
CERN

10th Beam Telescopes and Test Beams Workshop

20-24 June 2022

Commissioning and First Run for the CERN Proton Irradiation Facility (IRRAD) after the Long Shutdown 2

Blerina Gkotse (CERN EP-DT) on behalf of the IRRAD Team

BTTB Workshop, 20-24 June 2022

Outline

- CERN Irradiation Facilities and Long Shutdown 2 (LS2) Upgrades
- IRRAD Upgrades:
  - T8 Beam Instrumentation
  - Technical Area
  - IRRAD Software and Hardware Infrastructure
- Beam Commissioning and IRRAD runs 2021-22
- European Projects associated to IRRAD
- Summary

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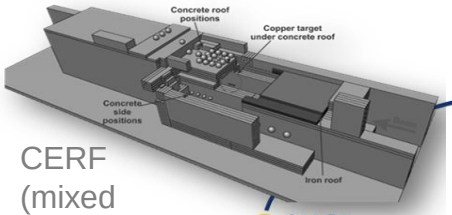
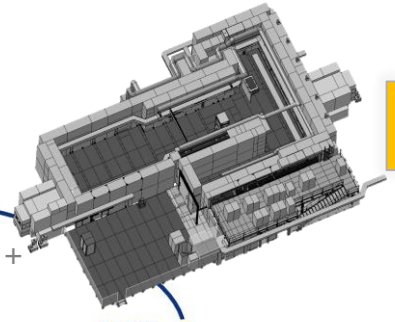
CERN Irradiation Facilities



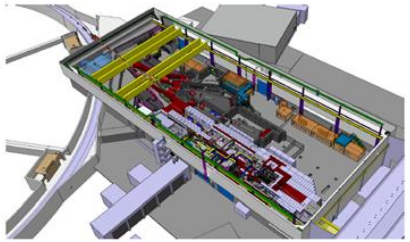
CERF (mixed field)



GIF++ (gamma + muons)

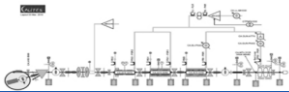
Presentation from M. Jaekel

CALLAB (irradiation sources)



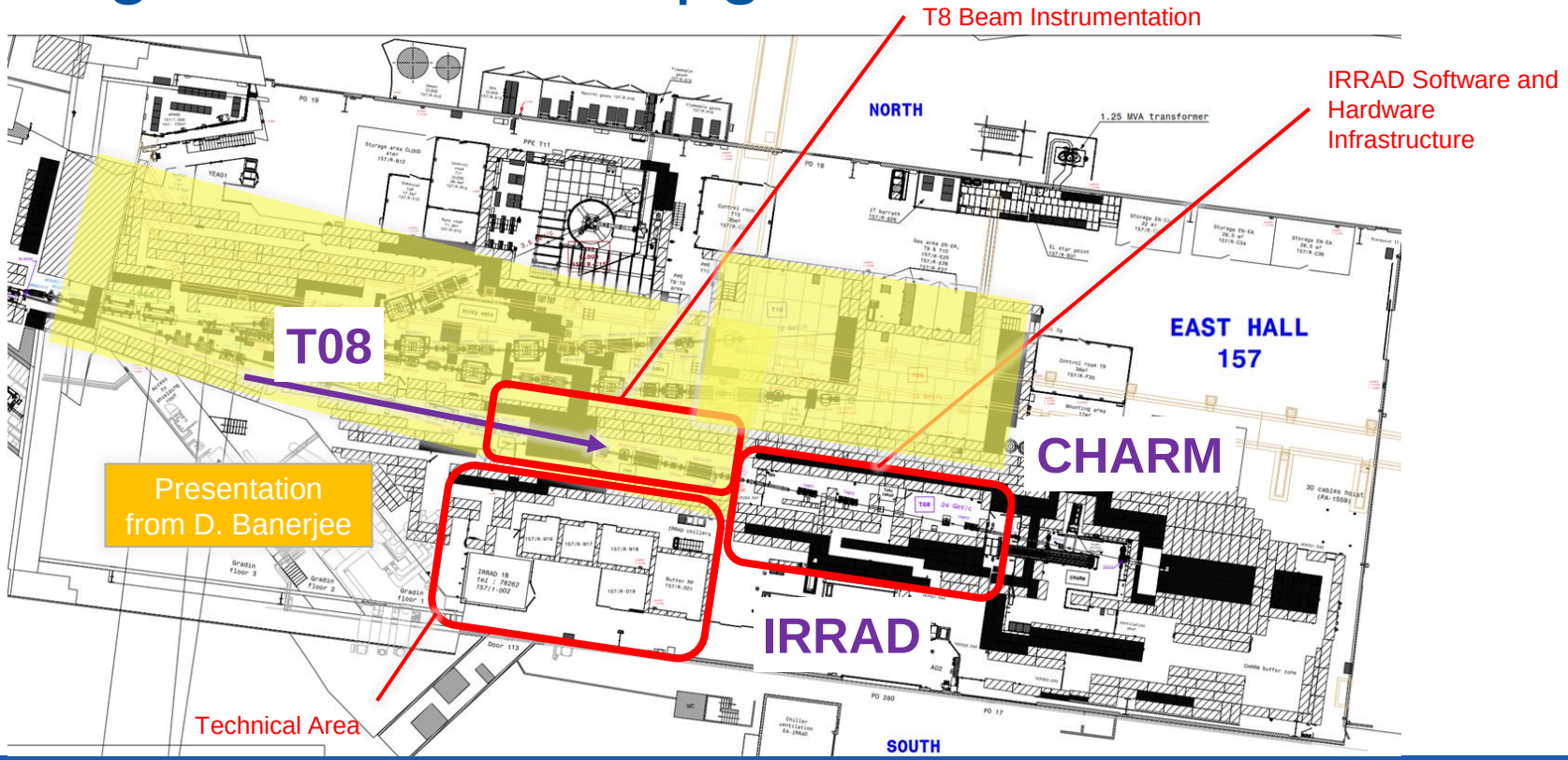
IRRAD (protons)

