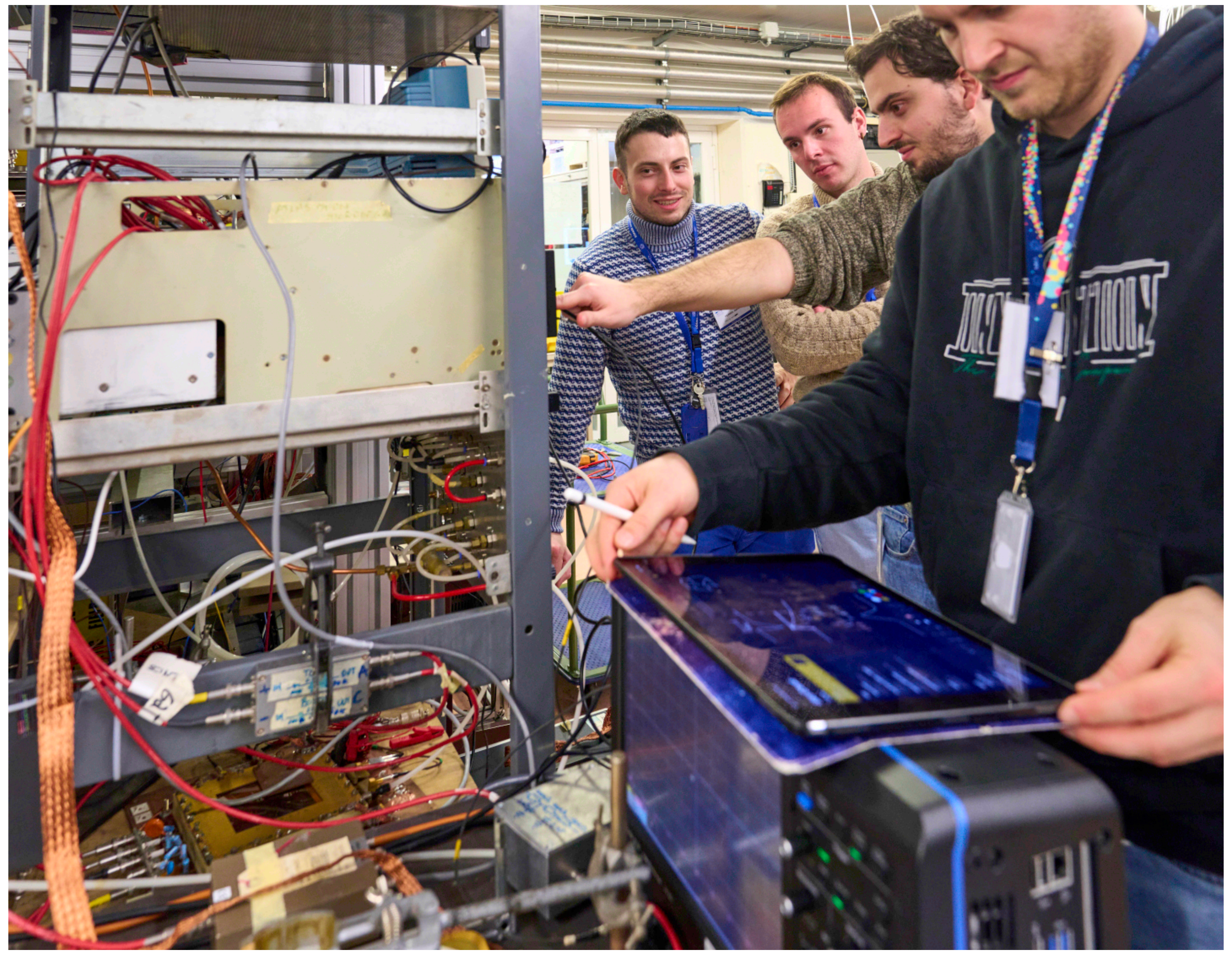

Include figure 1a-d

The experimental setup and the instrumentation.

