Task 2.5 Service Improvements

Task 2.5.1 Streamlined access - coord. Paweł Napiorkowski (Warsaw)
Task 2.5.2 Targets - coord. Manuela Cavallarro (LNS)
Task 2.5.3 FLASH - coord. Marco Durante (GSI)
Task 2.5.4 ERIBS - coord. Hannu Koivisto (JYFL)
Task 2.5.5 INTRANS - coord. Magda Górska (GSI)

Marco Durante, GSI & TUDa

This project has received funding from the European Union's Horizon Europe Research and Innovation programme under Grant Agreement No 101057511.

EURO-LABS: Streamlined Access

WP2.5 Service Improvements, C1) Streamlined and Remote Access

Part of **WP2.5** Service Improvements, **C1) Streamlined** and Remote **Access**

Improvement of accessibility to European accelerator facilities

The implementation of a database and related webpage containing relevant information from all EURO-LABS accelerator nuclear physics facilities by a single-point access for TA proposal submission

The main goals

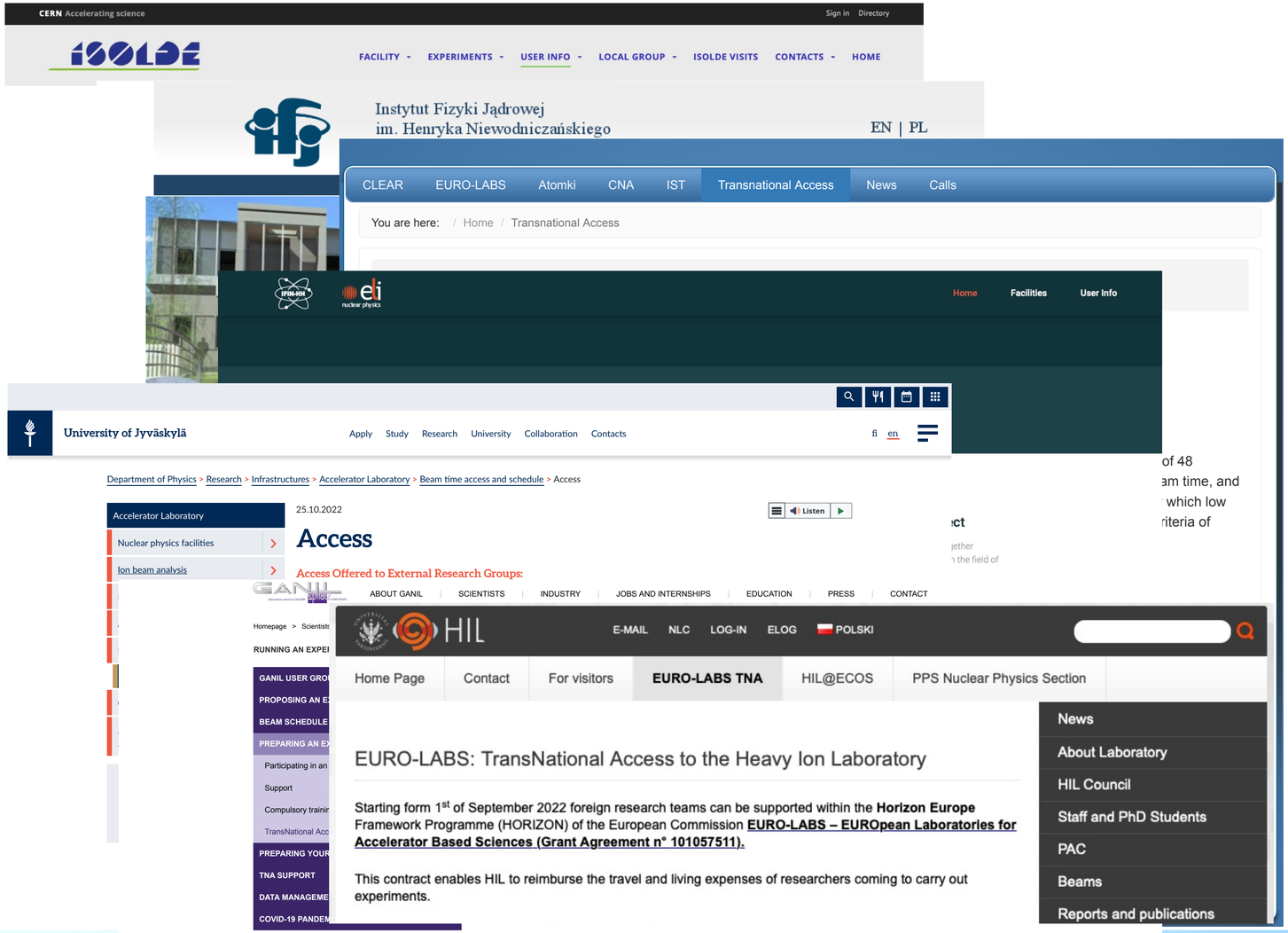
- improved dissemination of facility characteristics efficient use of available resources
- streamlined proposal submission and complied information on the accepted proposals and the beam-time allocation
- unified forms for the supported personal access to the TA experiments and comprehensive database of the TA support usage
- minimisation of required access and fostering of off-site participation

