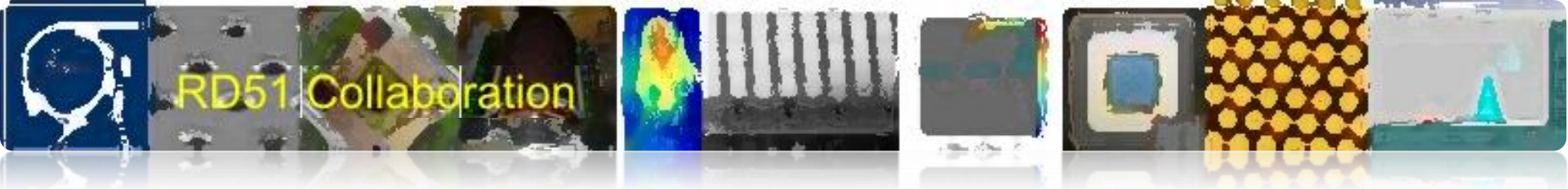


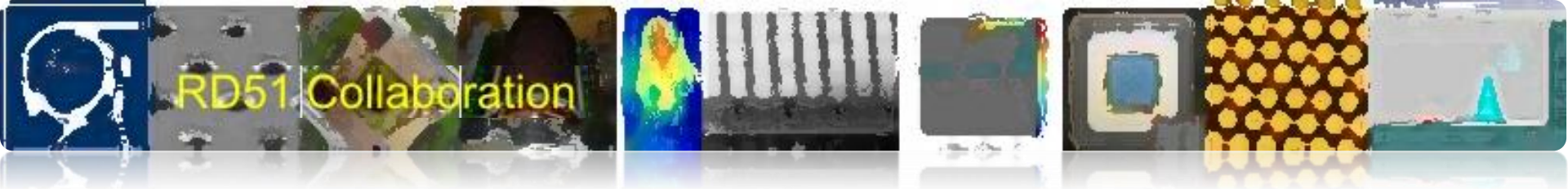
# RD51 test facilities

E. Oliveri (CERN) on behalf of RD51



# RD51 Common Facilities @ CERN - Outlines

- Common Laboratory
- Common Test Beam – Semi-Permanent Installation
- Access to CERN Facilities

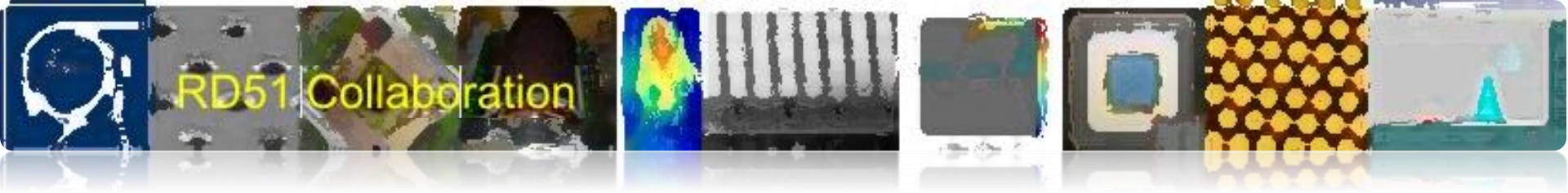


# Common Laboratory

A common place where projects based on different MPGD technologies can perform their activities in close contact.

Fully devoted to detector R&D and measurements, no production activities involved.

Main subject: Detector Physics

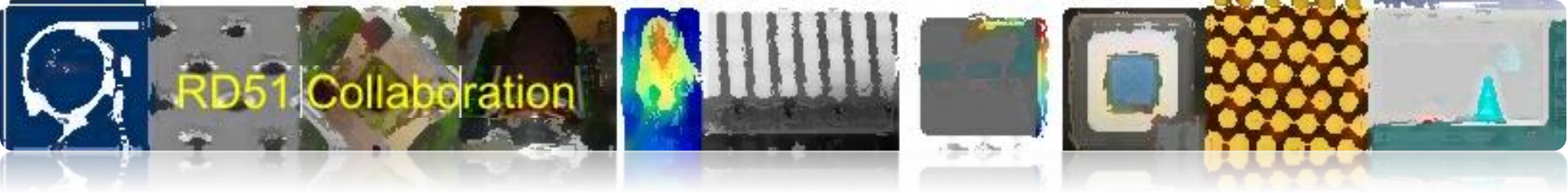


# How it is practically used...

Two main types of installation:

- Permanent (Long Term Projects)
- Temporary (on different time scale)

Rough averaged occupancy: about 5-10 persons everyday in the lab, one external group every one/two months.. Very rough, just to give some feeling



# Permanent Installations

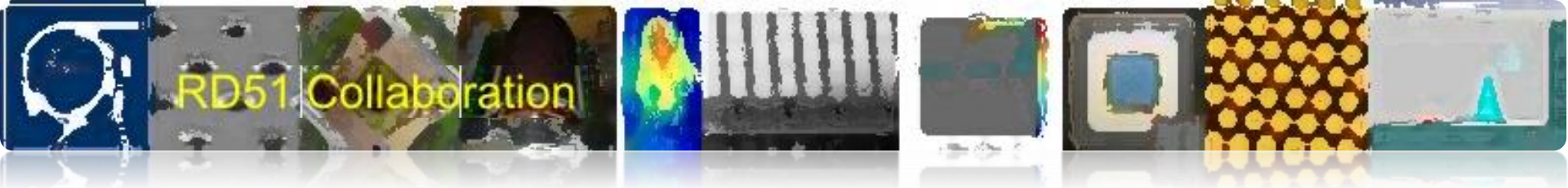
## Long Term Projects

- ALICE TPC (GEM)
- ATLAS NSW (mm)
- CMS high eta CMS (GEM) ... moved to their own lab few years ago
- ESS NMX Instrument (GEM)

Workspace, infrastructures and support if needed

Directly involved in the daily management of the laboratory.

Completely independent.



## Temporary Installations... different types

**Experienced** groups that have to perform specific measurements.

Support during the installation.

Normally **one week**, almost **independent** once familiar with the lab.

Groups (**with different level of MPGD expertise**) with a well defined ongoing project coming to the laboratory for detector optimization or troubleshooting.

Support on defining and performing measurements. Support on detector optimization.

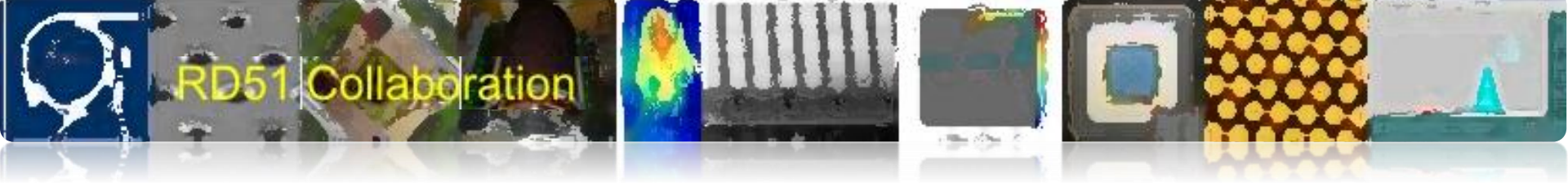
It can go up to **few months**, with a **support** that is normally **fading out with time**.

Groups that are **approaching** for the first time MPGD based detectors

Introduction and training, det. assembly/operation/characterization, support on det. design, on setting up measurements and laboratory.

Normally **few weeks**, with the obvious need of **constant support**, that normally evolves into **remote** support.

Important requirement for the lab: flexible and dynamic...

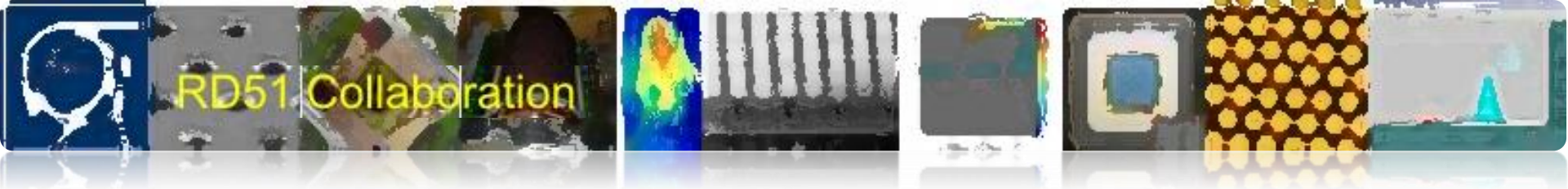


## Common Developments (where the laboratory framework is directly involved)

- Internal development - Coming from members of the collaboration
  - Electronics: See H. Muller talk and Working Group 5 related activities
  - Software: DAQ, DCS, Instrumentation control and readout,...
- External Development - Interaction with Companies:
  - MPGD producer
  - Electronics (CAEN, eicSys,..)