CHARM (mixed field)



VESPER (electrons)

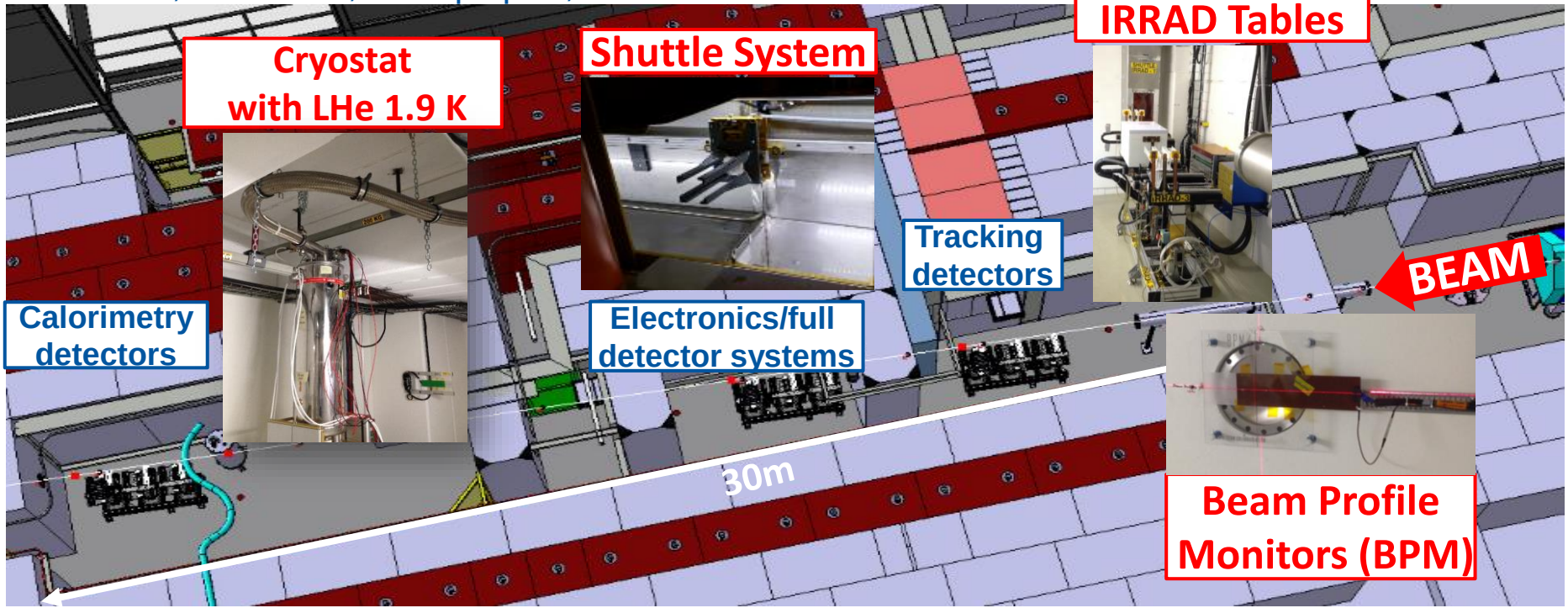
Long Shutdown 2 Upgrades



CERN Proton Irradiation Facility (IRRAD)

24 GeV/c, 400 msec, 5e11 p/spills, 12x12 mm^2 FWHM

cern.ch/ps-irrad



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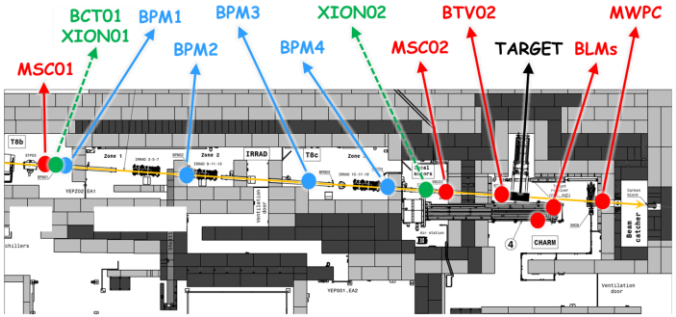
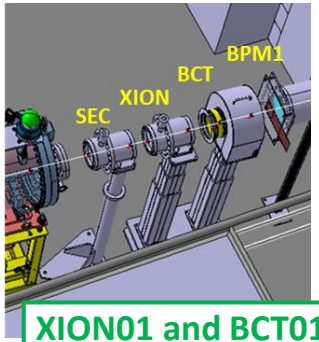
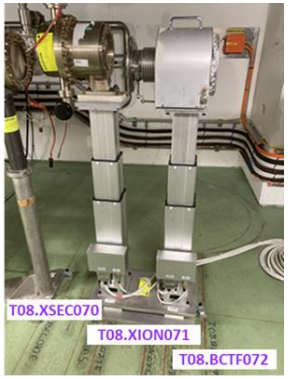
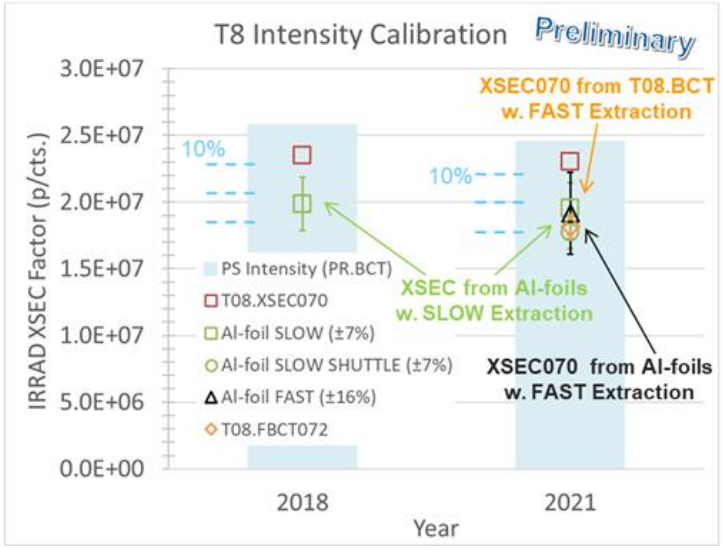
Beam Instrumentation Upgrade