The first three items will be developed in close synergy with the **Dissemination objectives** of the whole project (WP5.1)

Implementation: 24 PersonMonth for € 72 000, **D2.5:** Report on the Service Improvements in 36 month

EURO-LABS: Streamlined Access

WP2.5 Service Improvements, C1) Streamlined and Remote Access



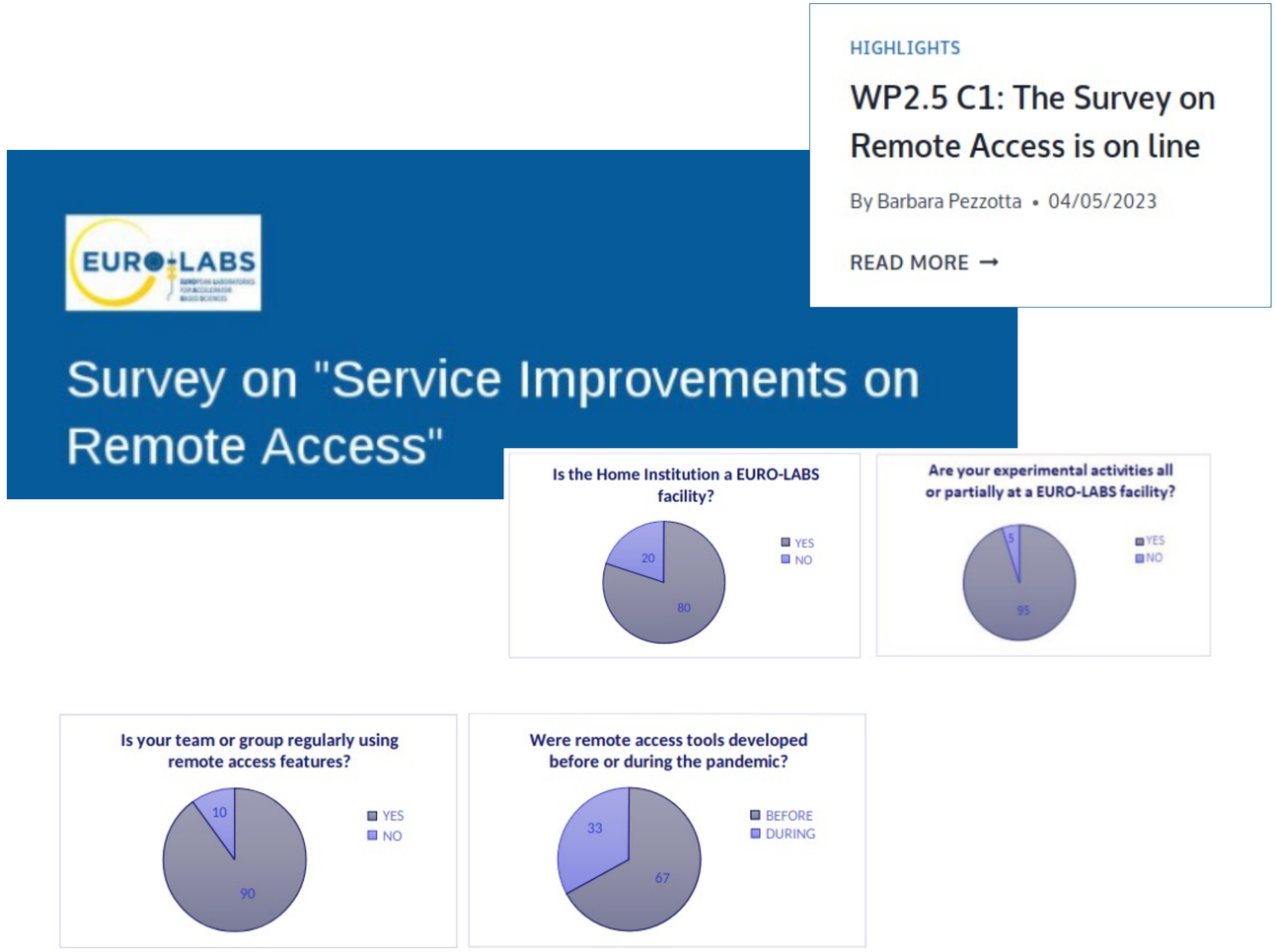
- ✓ Review of research opportunities offered by EUROLABS WP2 facilities
- ✓ Review of the conditions for submitting applications to various laboratories,
- ✓ Review of TNA support options offered by EUROLABS WP2 centres.
- ✓ Collection of forms required by the different facilities

