

EP Irradiation Facilities

Blerina Gkotse, Martin Jäkel, Giuseppe Pezzullo, Federico Ravotti (EP-DT-DD)



Outline

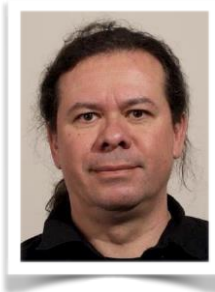
- EP Irradiation Team & Facilities
- Gamma Irradiation Facility (GIF++)
 - Run 2021
 - Pre-Dump Commissioning
- Proton Irradiation Facility (IRRAD)
 - New Technical Area
 - T8 Commissioning & Run 2021
- Beam Profile Monitors R&D
- Outlook for 2022

Current Team Members



Federico, STAFF

- ❖ Team Responsible
- ❖ IRRAD Coordinator, Facilities EXSO



Martin, STAFF (50% ATLAS)

- ❖ GIF++ Physics Coordinator



Giuseppe, STAFF

- ❖ Facilities Manager, GIF++ EXSO
- ❖ Users Supervisor



Blerina, FELL

- ❖ AIDAinnova, RADNEXT EU-projects
- ❖ Computing M&O / R&D



Alfredo, TECH (Oct. 20)
Until November 2021

- ❖ Data Management
- ❖ AIDAinnova EU-project



Ourania, USER (ATLAS)
Until July 2021

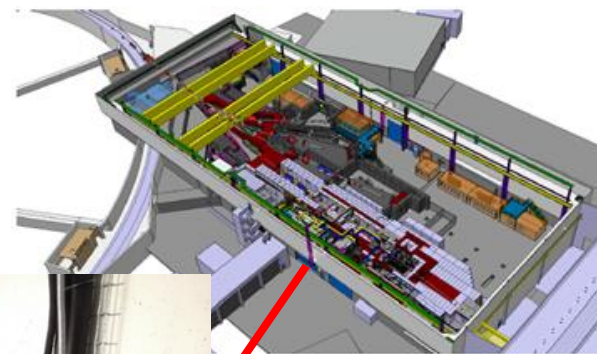
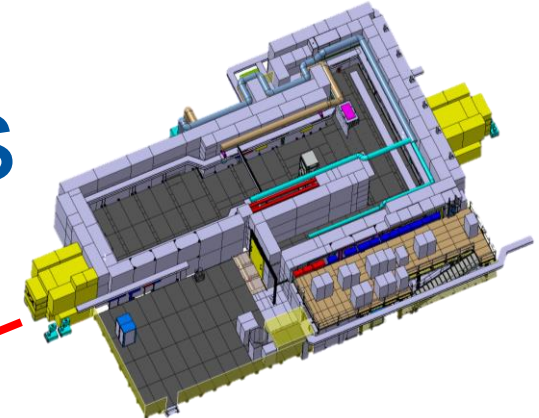
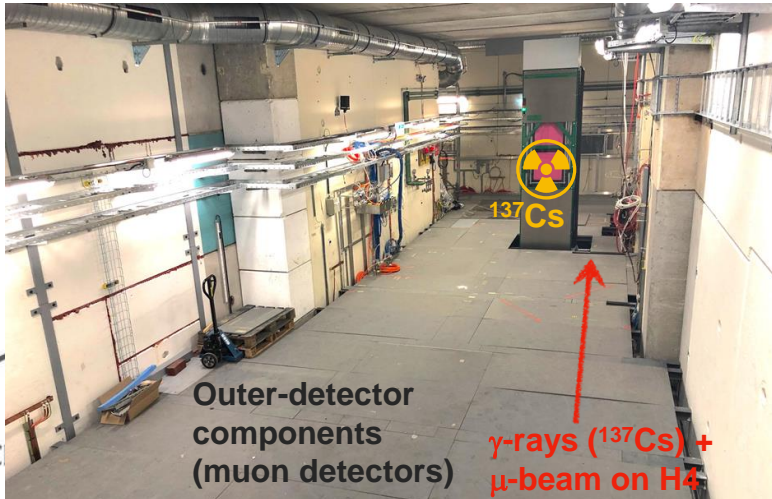
- ❖ u-BPM project (EPFL-CMi)
- ❖ R&D on Beam Instrumentation