IRRAD Technical Area Upgrade

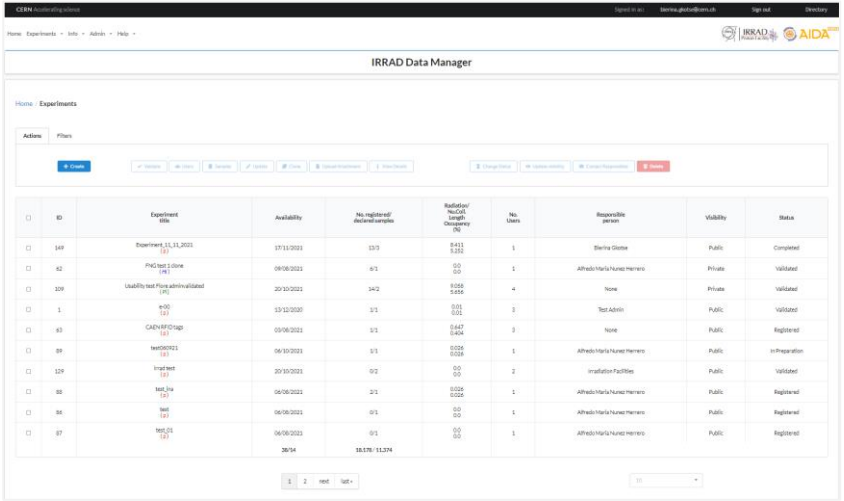
Completing and equipping the new **IRRAD Technical Area & Measurement Lab**

IRRAD Data Manager (IDM) Upgrades

- **The IRRAD platform to register your irradiation experiment and samples**
- Upgrades:
  - Several improvements and bug fixing
  - New User Interface style
  - Documentation finalized:

    https://edms.cern.ch/document/2664569/
  - GitLab repository
    https://gitlab.cern.ch/irrad1/irrad-data-manager

Register your experiment at:
https://irrad-data-manager.web.cern.ch
More details at: https://ps-irrad.web.cern.ch/ps-irrad/

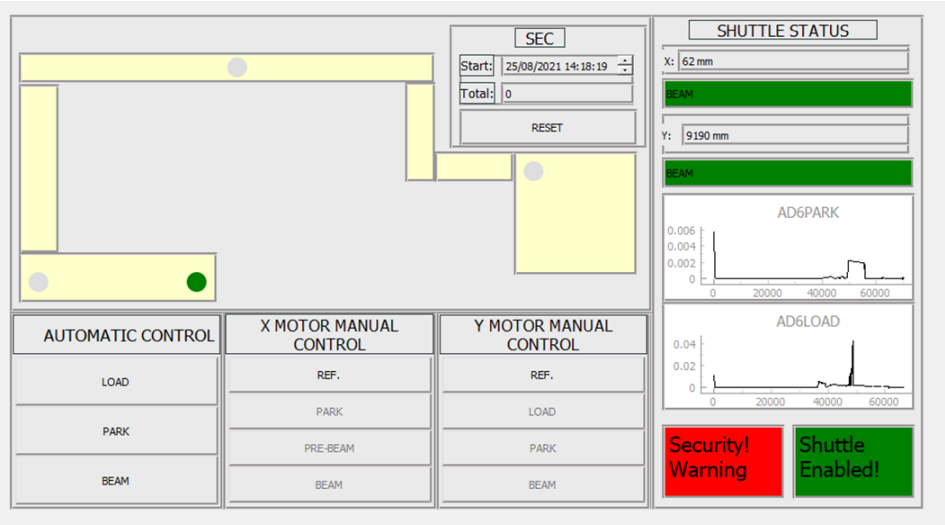


IRRAD Data Manager

A. Nunez, Technical Student (Spain)

IRRAD Shuttle Control System

- Python-based **IRRAD Shuttle Motor Control Application**
- based on pyQT (python) as for the IRRAD Tables (2020)
- compatible with Windows and Linux



IRRAD SHUTTLE

IRRAD Remote Summer Students' team

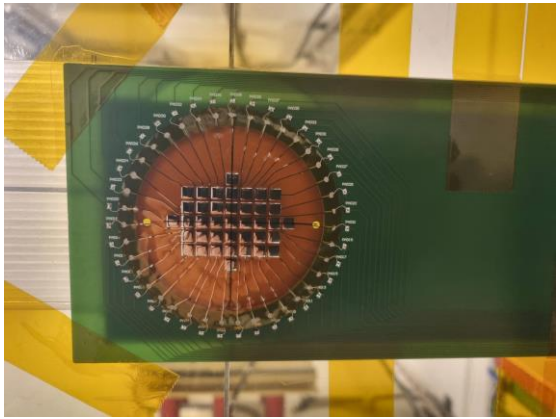
Tymoteusz Ciesielski (Poland)

Aseel Abdulhalim (Palestine)