## Knowledge Dissemination

- Laboratory equipment copy/paste
- School & Visits



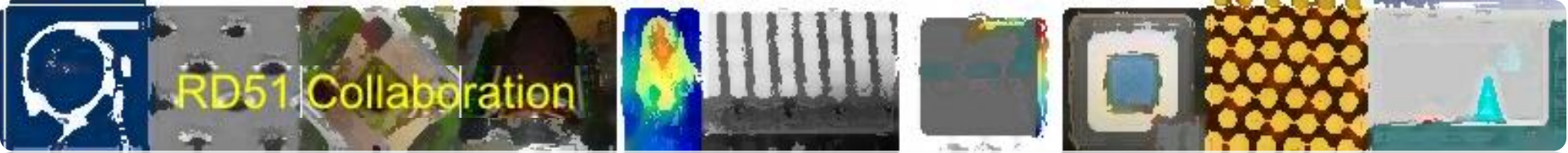
Hosted in the CERN EP-DT-DD Gas Detector Development (GDD) laboratory.

[Charpak → Sauli → Ropelewski Group]



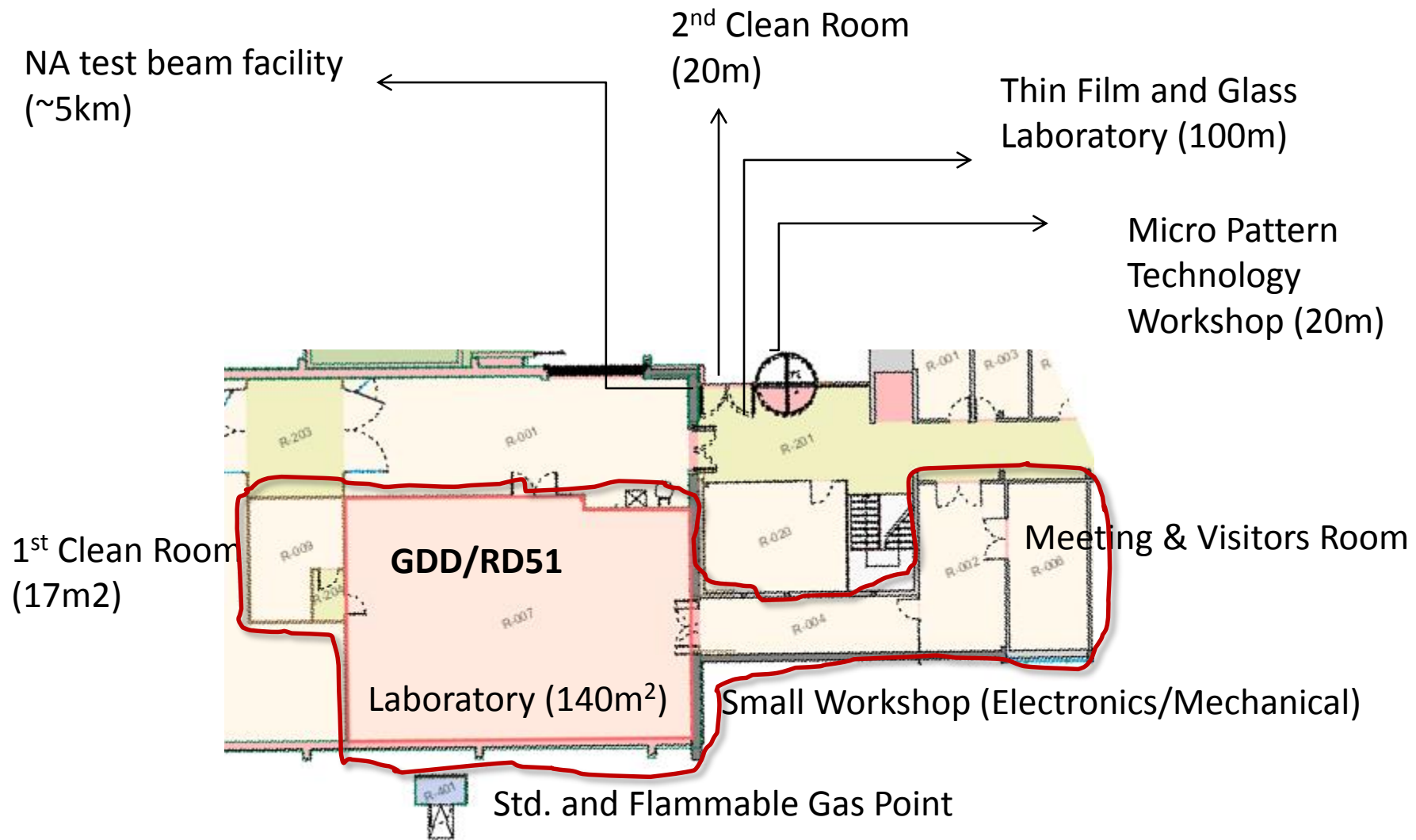
EP-DT-DD GDD Laboratory (Detector R&D) – Bdg. 154/R-007