- ✓ First content plan for the future website was created

- New team memeber **Paulina Sekrecka, M.Sc.** will create a website in technology compatible with the Wordpress engine

EURO-LABS: Streamlined Access

WP2.5 Service Improvements, C1) Streamlined and Remote Access



- ✓ Comprehensive web-based survey of current Remote Access tools and community needs carried out in Q1 2023
- ✓ Survey results published within Remote Access Definition of Scope document in April 2023
- ✓ Formulation of detailed Technical Roadmap ongoing
- ✓ New Team Member Dr. Nic Hubbard began work on Remote Access database in Q3 2023
- ✓ Preliminary outline and strategy for database infrastructure complete

Subtask 2.5.2 «Targets»

Why?

Different research areas and applications require high-quality targets:

- **Fundamental physics (nuclear reaction studies, nuclear data measurements, etc.)**
- **Production of strippers and neutron converters**
- **High quality standard medical radioisotope production**
- **…**

The main Goal

Gather the community of European “nuclear target makers” having specific expertise in the field of target manufacturing and characterization, both for nuclear and applied physics purposes

Activities:

1. **Study of existing and novel materials - enriched isotopes including actinides, alloys, doped materials, highly oriented pyrolytic graphite to withstand high working temperatures, low-Z target at cryogenic temperatures, implanted targets etc.**
2. **Improvement of current and development of novel fabrication techniques - Vacuum deposition, Spark Plasma Sintering, High-Energy Vibrational Powder Plating, Ion Implantation, drop-on-demand deposition etc.**
3. **Target characterization procedures - Scanning Electron Microscopy, Energy-dispersive X-ray spectroscopy, X-ray photoelectron spectroscopy, Rutherford Backscattering Spectroscopy, Particle Induced X-ray Emission, infrared and Raman Spectroscopy, Alpha-particle Transmission Spectroscopy, Inductively Coupled Plasma – Mass Spectrometry, electron-beam diagnostics during irradiation etc.,**
4. **Sharing of knowledge**

Institutions involved in subtask 2.5.2 «Targets»

12 Institutions, 7 Countries, 50 Researchers

Short Name	Participant organization name	Facility	Country
	Beneficiaries		
INFN	**Istituto Nazionale di Fisica Nucleare**	INFN-LNS	Italy
INFN	Istituto Nazionale di Fisica Nucleare	INFN-LNL	Italy
INFN	Istituto Nazionale di Fisica Nucleare	INFN- Turin	Italy
GSI	**Helmholtzzentrum für Schwerionenforschung GmbH**	GSI	Germany
UNIWARSAW	**Uniwersytet Warszawski**	SLCJ	Poland
GANIL	**Grand Accélérateur National d'Ions Lourds**	GANIL	France
CNRS	Centre National De La Recherche Scientifique	**CNRS - IJCLab**	France
CNRS	Centre National De La Recherche Scientifique	**CNRS - IPHC-Strasbourg**	France
CEA	**Commissariat à l'Énergie Atomique et aux Énergies Alternatives**	Saclay	France
IFIN	Institutul National de Cercetare-Dezvoltare Pentru Fizica si Inginerie Nucleara-Horia Hulubei	**IFIN-HH Tandem**	Romania
	Associated Partners		
LIP	Laboratório de Instrumentação e Física Experimental de Partículas	LIP	Portugal
PSI	**Paul Scherrer Institut**	PSI – Lab. of radiochemistry	Switzerland

Outcomes and milestones

Fostering the connection between different nuclear physics institutions in Europe and associated countries with the aim to create and maintain a distributed infrastructure for target development, production, and characterization.

Feedback and exchange of information among researchers involved in

- **Target developments**
- **Target fabrication**
- **Target characterization**
- **Final use**

Connection with

INTDS International Nuclear Targets Development Society

Milestones

Month 3 Production of a **report to define the state of the art** in the field and collect the requests from the community

Fulfilled

Month 18 **Creation of a database** containing the information about the preparation and the characteristics of available targets and those newly developed in various laboratories within this subtask