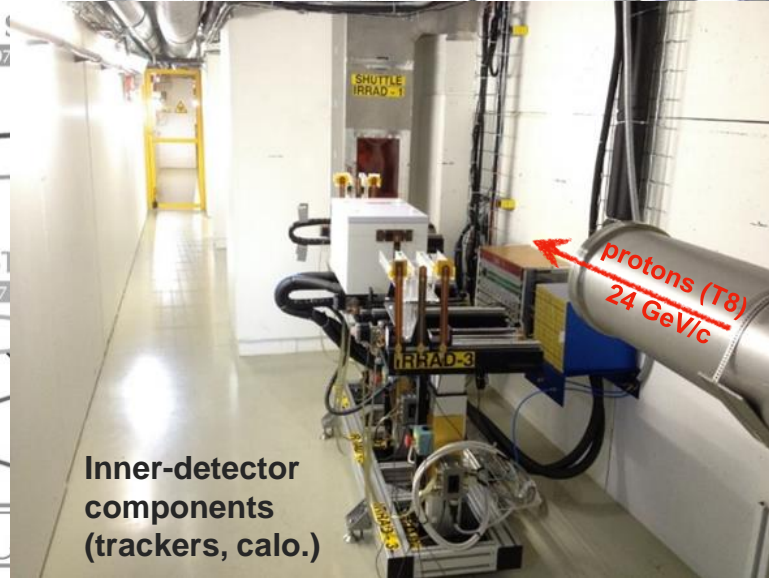
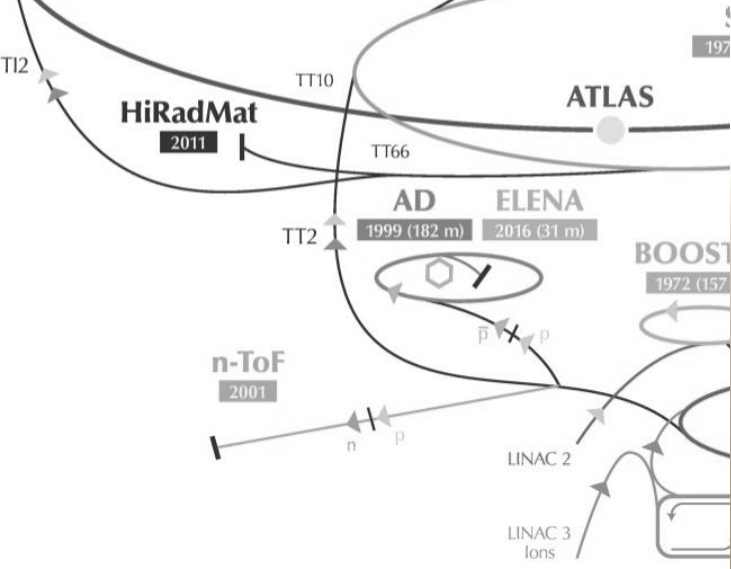
Maurice, Honorary Member (retired)