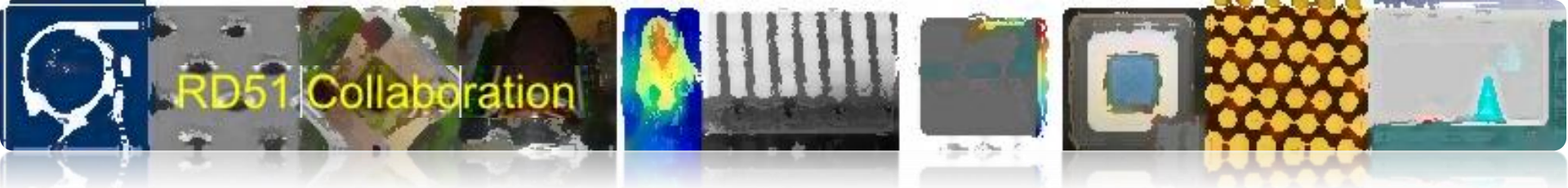




# RD51 Collaboration

Strategically located (i.e. @ CERN) from MPGD point of view





RD51 Collaboration

Active (X-Ray) and Passive Radioactive Sources



Clean Room Working Station Workshop (M&E)

Cosmic Stands Vacuum System Gas System (flammable)

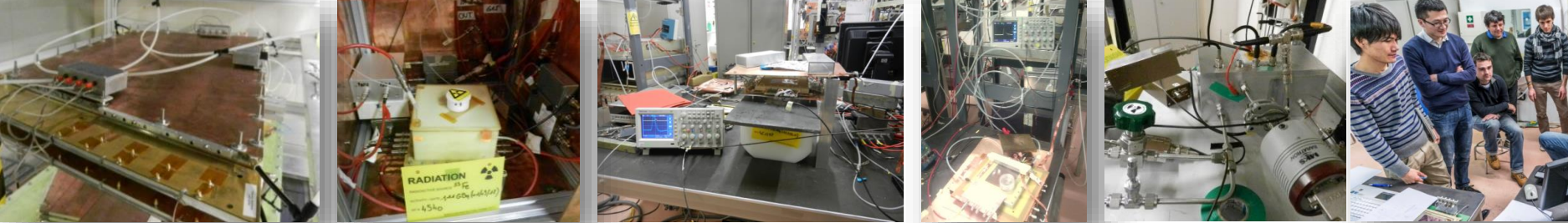


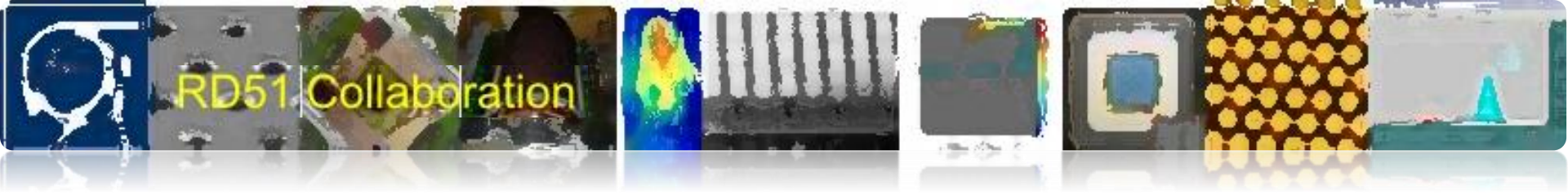
Electronics Development (Instrumentation and Readout Front End)