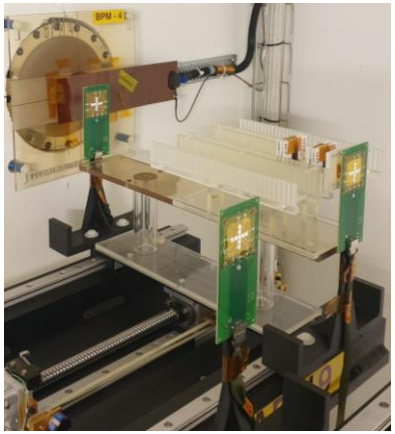
IRRAD Beam Profile Monitors Upgrade

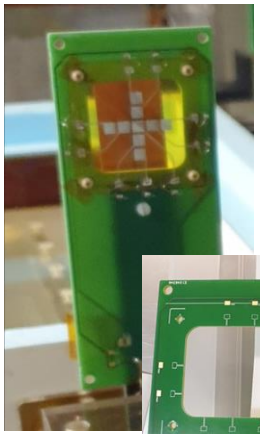
Innovative Beam Profile Monitors:

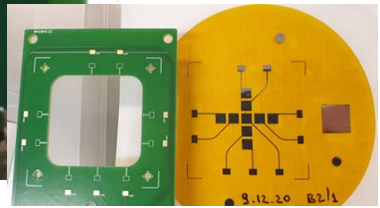
- new **mini-BPM Al/Kapton (0.3/25μm)** produced, tested in IRRAD, now operational
- large pattern **micro-BPM Al/Kapton (0.2/25μm):** first prototype tested, new production ongoing



40channel micro-BPM device



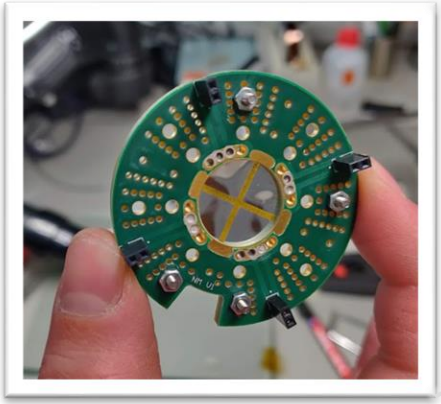




New mini-BPMs

Ultra Thin Beam Position Monitors

Support the development of **nano-BPM** for AD **Al/Parylene** (**10/100nm**) for keV range



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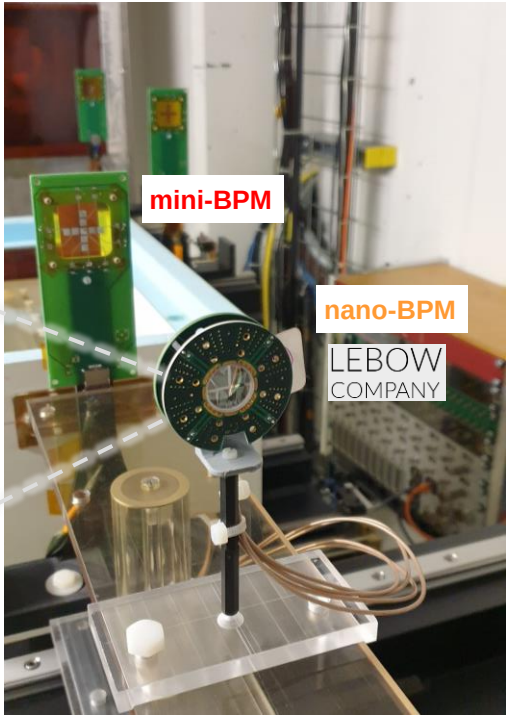


