Status and Outlook of WP04 “Roadmap and Pre-design of Future Irradiation Facilities”

R. Versaci (ELI BEAMLINES), P. Pelissou (CERN), F. Ravotti (CERN), S. Danzeca (CERN), I. Zymak (ELI BEAMLINES)

RADNEXT 3rd Annual Meeting 10 June 2024 https://indico.cern.ch/event/1348465/

Contact: roberto.versaci@eli-beams.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No **101008126**

WP04 goals and tasks

- **Main objective:**

  Define long term scientific and industrial **needs for irradiation facilities** based on key parameters, considering inputs from relevant research groups and industrial community

- **Key tasks' description:**

  - Task 4.1: WP Coordination and Communication

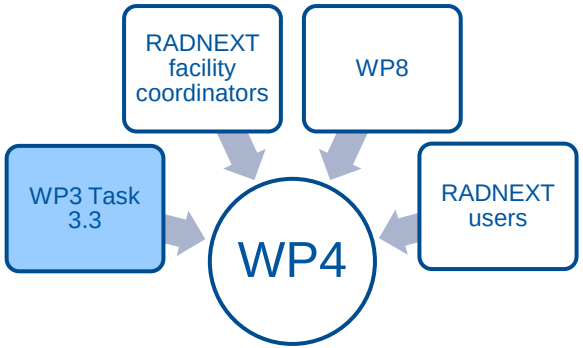
  - Task 4.2: Identify limiting factors of current irradiation facilities and propose solutions for the upgrade of existing infrastructures and the development of future ones **(D4.1 and D4.2, M20)**

  - Task 4.3: Investigate innovative solutions for current irradiation facilities **(D4.3, M30)**

  - Task 4.4: Design study of new irradiation facilities **(D4.4, M40)**

Update International Irradiation Facility Compendium

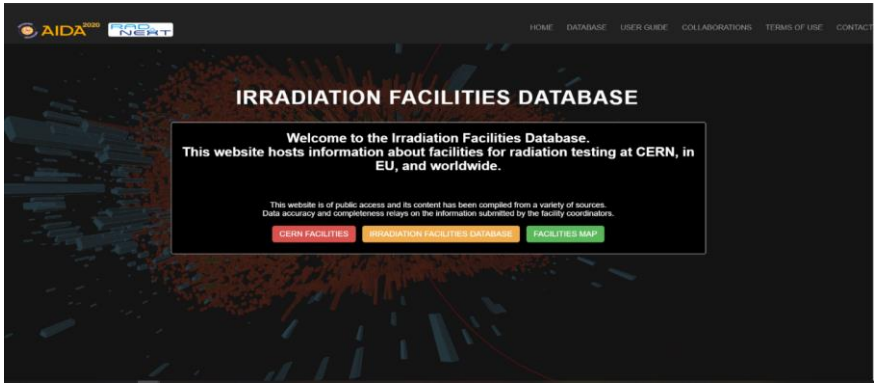
- Aims to maintain comprehensive, up-to-date, global irradiation facilities list
- Strong synergies with WP3 to retrieve facilities info and feedback
- **Focus**: Facilities + parameters (fundamental for KPI analysis)
- **Update Process**:
  - Thorough review & update of existing facility info
  - DB expanded to include facilities new and outside Europe
  - Improved DB portal backend and frontend for better user experience



Irradiation Facility Compendium and database

- **Future Directions:**
  - Constant updates and maintenance to ensure data accuracy (233 entries as of Friday)
  - Promoting the database to increase its use by the radiation effects community.
  - Ensuring long-term reliability and relevance of the database information

A unified entry point for **worldwide irradiation facilities** with an essential collection of information https://www.cern.ch/irradiation-facilities/

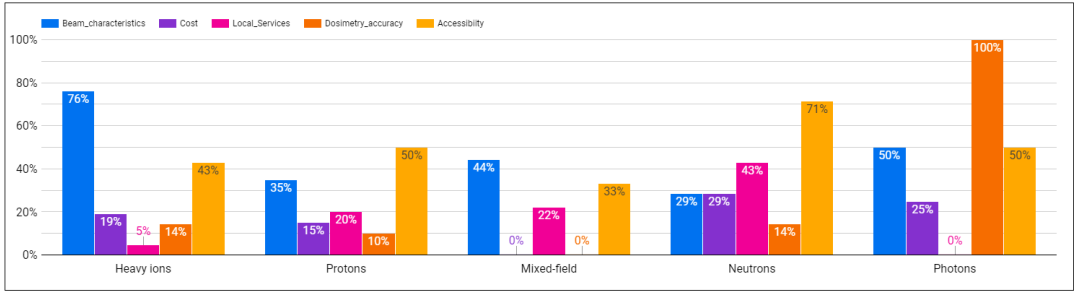


Key Performance Indicators for Current and New Facilities

Assessing RADNEXT facilities through KPIs

Objectives

- Collect user needs for radiation testing
- Evaluate RADNEXT facilities based on KPIs
- Identify limitations and propose improvements



See P. Pelissou's presentation on Wednesday

4 use cases

- Sensors and Detectors
- Electronics components
- Electronic System and Tests
- Materials

5 radiation field types

- Heavy Ions
- Protons
- Neutrons
- Photons
- Mixed fields

Key Performance Indicators Evaluation

KPI used:

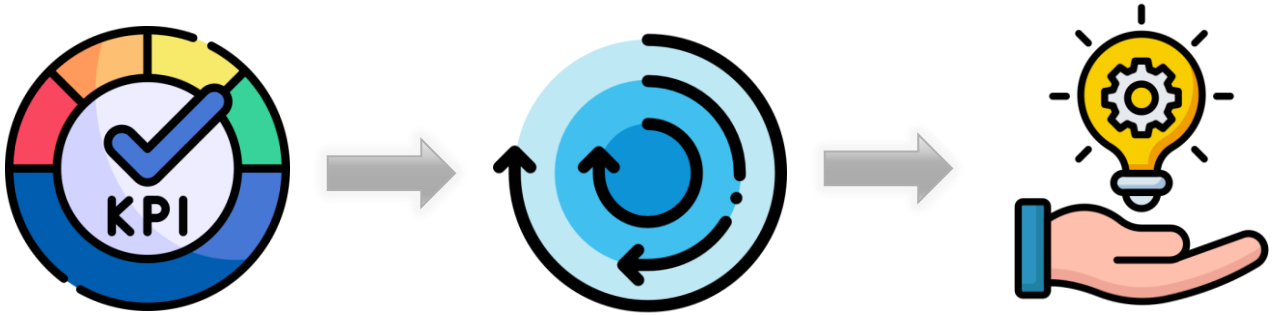
- High dose rate/flux capability
- Large volume/surface area testing
- High Energy/mixed energy fields
- High availability
- Services & environmental control
- Penetration in matter
- Low cost per irradiation unit
- Post-irradiation services

Limitations identifies:

- Facility availability
  - Gap between beam-time access and user needs
- Beam parameters
  - Need for better beam stability, intensity, and penetrations depth
- Services
  - Demand for improved facility services and remote access options

Future Solutions for Current Irradiation Facilities

- Focus on enhancing current irradiation facilities to meet user needs
- Future needs
  - Development of the space market (**New Space**)
  - Emergence of new components with higher sensitivity and complexity
- Possible solutions?



Issues and Solutions for Current facilities

- **Facility availability**
  - **Issue**: Gap between beam-time access and user needs
  - **Solution**: Improve communication channels to users,
    enhance coordination between existing facilities,
    explore alternative facilities (e.g. LPA, see R. Versaci's presentation on Thursday)

- **Enhancement of beam parameters**
  - **Issue**: Need for better beam stability, intensity, and penetration depth
  - **Solution**: Implement KPIs for beam monitoring and feedback to users,
    deploy more monitors, develop new monitors

Issues and Solutions for Current facilities

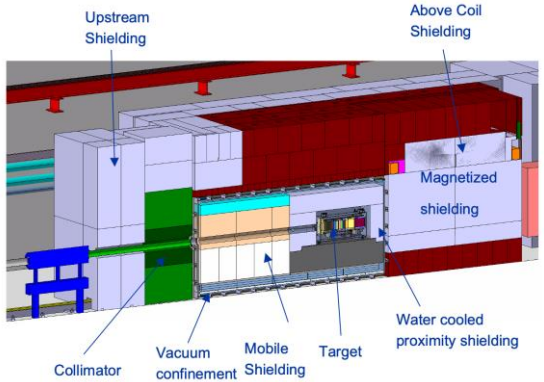
- **Services provided by facilities**
  - **Issue**: Need for better logistical support and remote facility access
  - **Solution**: Simplify access to information about beam parameters (e.g. beam logs), standardization of methodologies (e.g. NIEL sensors, dosimetry); standardization of devices, enlarge irradiation areas (e.g. larger samples); develop remote access systems for digital platforms and virtual visits (see A. Scialdone's presentation on Wednesday)

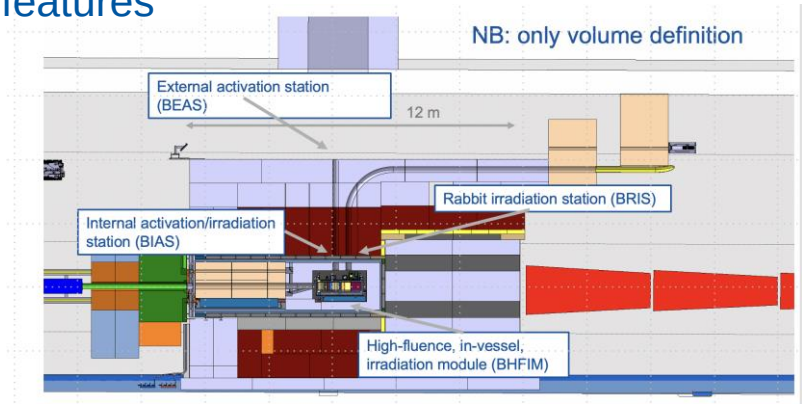
Design study of new irradiation facilities

- **IFMIF-DONES** (see W. Krolas' presentation on Wednesday)
- **LPA** (see R. Versaci's presentation on Thursday)
- **CERN BDF**

  KPIs identified in D4.2 used to:

  - Assess and evaluate tests positions
  - Highlight and analysis constraints and features





Deliverables

Status	ID	Title	Deadline	Responsible (s)
Completed	D4.1	Report on key performance parameters and limiting factors for current facilities	30/01/2023	P.Pelissou
Completed	D4.2	Updated international irradiation facility compendium	30/01/2023	P.Pelissou
Completed	D4.3.	Report on the solutions to overcome the technological and accessibility limits for present facilities, including analysis on virtual and remote irradiation access	30/11/2023	P.Pelissou
In work	D4.4	Design report on advanced technologies to be implemented in future beam and mixed-field irradiation facilities.	30/11/2024	-

Milestones

Status	ID	Title	Deadline	Responsible (s)
In Work	M4.1	Prototype of remote access to FPGA platform for mixed-field irradiation in CHARM	31/05/2024	S. Danzeca