Permanent Users (ALICE, ATLAS, ESS) working station

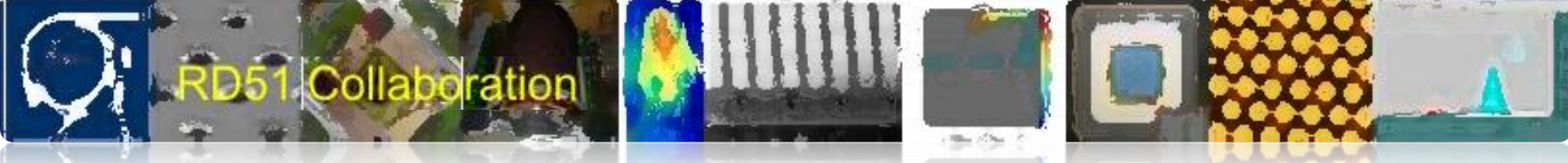
Temporary Users Working station Schools





# Test Beam

## North Area (H4) - Semi permanent Installation



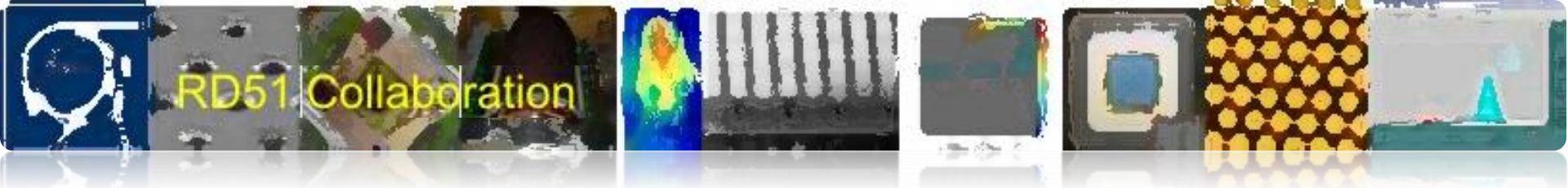
RD51 Collaboration



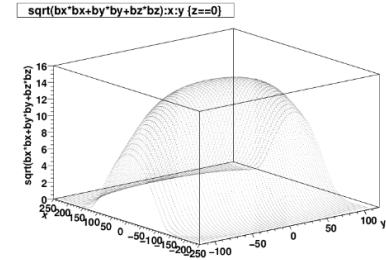
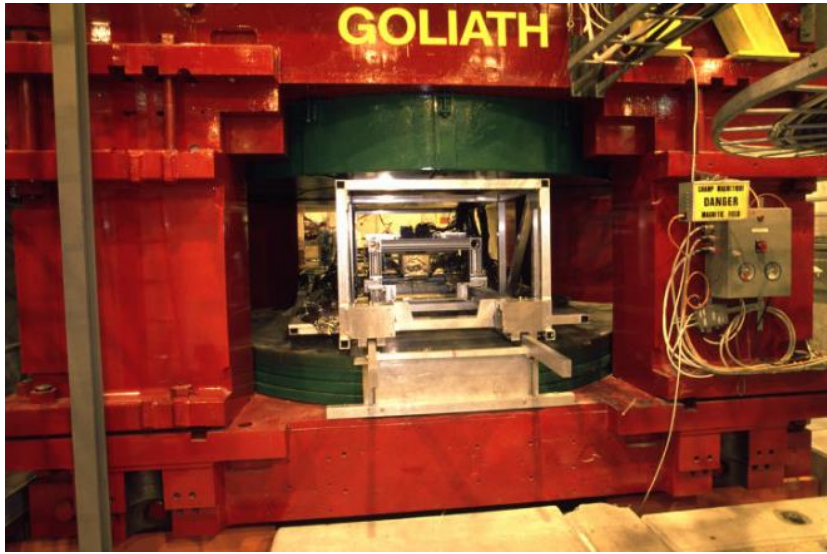
<http://sba.web.cern.ch/sba/BeamsAndAreas/resultbeam.asp?beamline=H4>

## H4 beam line

- **The** H4 beam line is located in EHN1. It is a high-energy, high-resolution general purpose beam suitable for both experiments and tests. Main parameters:  $P_{\max} = 330$  (450) GeV/c,  $Acc. = 1.5 \mu\text{Sr}$ ,  $\Delta p/p_{\max} = \pm 1.4 \%$  The maximum momentum is 400 GeV/c.
- **detailed user guide:** [H4](#)
- **Beam types:**
  - polarized protons for  $\Lambda 0$  decay, enriched low-intensity beam of anti-protons, or  $K^+$
  - electrons from  $\gamma$ -conversion,
  - Attenuated primary beam, Heavy ion beam
- **Maximum intensities** for  $10^{12}$  incident protons at 400 GeV/c:
  - $n^+$ , e fluxes similar to H2
  - $\sim 10^7$  protons at 400 GeV/c
  - $\sim 10^7$  Pb