IRRAD Experiment

See N. Minafra' s presentation on Wednesday

© N. Minafra, M. Doser, R. Caravita

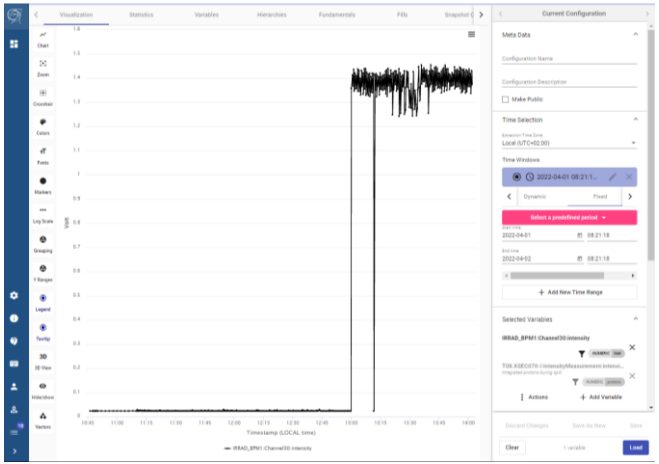
AEgIS EXPERIMENT

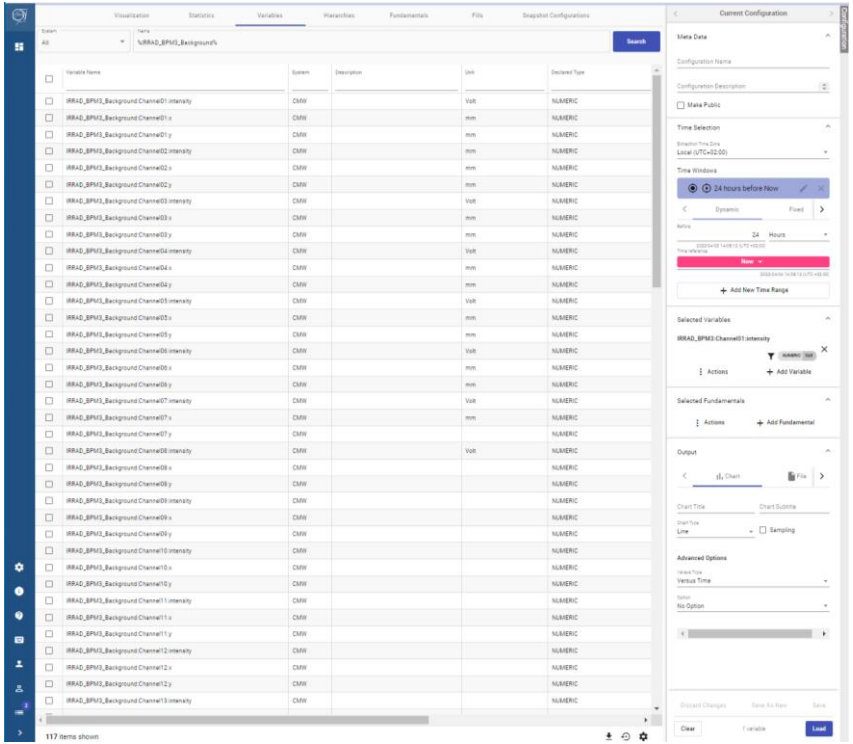
BPM Software Architecture Upgrade

Beam Profile Monitor (BPM) data:

- logged in NXCALS (CERN Logging System)
- published in Timber in real-time (https://timber.cern.ch – accessible only from CERN)

Allowing for further beam corrections by CERN Control Center (CCC)





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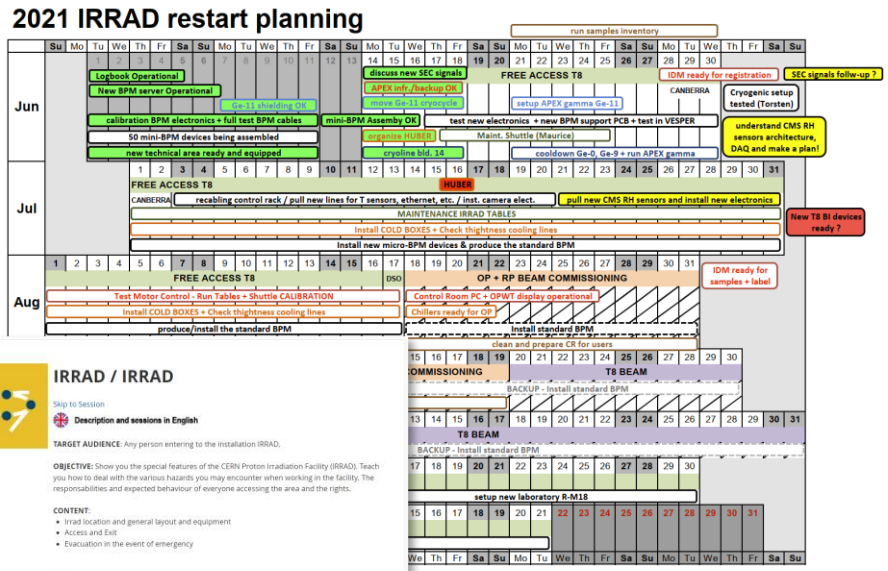
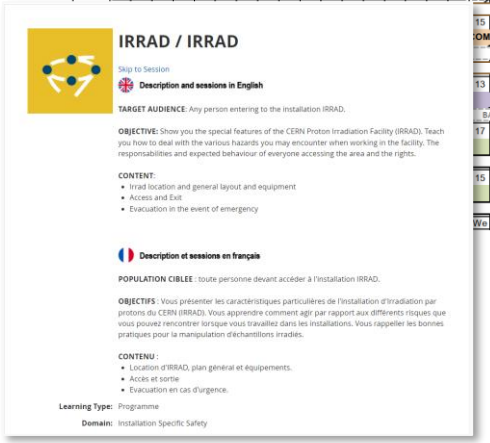
IRRAD Restart

- Complete **LS2 activities**
- Commission **new Beam Instrumentation**
- Update **Safety Docs, Safety Trainings** (https://ps-irrad.web.cern.ch/ps-irrad/safety.php)
- Define **COVID procedures** and install air recirculation systems control rooms
- **New IRRAD e-log** from BE-OP
- Restoring BI signals to IRRAD
- …




IRRAD / IRRAD

Skip to Session

Description and sessions in English

TARGET AUDIENCE: Any person entering to the installation IRRAD.

OBJECTIVE: Show you the special features of the CERN Proton Irradiation Facility (IRRAD). Teach you how to deal with the various hazards you may encounter when working in the facility. The responsabilities and expected behaviour of everyone accessing the area and the rights.

CONTENT:
- Irrad location and general layout and equipment
- Access and Exit
- Evacuation in the event of emergency

Description et sessions en français

POPULATION CIBLEE : toute personne devant accéder à l'installation IRRAD.

OBJECTIFS : Vous présenter les caractéristiques particulières de l'installation d'irradiation par protons du CERN (IRRAD). Vous apprendre comment agir par rapport aux différents risques que vous pouvez rencontrer lorsque vous travaillez dans les installations. Vous rappeller les bonnes pratiques pour la manipulation d'échantillons irradiés.

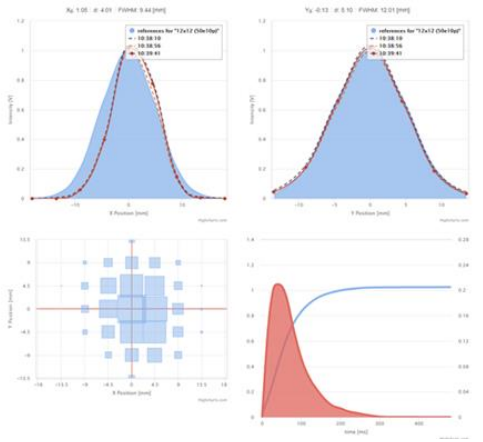
CONTENU :
- Location d'IRRAD, plan général et équipements.
- Accès et sortie
- Evacuation en cas d'urgence.