Work in progress

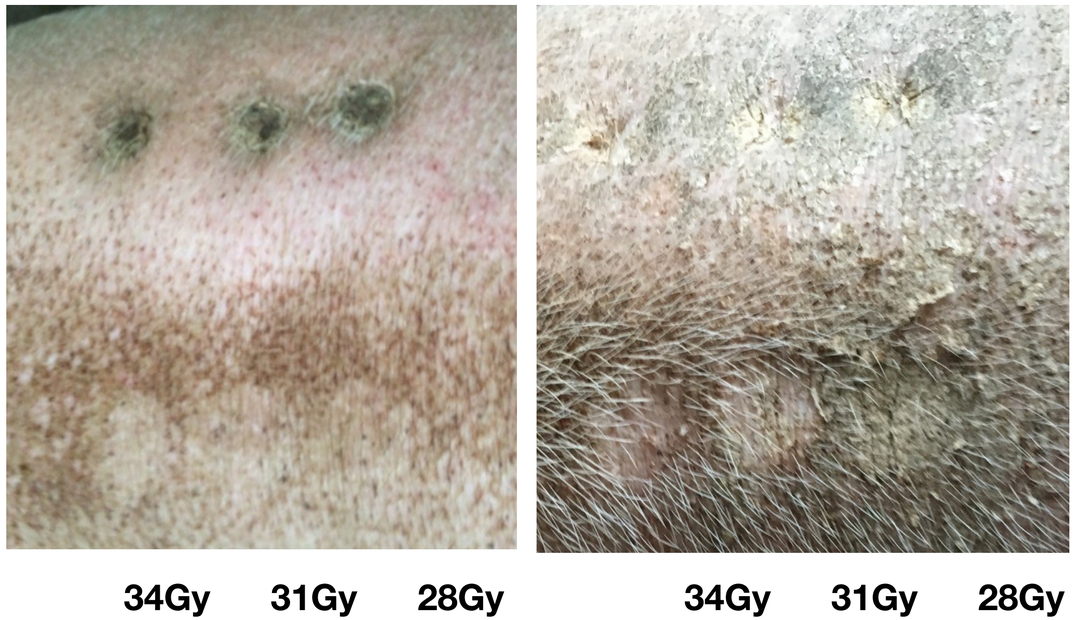
Just hired one of the planned post-docs (LNS), for the second one (GANIL) the hiring procedure is ongoing.
Start working on the definition of the database, structure and content