- ❖ Team consultant

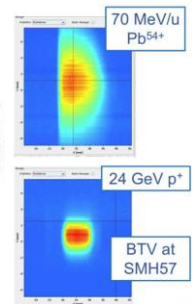
EP Irradiation Facilities



ALIC TT40 TT41 LHCb



IRRAD Proton Facility

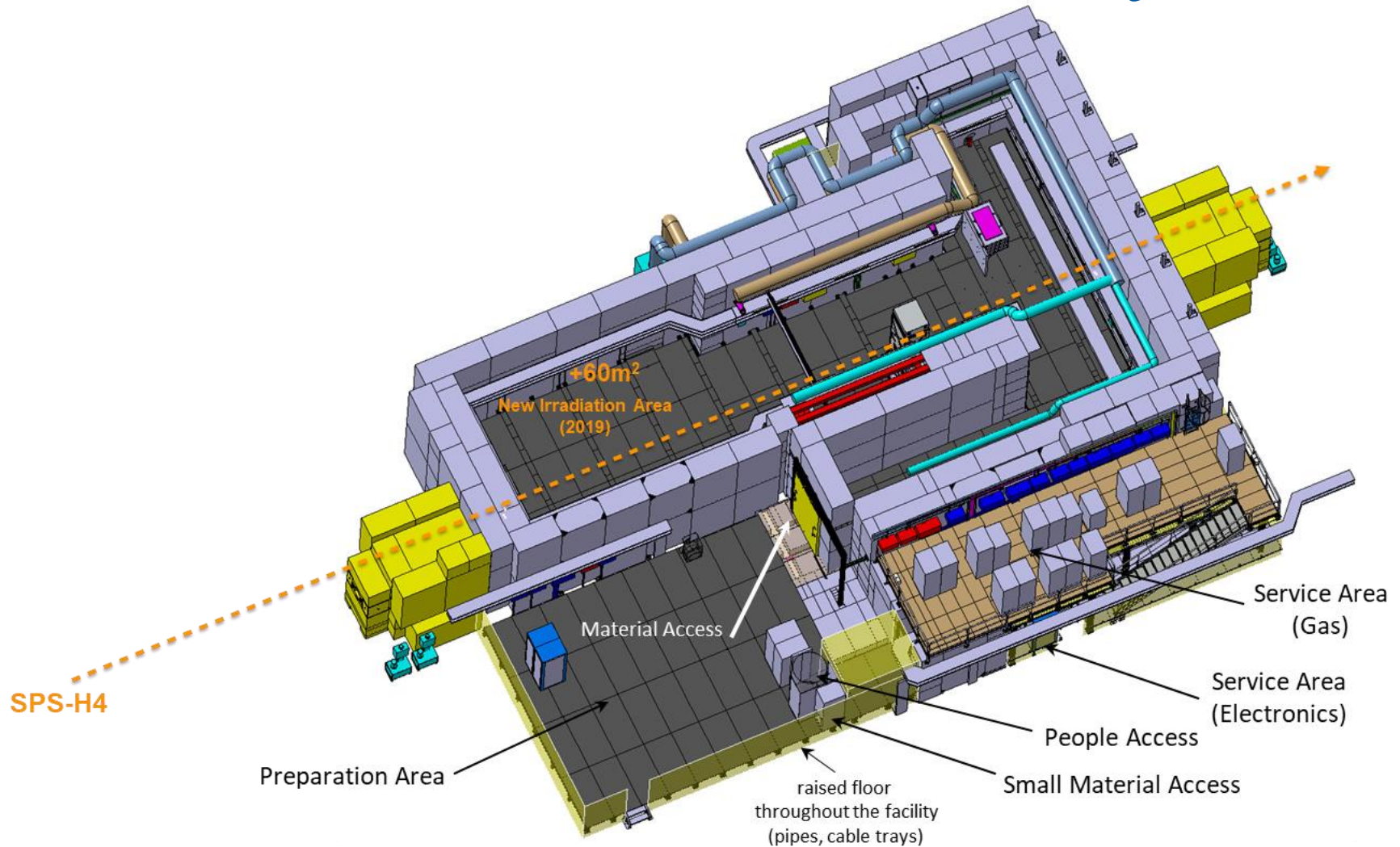


Development of HI beam for electronics testing on T8



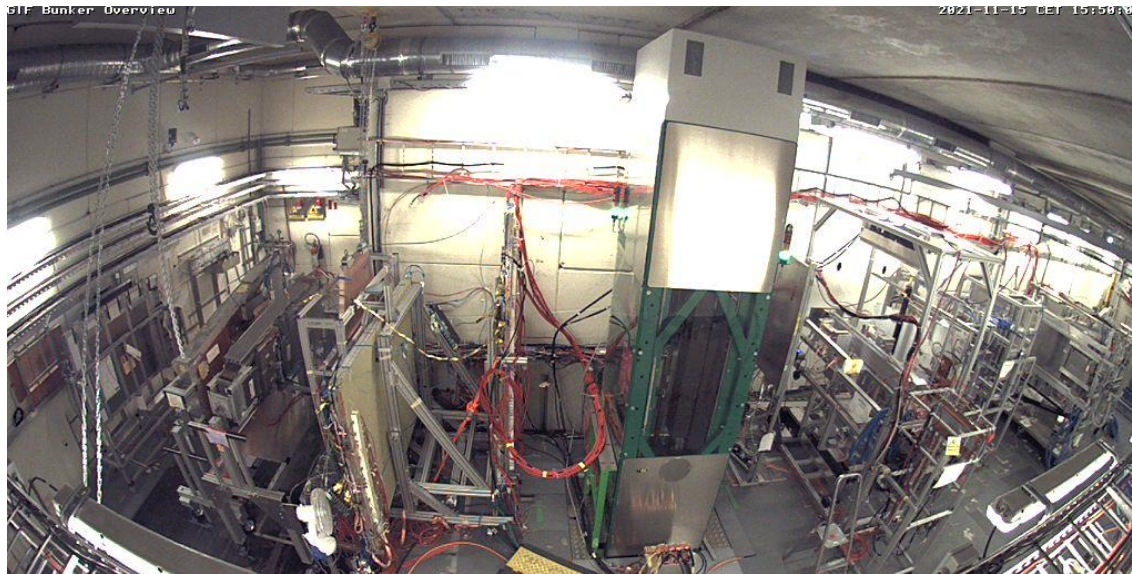
© M. Fraser (25/10)

Gamma Irradiation Facility



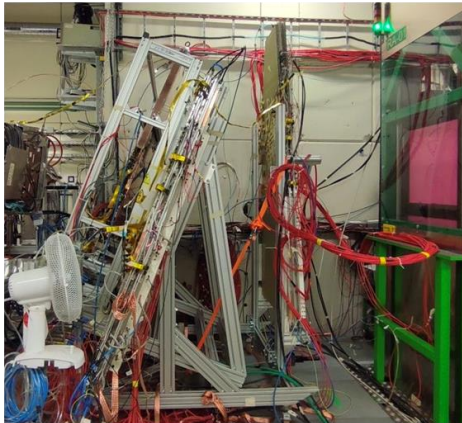
Starting the Run 3 of GIF++

- LS2 was a very busy time with mass-production tests dominating the weekly schedule
- With many improvements made during the last year, we finally have returned to beam time
- Even with the extension and the increased irradiation space, the bunker is getting full again....