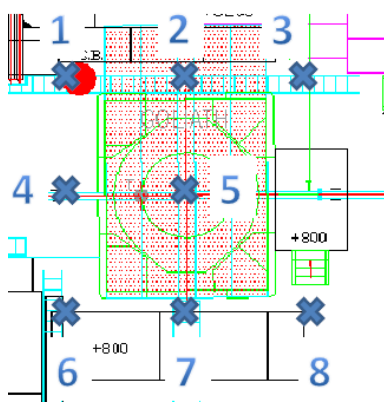
# RD51 Collaboration



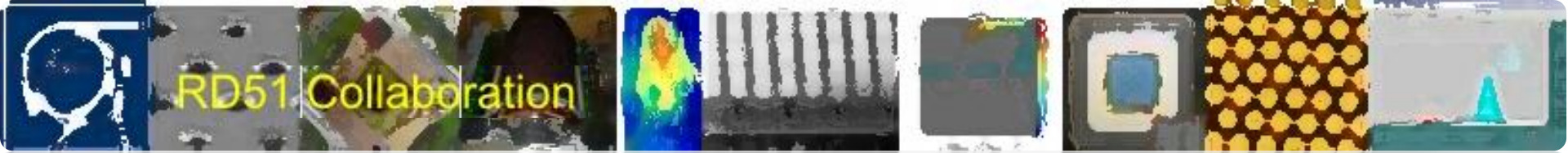
Field map realized during NA57 experiment, file decoded by Frascati group

Power: about 2MW  
 Maximum field: 1.4T  
 Gap volume: around 8 m<sup>3</sup>

[http://ab-div-po-mpc.web.cern.ch/ab-div-po-mpc/Pages/SPS\\_EA/Spectro/Goliath/Goliath.htm](http://ab-div-po-mpc.web.cern.ch/ab-div-po-mpc/Pages/SPS_EA/Spectro/Goliath/Goliath.htm)

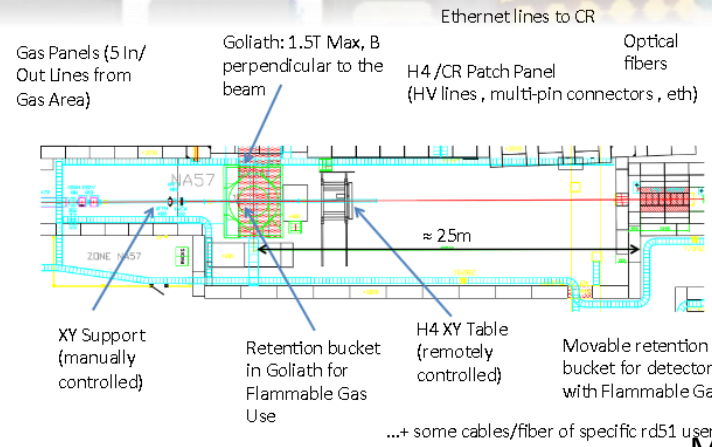
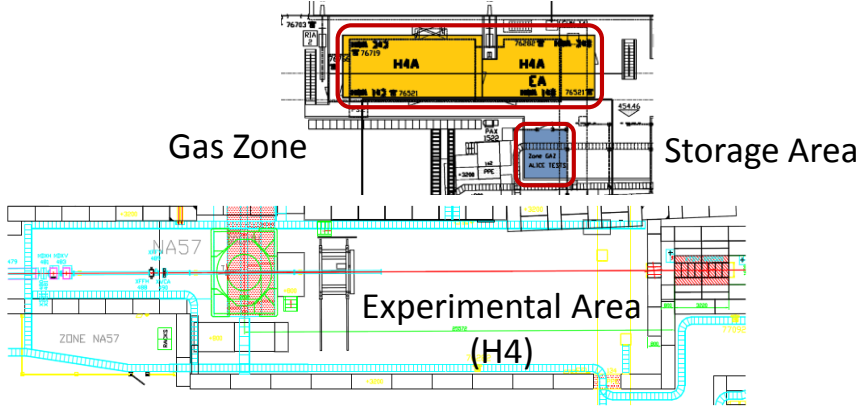