Sub-task 2.5.3: FLASH

9 mo post-RT **3 years post-RT**

CONV

FLASH

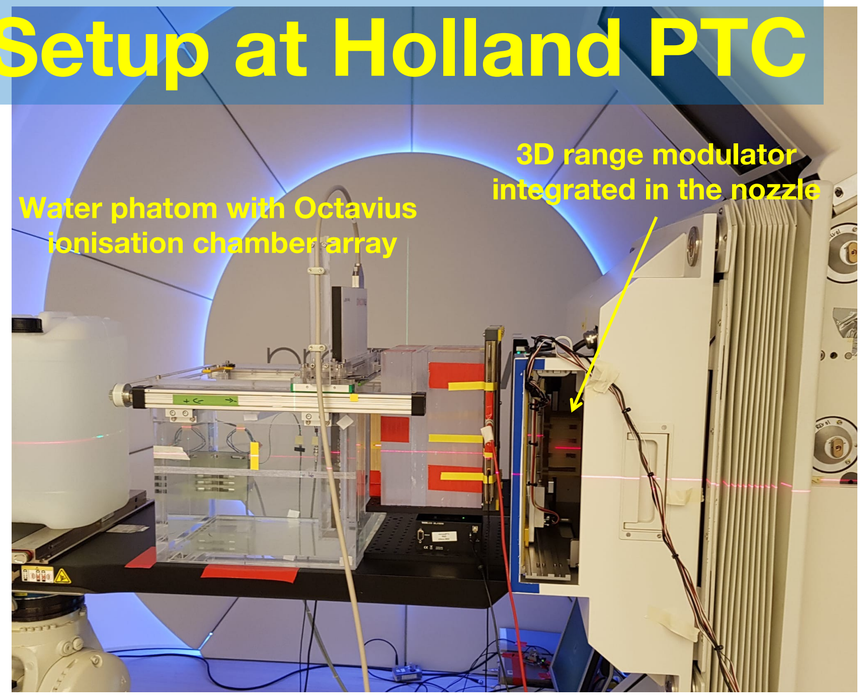


34Gy 31Gy 28Gy **34Gy 31Gy 28Gy**

Vozenin, Bourhis & Durante, *Nat. Rev. Clin. Oncol. 2022*

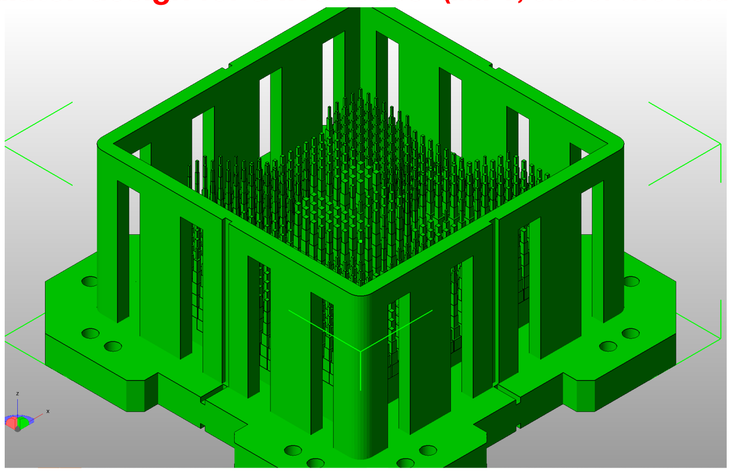
GSI – VARIAN cooperation

Setup at Holland PTC



Last test campaign @ Holland PTC (Delft), 15.-18.9.23

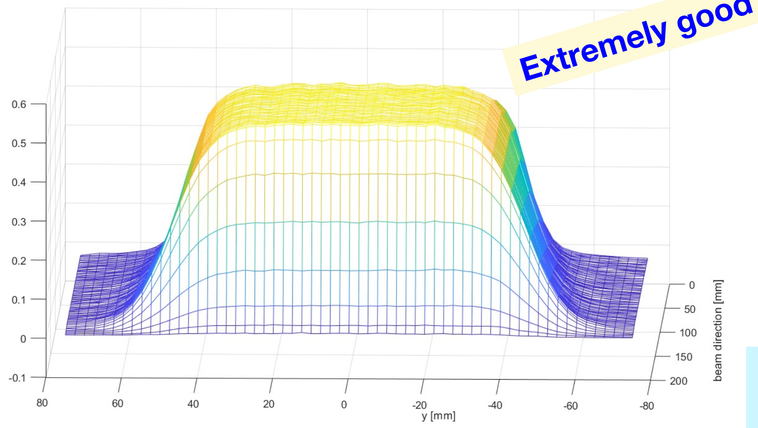
Modulator design for a liver case (IMPT, one of two fields)

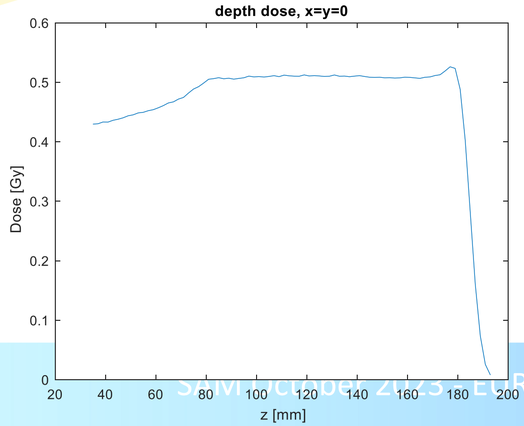


Dose verfication with > 60.000 dose points

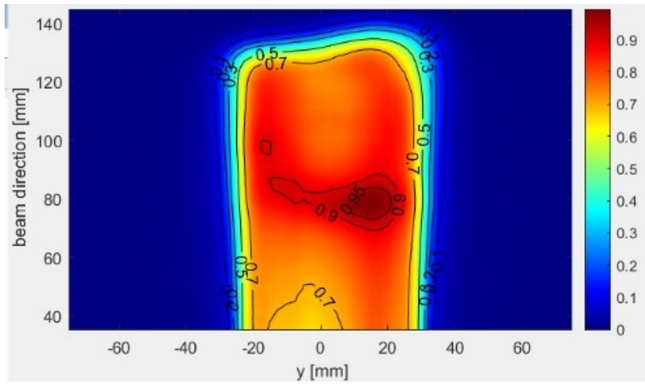
Measured 3D dose for a flat dose cube (10 cm SOBP)

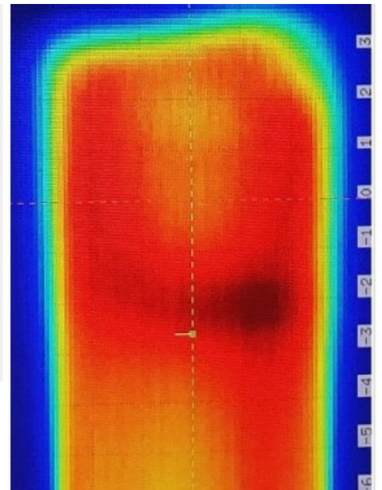
Extremely good homogeneity





Comparison Measurement vs. Monte Carlo)
For a clinical IMPT treatment plan (liver case)





- Testing IC and pinpoint thimble chambers for **FLASH dosimetry** in different facilities
- Improving the **non-linear dose reading** affected from UHDR beam