GIF++ User Run 2021

14 setups participating in parallel, including ATLAS RPC, CMS CSC, ATLAS NSW MM & sTGC, ProTov, ATLAS sMDT, CMS RPC, Ecogas, EP-DT, CMS iRPC, CMS DT, RE21/CBM



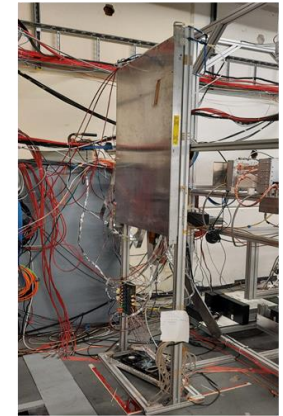
First combined data taking of ATLAS NSW MM and sTGC with final electronics and realistic background radiation



Performance measurement for ATLAS RPC BIS78 chamber inc. readout system, in presence of HL-LHC radiation background



ECOgas - search for environmentally friendly gas mixture with lower Global Warming Potential (GWP) than standard RPC mixture



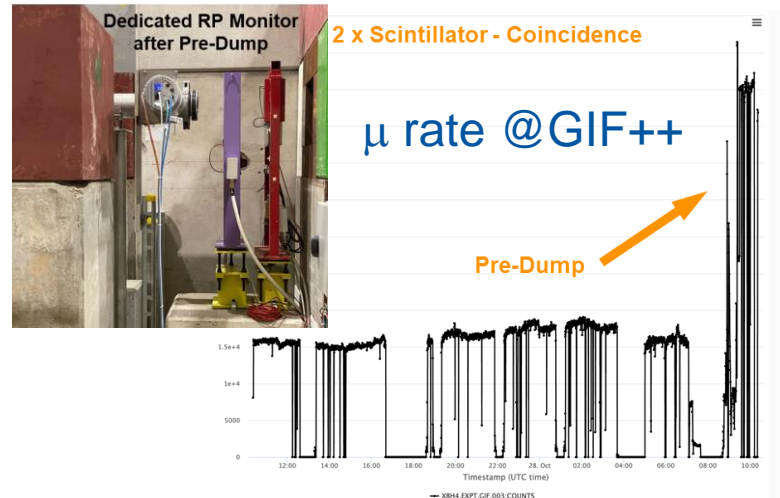
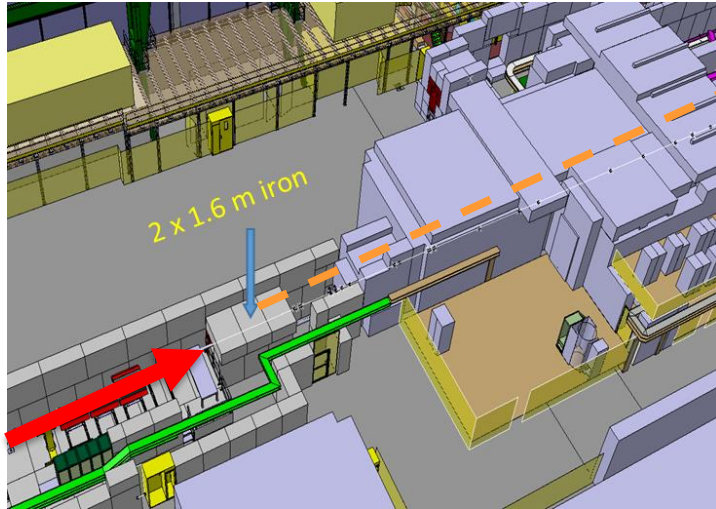
CBM@Fair - checking performance of GEM & RPC chambers under harsh CBM radiation background