Point	Half Current	Maximum Current
1	0.0005 T	0.007 T
2	0.0004 T	0.010 T
3	0.0005 T	0.007 T
4	0.005 T	0.011 T
5	<b>0.868 T</b>	<b>1.518 T</b>
6	0.0003 T	0.006 T
7	0.0009 T	0.009 T
8	0.0004 T	0.008 T



# RD51 Collaboration

## Control Room



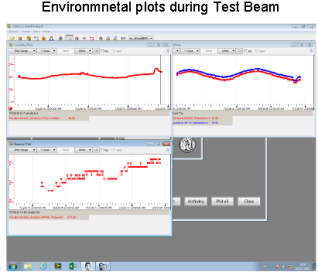
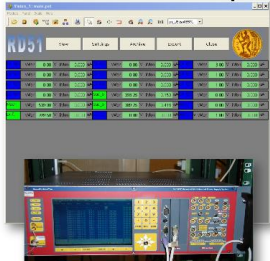
Infrastructures (gas, HV, LV, sensors,...)

## Goliath Magnet (1.5T max)

## RD51 DCS (Control and monitoring)

## RD51 Trackers and SRS/APV25 DAQ

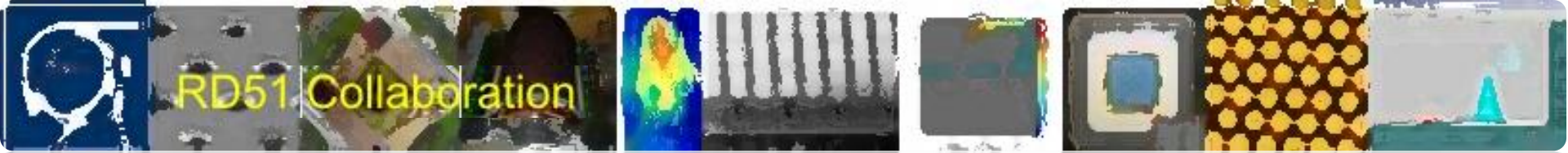
## Mechanical support (Miranda)



RD51 test beam, November 2015

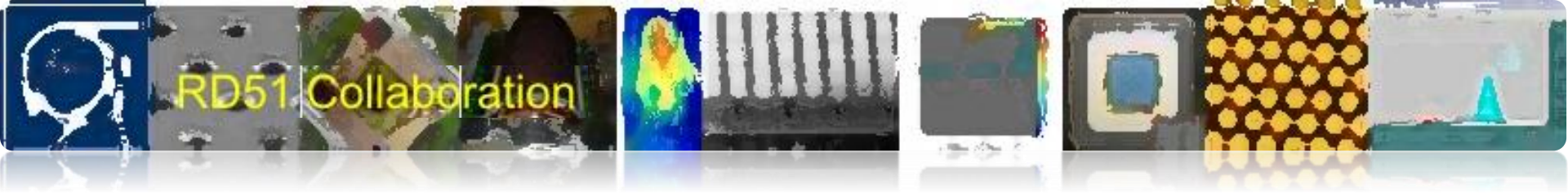


CMS (GEM, FTM), ATLAS (NSW resistive mm), LNF( $\mu$ ResWELL), BES3(GEM), SHIP(emulsions & GEM)



# How it practically works...

- A common request is sent every year to the SPS coordination based on “expression of interest” from the member of the collaboration.
- Normally: three periods of two weeks each – spring, summer, fall. Always accepted by the SPS, always used with an average presence of 4 groups per period.
- Main user periods are given to each group according to a rotating shift schedule (about 8h shift). The beam condition normally allows each user to run during the main user period of the other groups. Users has to carefully evaluate this point to be sure that they will be ale to complete their measurements in these conditions.
- The collaboration is ready to provide support for the measurements (gases, triggering and tracking system, detector slow control, powering system (HV/LV), readout electronics, mechanical support,...) if needed.
- Safety, infrastructures, services, handling in the area... everything is managed by the collaboration in a common way, simplifying the efforts for each group and for the facility itself.