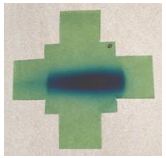
Learning Type: Programme

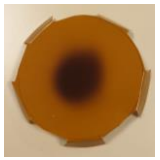
Domain: Installation Specific Safety

Mandatory Safety Training

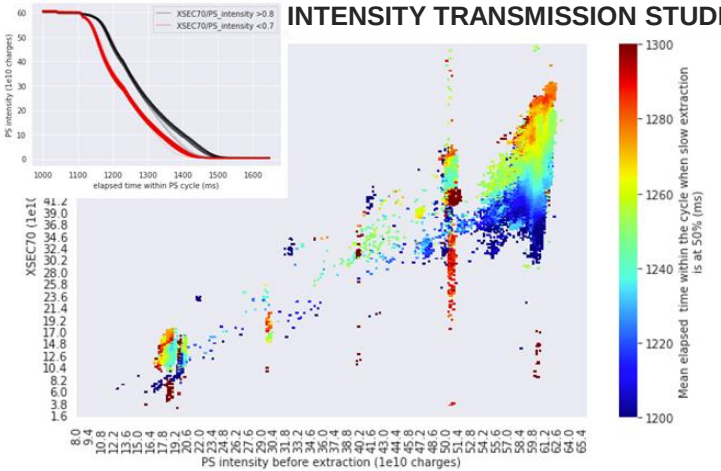
Beam Commissioning 2021

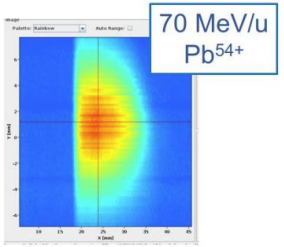


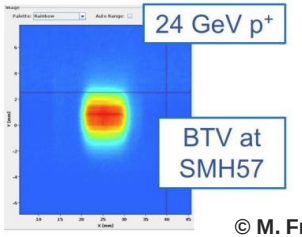




T08 BEAM PROFILES







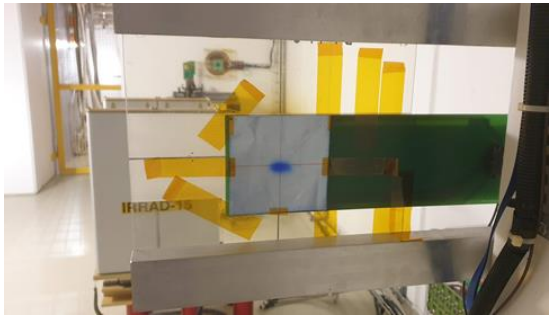
© M. Fraser (25/10)

- **Beam instrumentation commissioning & tests** in collaboration with SY-BI
- **Optics studies to reduce the proton beam losses**
- **High Energy Heavy Ion beam steered down T8** with several intensity flavours (**CHIMERA**) – 2 weeks of HI run Nov.-Dec. 2022

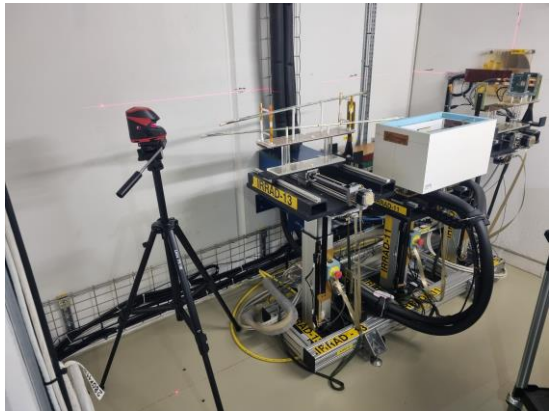
IRRAD User Run 2021

- 8 weeks run
- 18 experiments completed
- 190 samples irradiated

Priority was given to beam commissioning



Dosimetry & alignment verification measurements in IRRAD Zone 3



Samples installed in IRRAD Zone 2

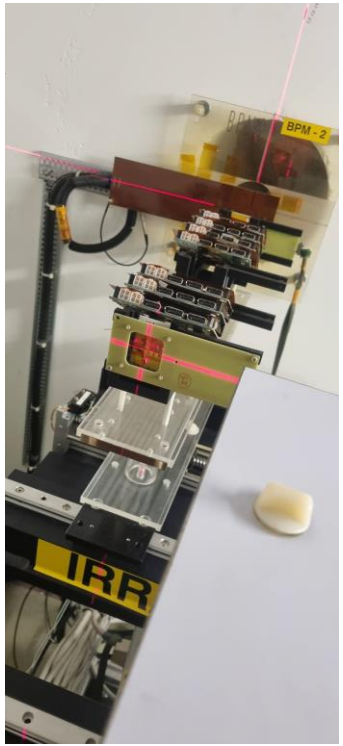
Samples installed in IRRAD Zone 3

IRRAD Run 2022

- From March to December
- 18 experiments registered in IDM, and more being discussed
  - 7 completed
  - 5 ongoing
  - 6 being prepared and scheduled
- ~300 samples registered in IDM
  - 231 being irradiated

IRRAD Zone 2 samples setup

IRRAD cold-box with VORTEX system for long-run experiments



IRRAD Zone 2 samples and micro-BPM2

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European Projects Associated to IRRAD