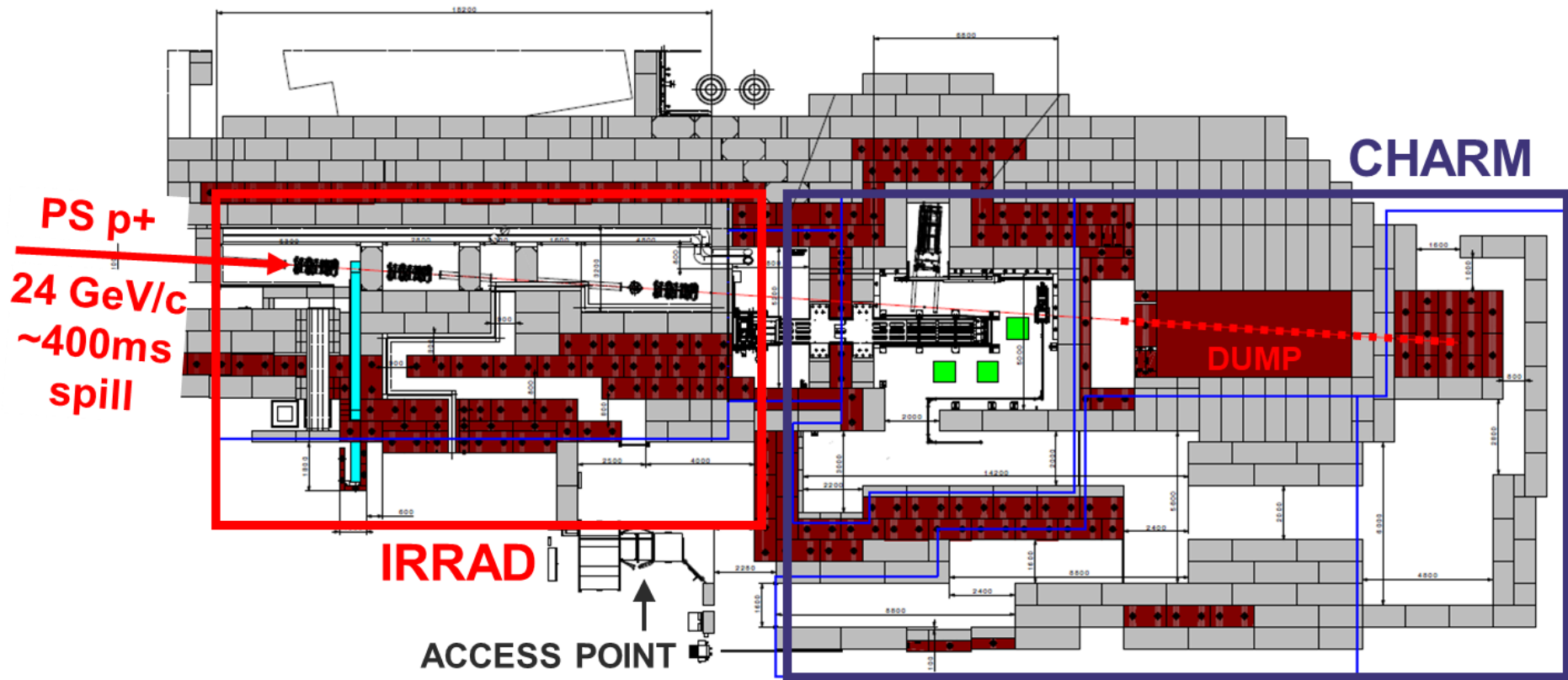
And many more results !

Please see the Annual User Meeting (16.Nov) for details <https://indico.cern.ch/e/GIF-AUM-2021>

GIF++ Pre-Dump Commissioning



Proton Irradiation Facility



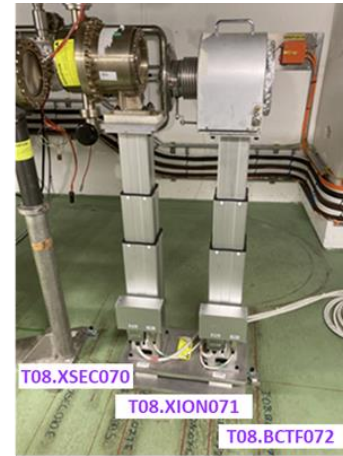
IRRAD Technical Area

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

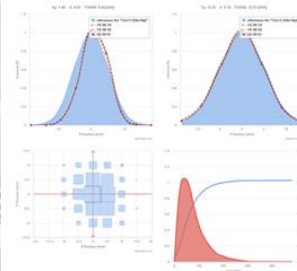


Beam Commissioning 2021

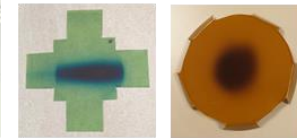
- Challenging run: 8 weeks after the LS2
 - re-commissioning vs. stable beam...
- New beam line instrumentation in T8:
 - BCT, XIONs, etc.
- Intensity fluctuations, homogeneity of the profile, time structure, etc.
 - to be followed-up in 2022
- SY-BI electronics replaced (same EHN1)
 - restoring XSECs signals to IRRAD!