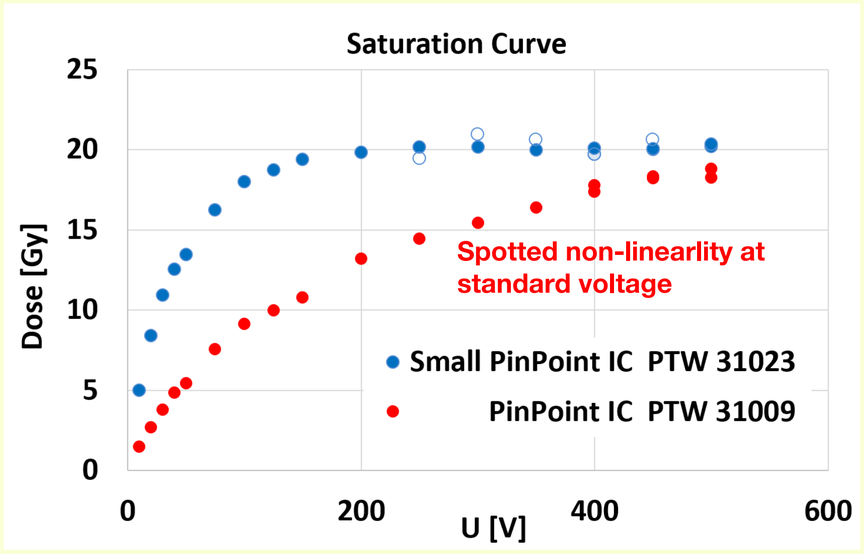
TECHNISCHE UNIVERSITÄT DARMSTADT

Warisara Charuchinda
February 2023-present
Ph.D. student

GSI

Biophysics department
Radiation physics group

- Mini-Pinpoint Showing tremendously reduced saturation effects
- However! Mini-PinPoint might also not work as well at **even higher dose rates!**



Farmer chamber

Sensitive volume: 0.6 cm^3

- Standard IC for absolute dosimetry
- Vented to air

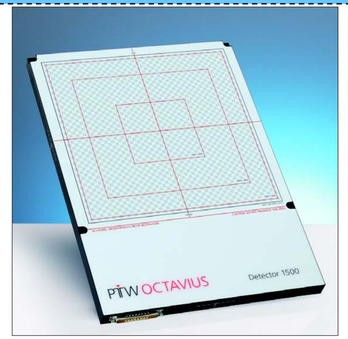
Sensitive volume: 0.03 cm^3

PinPoint chamber

Sensitive volume: 0.015 cm^3

Mini-PinPoint chamber

- **Testing smaller thimble chamber** (stronger field strength could reduce ion recombination effect)



Octavius: IC arrays detector

ERIBS: European Research Infrastructure - Beam Services

Objective: ***improve the properties and variety of available ion beams to better service the scientific program of the EURO-LABS research infrastructures***

Ion source team	Country
ATOMKI	Hungary
CNRS-IPHC	France
GANIL	France
GSI/FAIR	Germany
JYFL (coord.)	Finland
INFN (LNS+LNL)	Italy
UMCG-PARTREC	The Netherlands
CNRS-LPSC (associate partner)	France

Tasks to improve:

- **Ion beam variety and production efficiency (Task 1)**
- **Short and long-term ion beam stability (Task 2)**

- **Coordinator: H. Koivisto (JYFL)**
- **Deputy coordinator: V. Toivanen (JYFL)**
- **Leader of task 1: A. Galata (INFN-LNL)**
- **Leader of task 2: R. Kremers (UMCG-PARTREC)**

Steering committee: Benoit Gall (CNRS-IPHC), Fabio Maimone (GSI), Richard Racz (ATOMKI), Ville Toivanen (JYFL)

Funded by the European Union

Task 2.5.4.1: Ion beam variety and production efficiency

New metal ion beams by:

- Improving ovens beyoned the present capabilities (inductive oven, foil oven, GANIL HT oven, etc.)
- Developing new MIVOC (Metal Ion beams from VOlatile Compounds) beams
- Developing axial sputtering which is presently largely unavailable in Europe
- Optimization work for production efficiency