AIDA innova

Started April 2021

RADNEXT

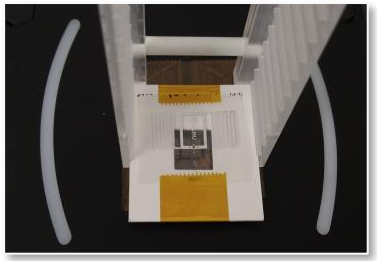
Started June 2021

EURO-LABS
EUROPEAN LABORATORIES FOR ACCELERATOR BASED SCIENCES

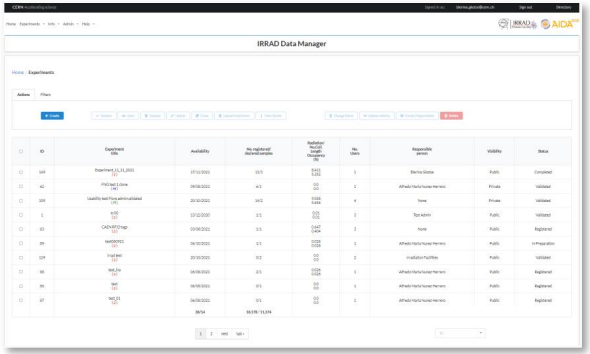
To start September 2022

AIDAinnova

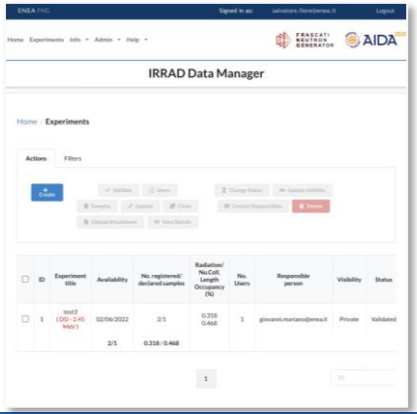
- **Advancement and Innovation for Detectors at Accelerators**
- Leading Task 4.3: Common tools for irradiation facilities quality control
  - Generalisation of IRRAD Data Manager for ENEA-FNG and GIF^{++}
  - Prototype of integrated system for induced activation and traceability data management
  - Dosimetry calibration set for cross-comparison of irradiation facilities by evaluation of Non-Ionizing Energy Loss (NIEL)



RFID measurements after irradiation experiment



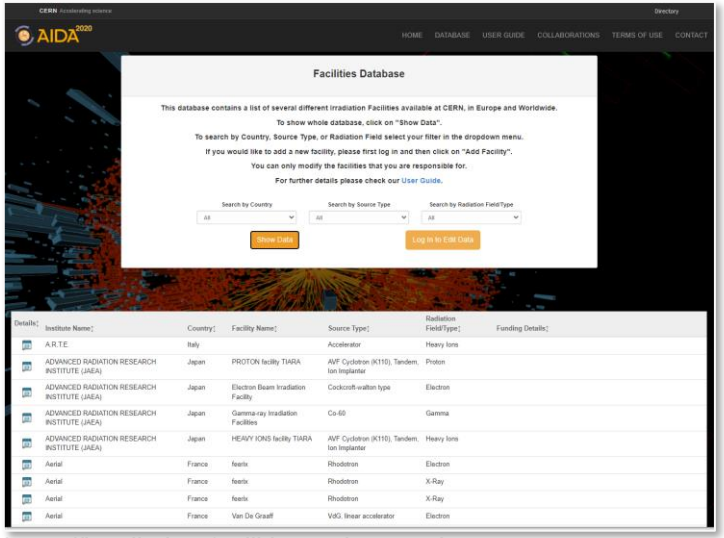
IRRAD Data Manager



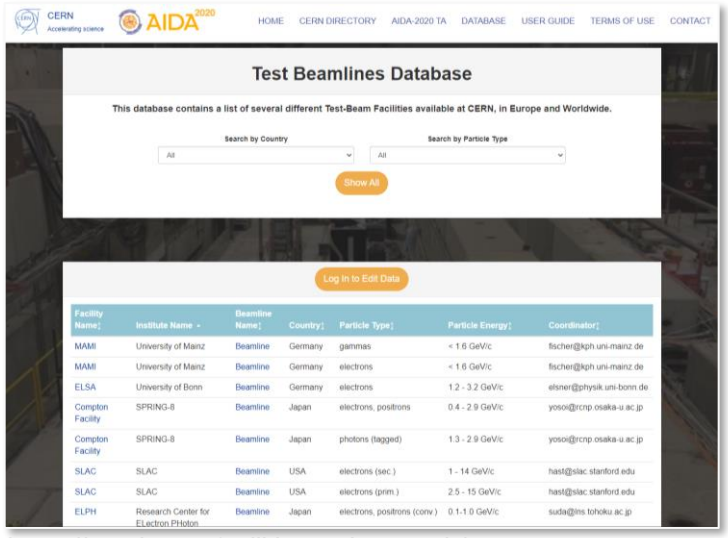
IDM for ENEA-FNG

Irradiation and Test Beam Facilities DBs

- Two separate but similar platforms for researching information about the test beam and irradiation facilities
- Maintained by the facility coordinators



https://irradiation-facilities.web.cern.ch



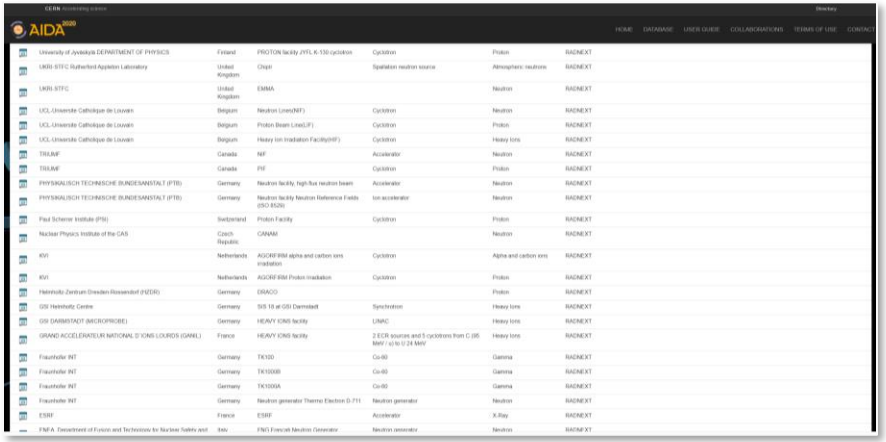
https://test-beam-facilities.web.cern.ch/