T08 BI UPGRADED

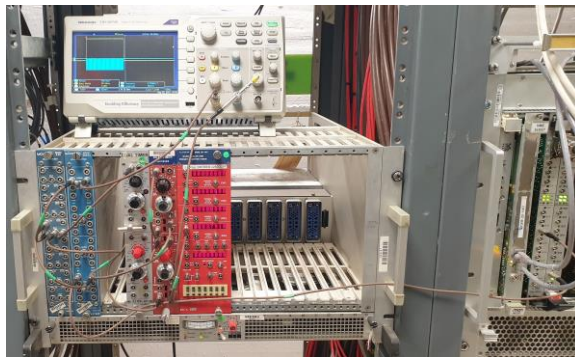


T08 BEAM PROFILES



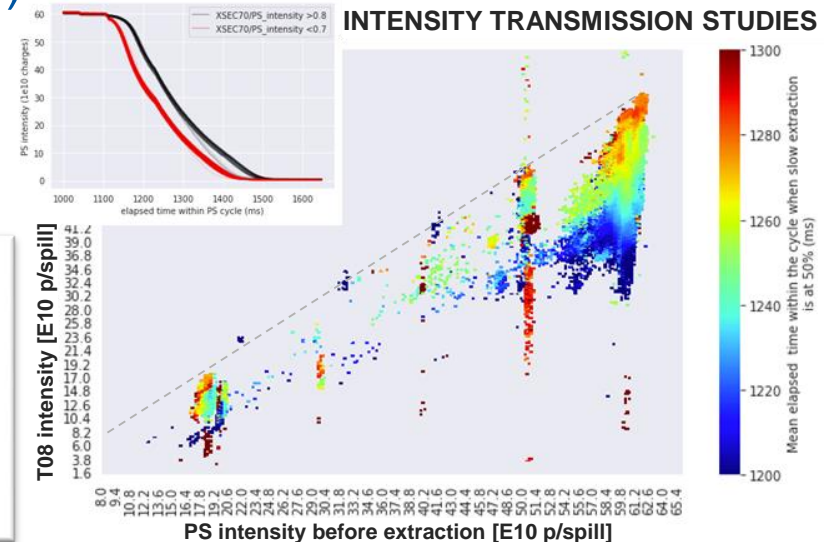
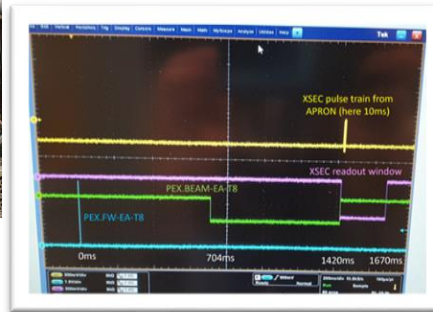
IRRAD1 SHUTTLE

CHARM TARGET



XSEC electronics for IRRAD

XSEC signals for IRRAD



IRRAD/CHARM User Run 2021

• IRRAD:

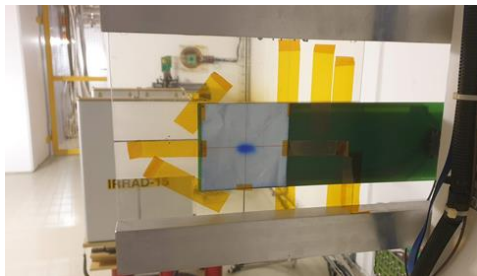
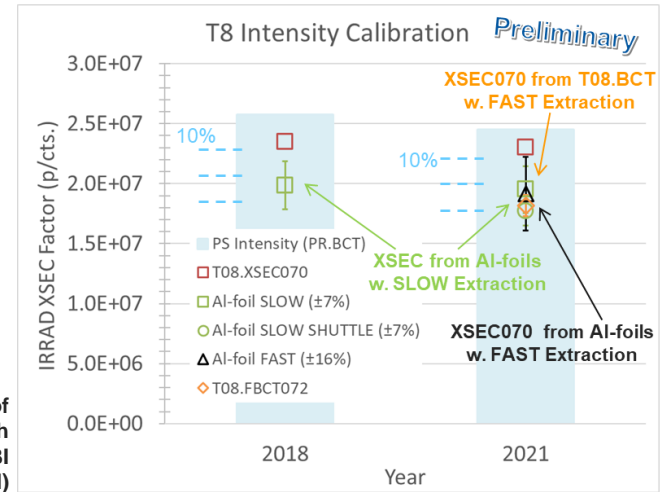
- **18 experiments; 190 samples** (262 registered)
- EP-ESE (2), TE-MSD (1), ATLAS (5^{*1}), LHCb (3), CMS (1), RD53 (2), EU/other R&Ds (2), R2E (2)
- 2 experiments postponed to 2022