Lab exercises







Student presentations

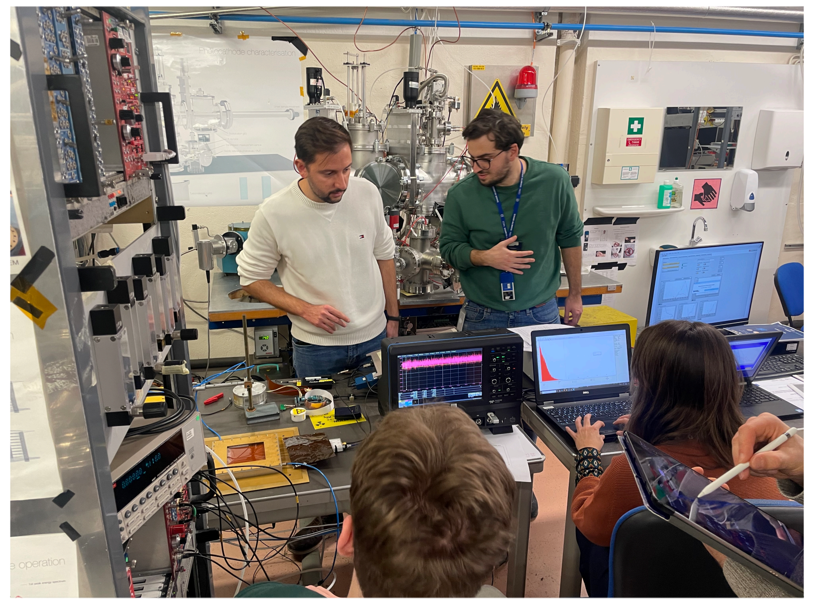
Students are invited to give 10min presentations during WG8 session of RD51 Collaboration Meeting (https://indico.cern.ch/event/1327482/) on Friday, Dec 8

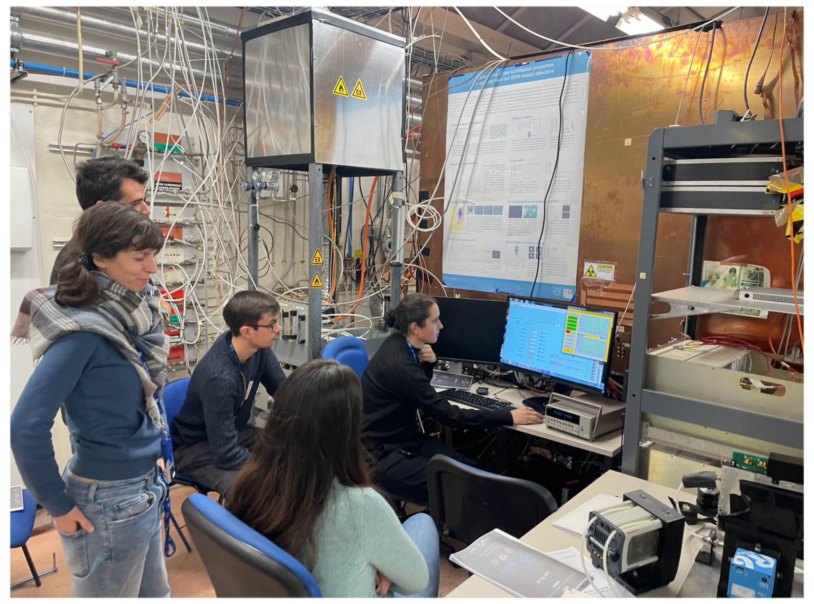
Presentation to explain the setup and experimental methods of one of the lab exercises
Can contain results obtained during the exercise as well as additional analysis performed.
Some open questions and further analysis are given in the lab book.

Each group can present one lab exercise during the meeting

Thank you

RD51 MPGD School





RD 51
Micro Pattern Gaseous
Detectors School

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WG8 mailing list
https://e-groups.cern.ch/e-groups/EgroupsSubscription.do?egroupName=rd51-wg8