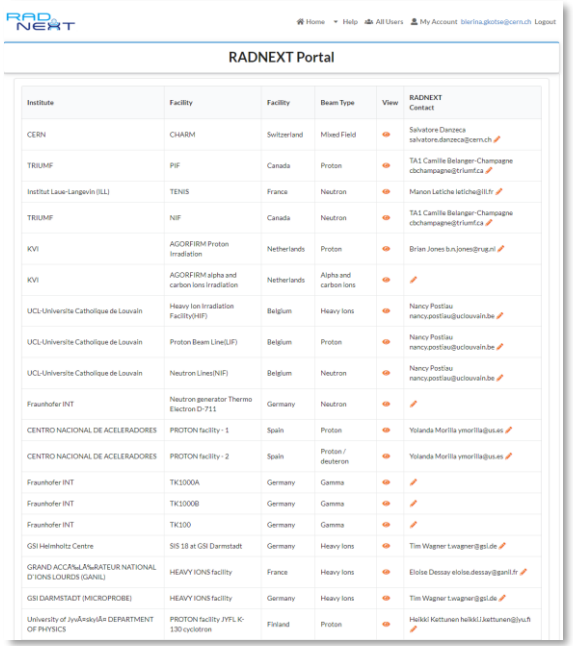
RADNEXT Facilities

Accessibility to irradiation facilities for research on radiation effects in electronics

- A **network of irradiation facilities**
- **Transnational access** to irradiation facilities

RADNEXT Facilities included in the irradiation facilities DB

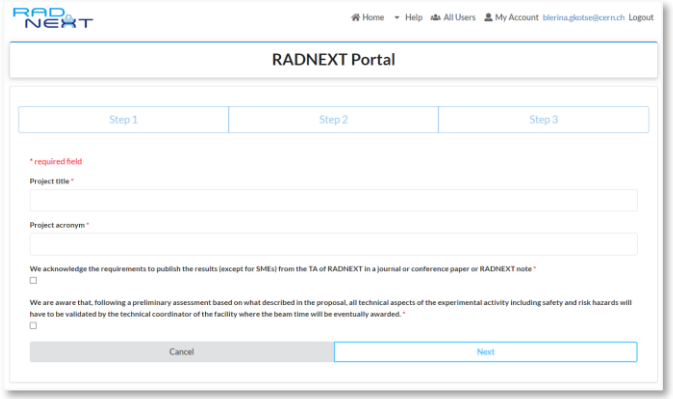




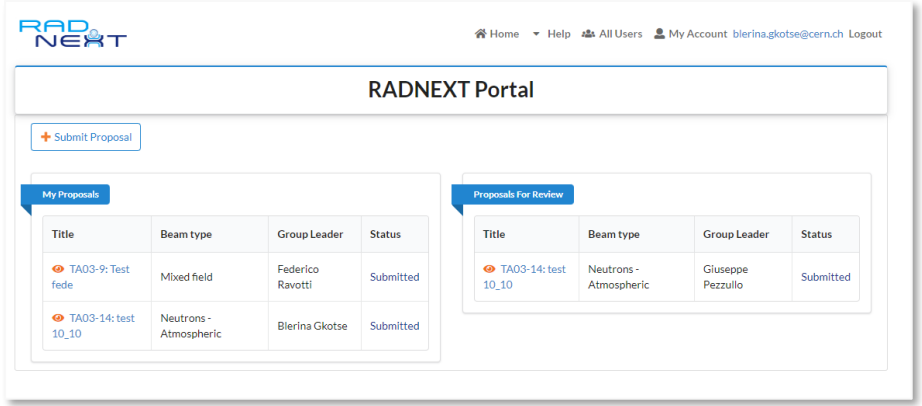
RADNEXT Facilities and Transnational Access

Transnational Access provides **beam time** for experiments:

- **Calls open** every **3 months** (call currently open)
- A **dedicated web portal** for proposal submission was developed
- (https://radnext-ta-portal.web.cern.ch)
- Beam time assigned after **review** of the proposals and **facility availability**



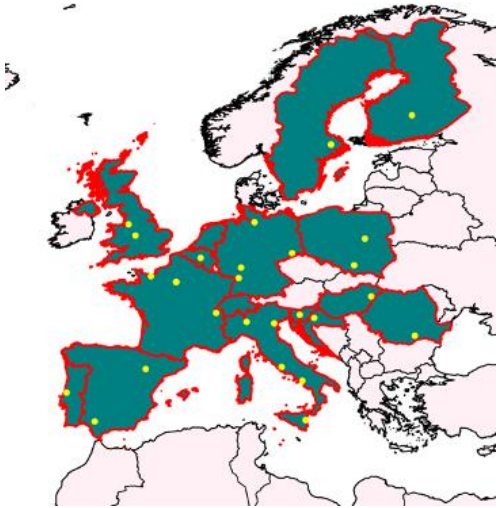
Irradiation Experiment Proposal form



Proposals' view

EURO-LABS

- A consortium of thirty-nine Research Infrastructures (RIs) from twelve countries in Europe
- First joint EU proposal between Nuclear Physics, HEP accelerators and HEP detectors
- Transnational Access to IRRAD and GIF++
- **Foreseen to start 1st September 2022**



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*Paolo Giacomelli https://indico.cern.ch/event/1104064/contributions/4797462/

Summary

- T8 Beam Instrumentation and IRRAD Upgrades
- Beam commissioning completed
- IRRAD Run 2022 ongoing
- Irradiation and Test Beam Facilities DBs fully functional and being kept updated in the best effort
- New European projects and Transnational Access:
  - RADNEXT network already available
  - IRRAD and GIF++ available soon through EURO-LABS

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA no 101004761.

www.cern.ch