• CHARM:

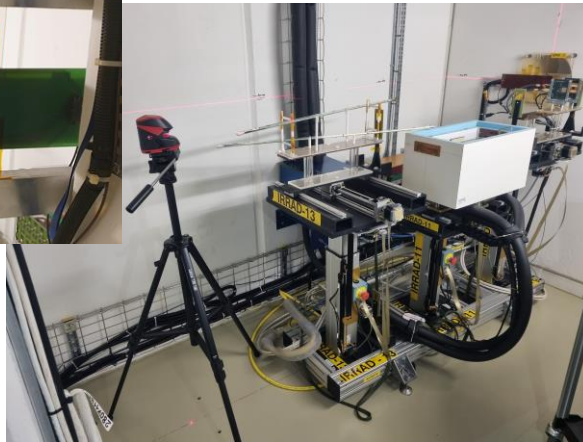
- **4 users scheduled; 7 system level tests**
- TE-VSC, SY-EPC, SY-BI, CMS BDT, several components testing by BE-CEM
- 11 users already booked for the run 2022

[*] run in cold box (-25°C)

• T08 Proton Intensity (absolute):



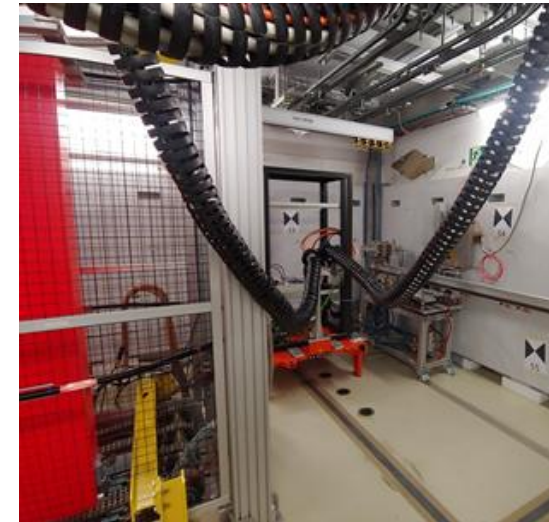
Dosimetry & alignment verification measurements in IRRAD Zone 3



Experiments installed in IRRAD Zone 2



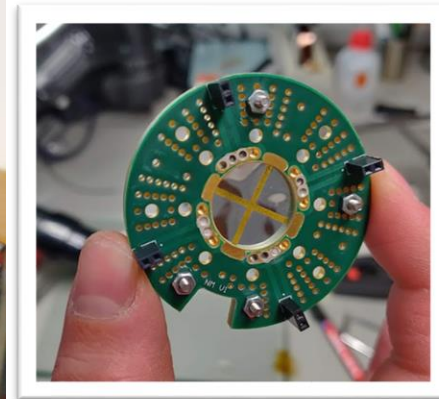
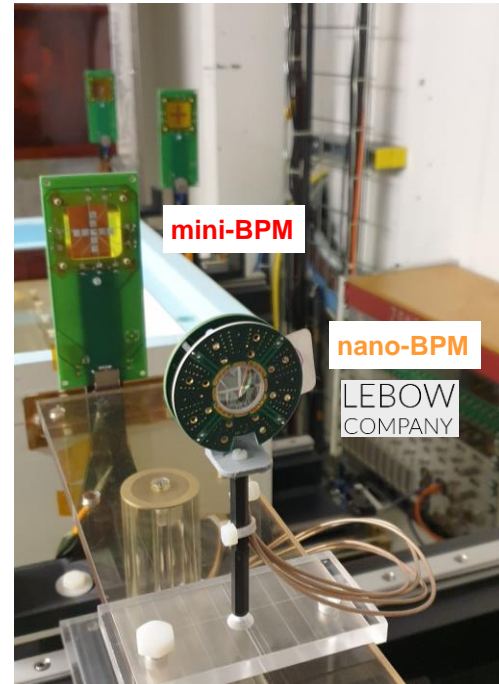
Samples installed in IRRAD Zone 3