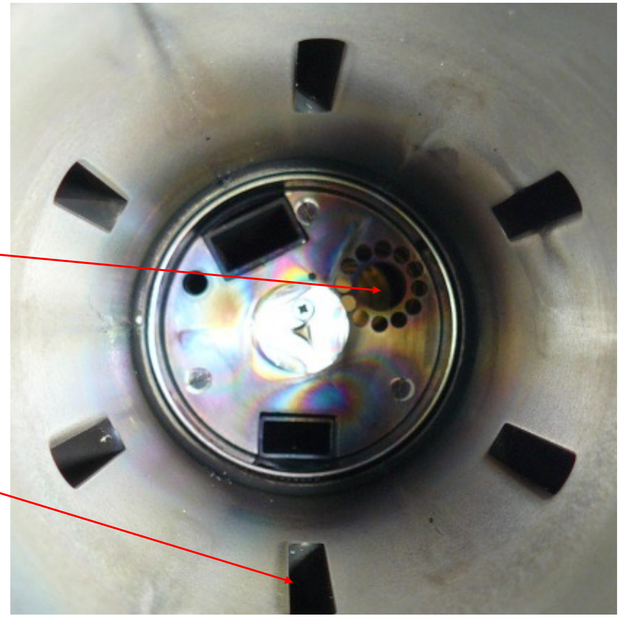
Test bench

ø26 oven tested
2500 °C reached

New ø20 oven

Possible port/access for axial sputtering

Port for radial sputtering: typically not available



View from the extraction side of plasma chamber

Task 2.5.4.2: Short and long-term ion beam stability

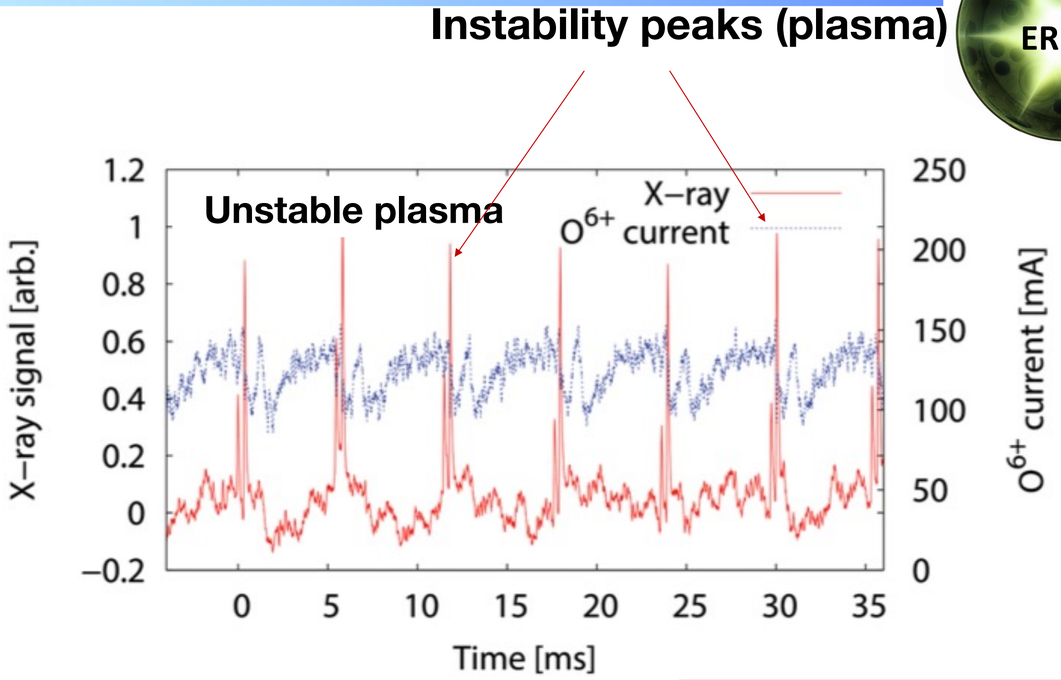
Short-term beam stability

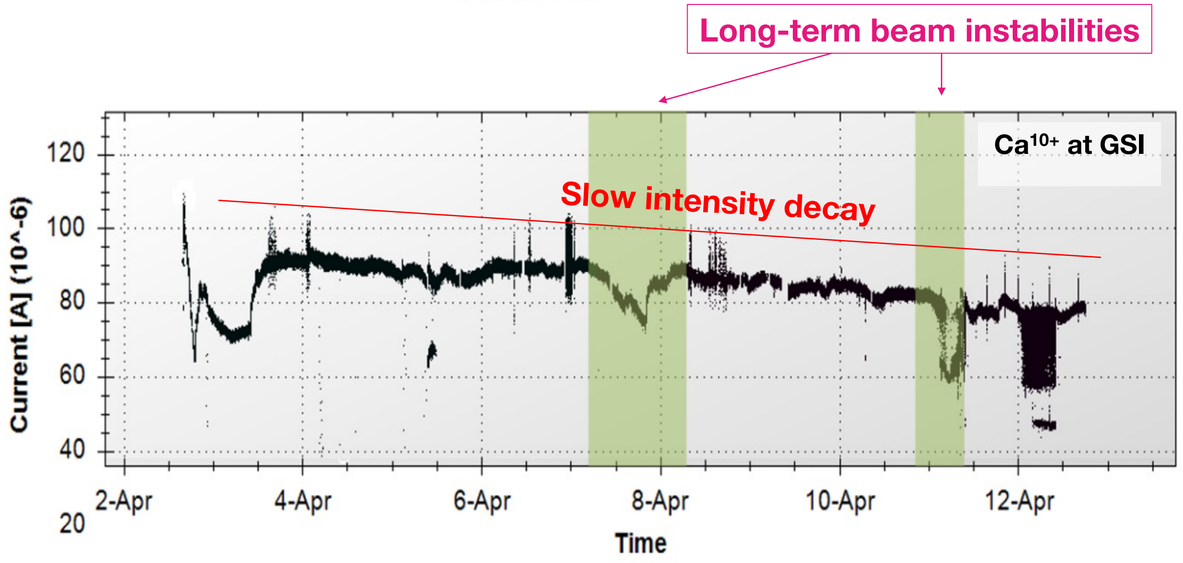
- Short-term beam instabilities are typically caused by plasma
- They have detrimental impact on the intensities of highly charge ion beams and they can also be the origin of beam contaminants
- Monitoring method for plasma instabilities is needed
  - Feedback and level of action (to restore stable plasma)
  - Methods to avoid/mitigate plasma instabilities

Long-term beam stability

- Monitoring of parameters and responses (intensity, plasma parameters, etc.)
- Feedback and level of action (alarm, suggestion, automatic reset of preset parameters, etc.)