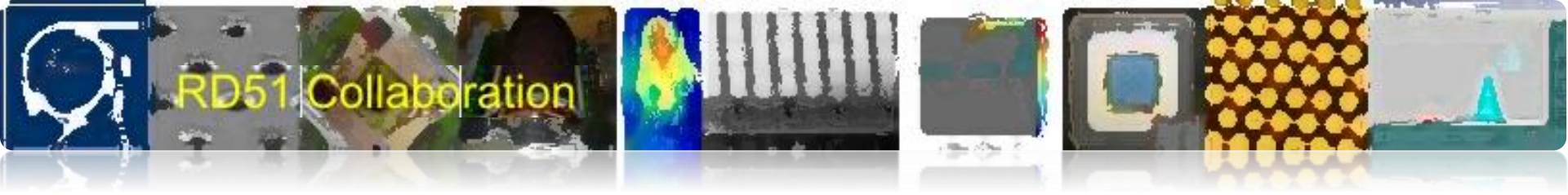
# What is priceless...

Daily meeting and continuous discussion during the beam between the groups on...

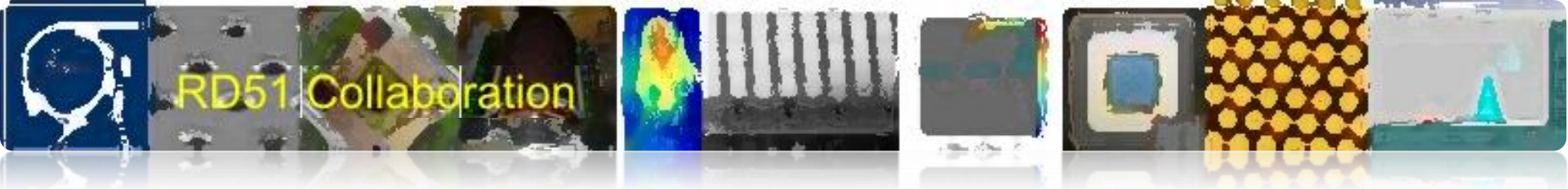
- Detector physics..
- How to perform specific measurement or implement new ones..
- Interpretation of preliminary results..
- Trouble shooting..
- A common laboratory @ few km

A large community and expertise available “on-fly”





# Access to CERN Facilities



# CERN Facilities

## Contacts and facilitating access

CERN Irradiation Facilities & alternative beam lines...

CERN gas group...

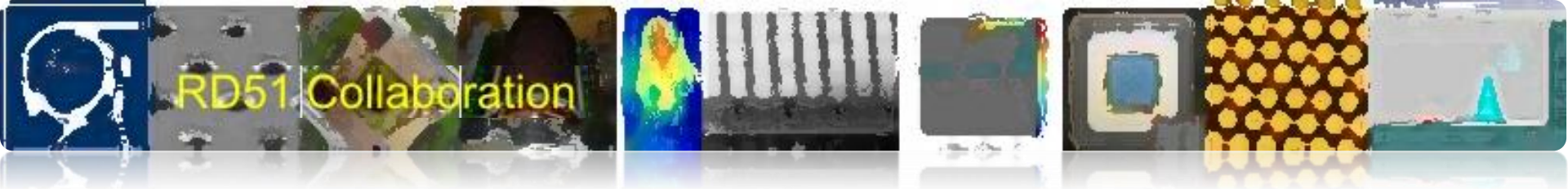
Materials and Metrology Services (SEM, EDS,...)...

Bonding lab...

Access to specific instrumentation or measurement tools (X-Ray radiography, thermo-camera, chemical analysis,... ) available at CERN

.....

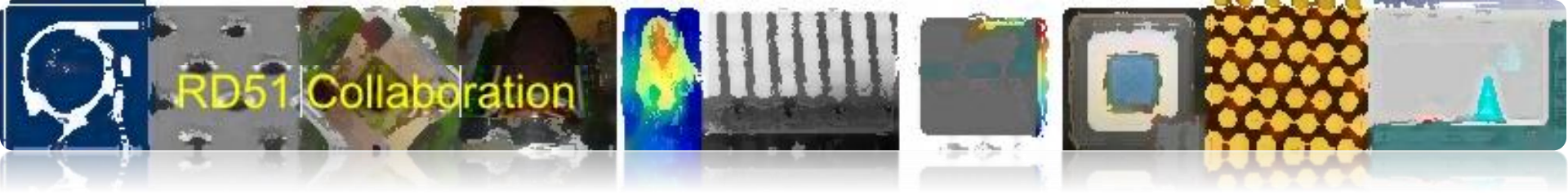
Very important for groups not familiar with CERN



## And finally....Common “coffee break”

Most efficient way of knowledge/technical transfer, sharing, troubleshooting, new ideas, start-up of collaborations...

Very important for ~~groups not familiar with CERN~~ everybody



Thanks