

# HiRadMat at the CERN SPS

## A new powerful material test facility

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# Purpose of HiRadMat

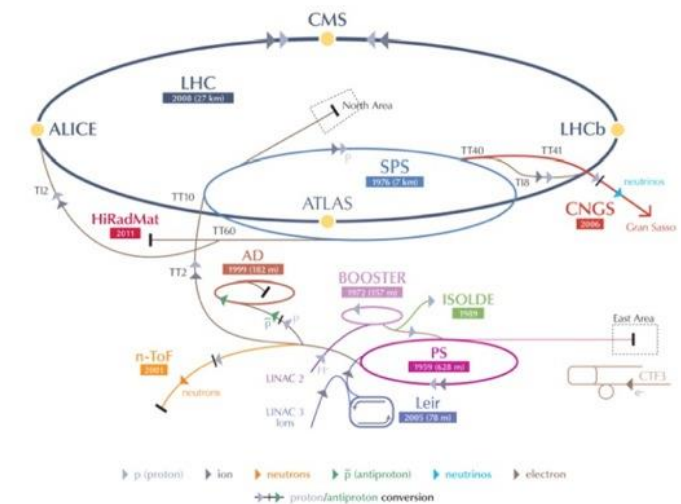
## High Radiation to Materials

- **Dedicated facility** designed, to **study the impact of intense pulsed beams** on materials

- material damage
- material vaporization
- Thermal management
- Radiation damage to materials
- Thermal shock - beam induced pressure waves

- Application areas:

- materials R&D
- high-power targetry
- benchmark tests
- (survival of) beam line components (windows, coating, vacuum)
- detector R&D
- ...



LHC Large Hadron Collider SPS Super Proton Synchrotron PS Proton Synchrotron  
 AD Antiproton Decelerator CTF3 Clei Test Facility CNGS Cern Neutrinos to Gran Sasso ISOLDE Isotope Separator OnLine Device  
 LEIR Low Energy Ion Ring LINAC LINear ACcelerator n-ToF Neutrons Time Of Flight HiRadMat High-Radiation to Materials

- **Beam testing almost independent of other accelerator activities at CERN**

- **Dedicated space/tunnel for target area**
- **Dedicated primary beam exposure**

# SPS beam parameters

- LHC injection like beam

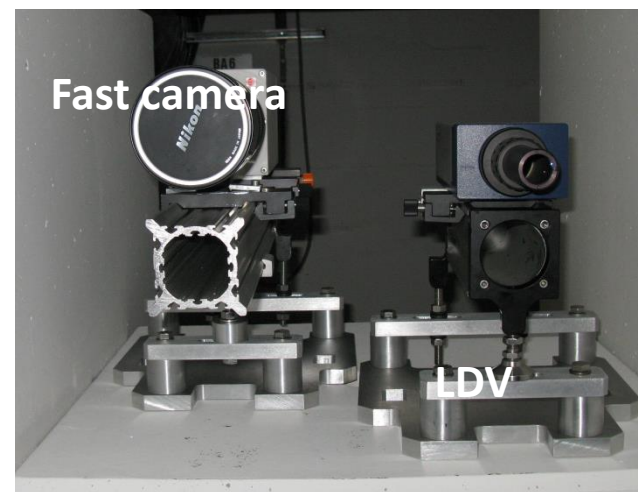
	Protons	Heavy ions (Pb82 <sup>+</sup> )
Beam Energy	440 [GeV]	173 [GeV/u], 36.1 [TeV/ions]
Pulse energy	up to 3.4 [MJ]	up to 21 [kJ]
Bunch intensity	$3 \times 10^9$ to $1.7 \times 10^{11}$ [protons]	$3 \times 10^7$ to $7 \times 10^7$ [ions]
Number of bunches	1 to 288	52
Max intensity	$4.9 \times 10^{11}$ [protons]	$3.64 \times 10^9$ [protons]
Bunch length	11.24 [cm]	11.24 [cm]
Bunch spacing	25, 50, 75 or 150 [ns]	100 [ns]
Pulse length	7.2 [ $\mu$ s]	5.2 [ $\mu$ s]
Cycle length	18 [s]	13.2 [s]
Beam spot at the experiment	variable around 1 [mm <sup>2</sup> ]	variable around 1 [mm <sup>2</sup> ]

- Annual ion budget limited to  $\sim 10^{16}$  pot.