System level test installed in CHARM

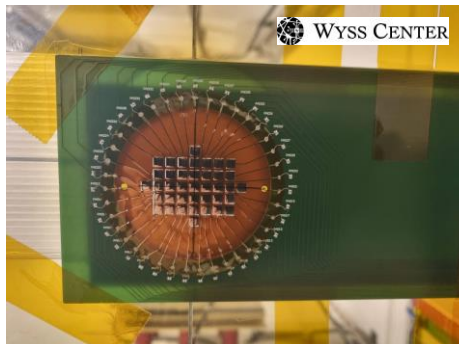
Ultra Thin Beam Profile Monitors

- EP-DT Seminar 02/21 (Ourania)
 - <https://indico.cern.ch/event/1002096/>
- Innovative Beam Profile Monitors:
 - new **mini-BPM Al/Kapton (0.3/25 μ m)** produced, tested in IRRAD, now operational
 - large pattern **micro-BPM (0.2/25 μ m)** tested
 - support the development of **nano-BPM** for AD **Al/Parylene (10/100nm)** for keV range

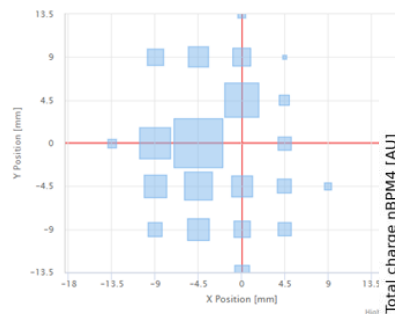


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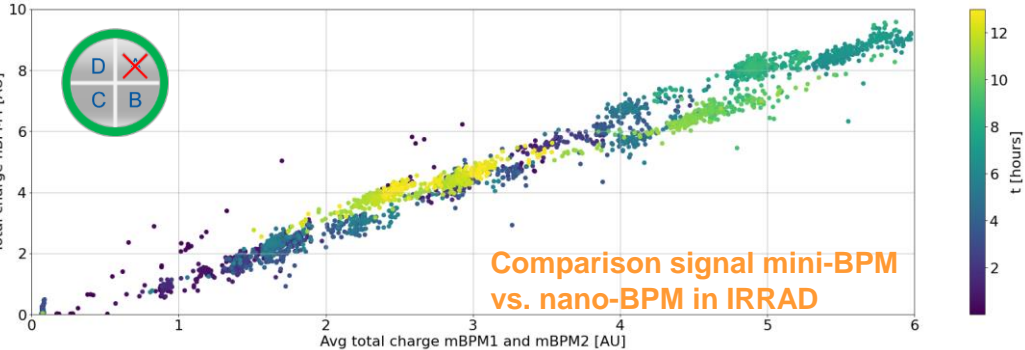
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M. Doser,
R. Caravita AEGIS EXPERIMENT



40ch. micro-BPM device



Functional test
micro-BPM (IRRAD)



Comparison signal mini-BPM
vs. nano-BPM in IRRAD

Outlook for 2022

• East Area Beam Requests 2022:

- **all beam year** during PS operation for proton / mixed-field experiments:
 - EP experiments, BE-CEM / R2E
- **2 weeks Heavy Ion run** after protons and when available from injectors
 - R2E (CHIMERA project: collaboration agreement between CERN-ESA)
- **call for user experiments beginning 2022**

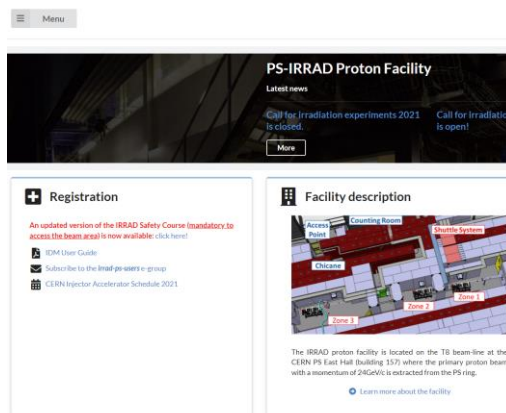
• GIF++ Beam Request 2022:

- **12 groups** submitted beam requests :
 - 3 or 4 periods of 2 weeks (**6-8 weeks**) of dedicated muon beam
- wish to have beam time spread ~ evenly throughout the year to **allow maximum irradiation time between measurements**
 - advance the ageing studies between beam slots
- **μ-beam parameters are fine**
- **beam steering to be tested**

• Run 2022 for both Facilities:

- **W13-2022:** EA physics start
- **W17-2022:** NA physics start

@ R. Steerenberg, 297th IEFC
(proposal, to be confirmed)



ATL - NSW MM
ATL - NSW sTGC
ATL - RPC
ATL - sMDT
CMS - CSC
CMS - DT
CMS - GEM
CMS - RPC
EP-DT-2
RPC Ecogas
ProTov-RPC
RE21/CBM

Stand alone irradiation

Chamber qualification

Radiation hardness of electrical and optical components

Other radiation request