MS15: *"Conceptual plan for online monitoring of long-term operation beam stability" report has been completed.*





Task 2.5.5: InTraNS

Instrumentation and Training for accelerator based Nuclear Spectroscopy and Reaction Dynamics

https://web.infn.it/EURO-LABS/intrans

An Initiative for Detectors and Training

GAMMAPOOL
European Ge Detectors Laboratories
Forming together and Building bridges between communities

Integrating Communities

Nuclear Spectroscopy Reaction dynamics

- to exploit synergies and complementarities on experimental methods, instrumentation and techniques for frontline research
- to train new generation of researchers and technical staff to better exploit the experimental tools

INTRANS: Participants

Steering committee: A. Boston, E. Clement, J. Eberth, A. Gadea,

M. Górska, K. Hauschild, S. Lenzi, A. Lopez-Martens, D.R. Napoli

The collaborations involved in this proposal are the builders of the following travelling instrumentation:

AGATA, FATIMA, GRIT, NEDA, PARIS, GAMMAPOOL

The institutions involved in this proposal are:

INFN (LNL, LNS, Padova, Milano, Firenze, Napoli, Catania, Perugia), IN2P3, CNRS, ICEA, GANIL, IRFU, IJCLab-Orsay, IP2I-Lyon, IPHC-Strasbourg, JLU, FAIR/GSI, U-Köln, TU-Darmstadt, STFC Daresbury, U-Liverpool, U-Manchester, U-Birmingham, U-Surrey, U-York, U-West Scotland, U-Lund, KTH Stockholm, U-Uppsala, JYFL, HIL-Warsaw, U-Warsaw, IFJ-PAN Krakow, NIPNE Bucharest, ININ-HH/ELI-NP, Demokritos-Athens, IFIC-Valencia, U-Huelva, UAM-Madrid, U-Huelva, U-S. de Compostela, GFN-U-Complutense-Madrid, U-Salamanca, IEM-CSIC, ATOMKI- Debrecen, ELI-NP, HIM, KU Leuven, UMAN, INRNE-BAS, UCO, LMU.

AGATA Analysis Workshop 2023

The workshop has been organized in the Legnaro **National Laboratory of INFN in** September 11-15, 2023 in the framework of the training activities supported by INTRANS (Euro-Labs)

The goals were to provide the skills for an optimal employment of the AGATA setup for the nuclear gamma spectroscopy and nuclear reactions communities, organized in the framework of EURO-LABS.

The lectures were followed by hands-on sessions on data analysis:

- **Local Level Processing (Jeremie Dudouet)**
- **Introduction to ancillary analysis (Daniele Brugnara)**
- **Data analysis software (Jeremie Dudouet)**
- **Preprocessing calibration (Rosa Maria Perez Vidal)**
- **Post-Pulse shape analysis (Rosa Maria Perez Vidal)**
- **PRISMA magnetic spectrometer: steps of the analysis with examples (Franco Galtarossa and Elia Pilotto)**
- **Global data replay (Jeremie Dudouet)**
- **Selector (Daniele Brugnara)**
- **Ancillary detectors analysis (Matus Balogh and Daniele Brugnara)**
- **Tracking (Araceli Lopez-Martens)**

The workshop was followed by more than 50 participants.

Task 2.5.5: InTraNS Plans 2024

https://web.infn.it/EURO-LABS/intrans/

https://web.infn.it/EURO-LABS/

Workshop on future campaigns using traveling detectors including AGATA

INTRANS Workshop

22-25 January 2024

IJCLab, Orsay, France

Chair: A. Lopez-Martens

- **School for experts in Legnaro in 2024 on detector repair training**
- **School for non-experts Ge detector (use and simulations) in Liverpool (financial support from Germany-INTRANS).**

MS12	Completed database containing selected features of remote-access toolkit	2.5	18	Database validated and web-interface released
MS13	Production of a report to define the state of the art in the field (targets for NP) and collect the requests from the community.	2.5	3	Report complete and available
MS14	Reports on FLASH detectors for different facilities	2.5	18	Report complete and available
MS15	Conceptual plan for online monitoring of long-term operation beam stability	2.5	12	Report of conceptual plan released
MS16	Organisation of hands-on workshops & training schools	2.5	30	Website for training events available

Zrzut ekranu

Thank you very much!