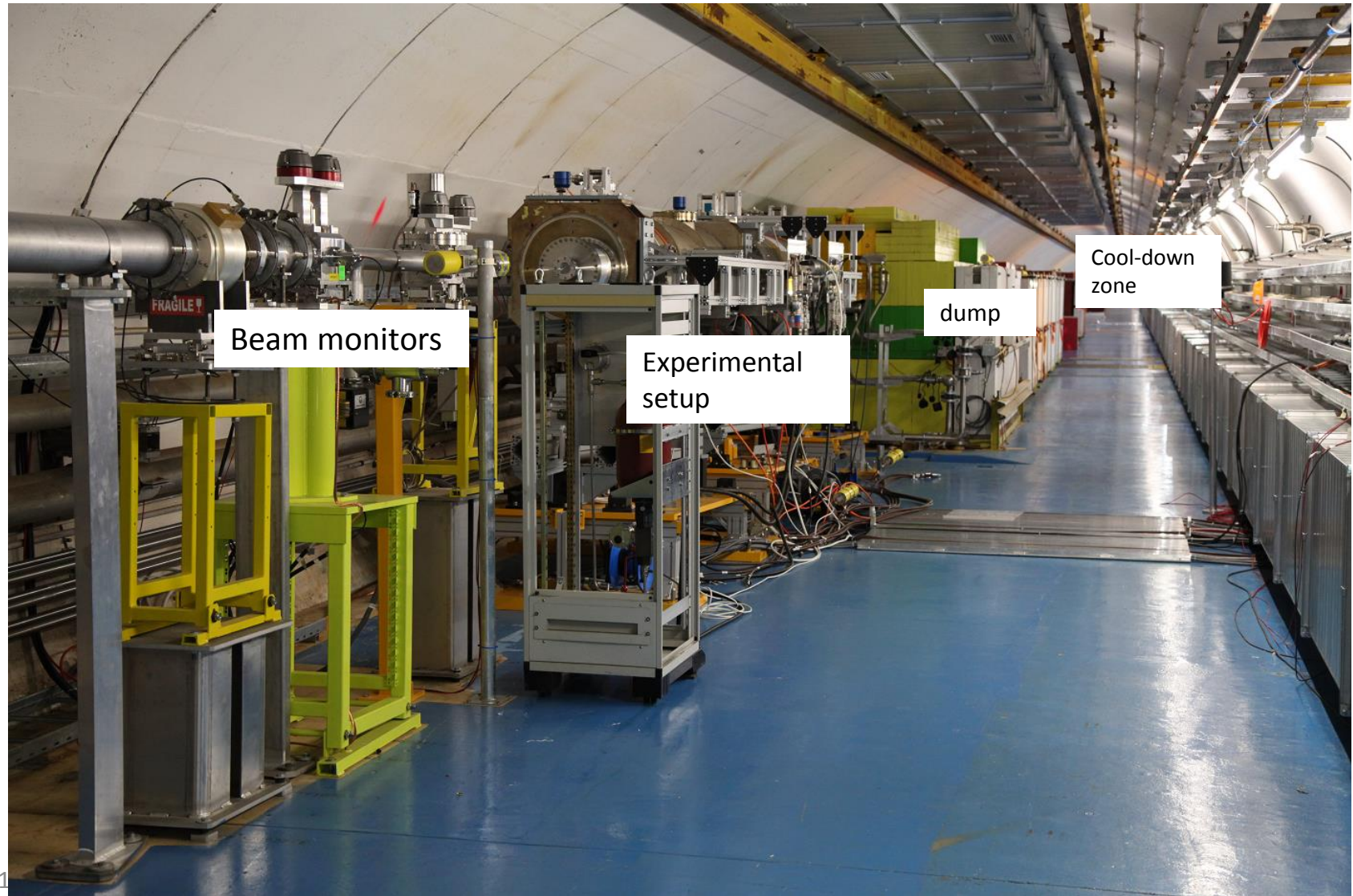
# Facility services

## Provision of dedicated infrastructure

- Preparation lab
  - Same interfaces as in the tunnel
- Control room
- Irradiation position
  - Standardized installation (remote)
  - General supplies (water, electricity, cabling)
  - Beam monitoring
- Observation tools
  - Fast camera, LDV (EN/STI), BLMs (diamond)
- Application/installation at CERN
- Support in safety aspects



# Target area



# An Experiment in HiRadMat

## Approval process for experiments

- Submit application for HiRadMat beam time (~August)
- Application = scientific interest (1-2 pages), pulse list, installation sketch, preliminary safety documents
- Initial discussion with Facility Management
- Feasibility of installation, compatibility with existing infrastructure
- Review by HiRadMat Scientific Board
- Evaluate the scientific interest of the experiment, feasibility, online and post-irradiation analysis, obtained results and publications
- establish experiment list for each running period ---> beam slot in the schedule
- From beam slot to scheduled beam schedule - HiRadMat Technical Board
- safety review : interview with safety officials, safety file (includes dismantling)
- beam review : interview with beam operations and CCC
- technical review : interview with HiRadMat technical coordination
- positive recommendation of all above validates the beam slot allocation to the schedule

## Beam time

**Dismantling - analysis of results - feedback on publications to HiRadMat Scientific Board**

VISIT <http://cern.ch/hiradmat>

# Facility upgrades in 2013

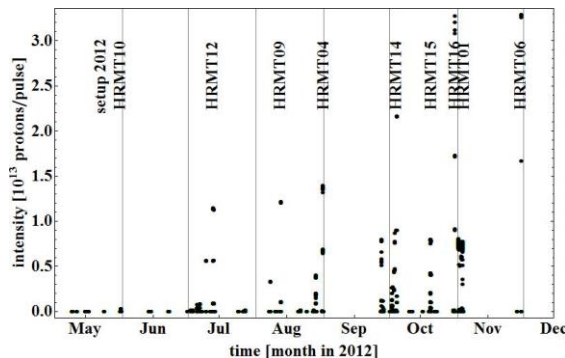
Based on experience gained during 2012:

- Extending the general infrastructure
  - Additional cables for signals, vacuum and 220V; to be installed in autumn 2013
- Fast trigger signal synchronous with the beam
- Adding a beam position monitor
  - High precision alignment to experimental tables
  - Based on pCVD diamond detectors
- Upgrading the fast camera system

Suggestions are welcome.

# Outlook

- Call for new experiment proposals by summer 2013
  - Experiments need preparation time
  - For any discussions we are open right away!
- Upgrading the facility during SPS shutdown 2013/2014
- SPS beam will return after LS1: Protons in autumn 2014, Argon ions early 2015



Continue the success of 2012!

HiRadMat is participant to the EuCARD<sup>2</sup> Transnational Access program - some financial support to experiments available.