HEARTS 1st Annual Meeting: WP6

6 February 2024

https://indico.cern.ch/event/1314502/

GSI

Funded by the European Union

HEARTS is a project funded by the European Union under GA No 101082402, through the Space Work Programme of the European Commission.

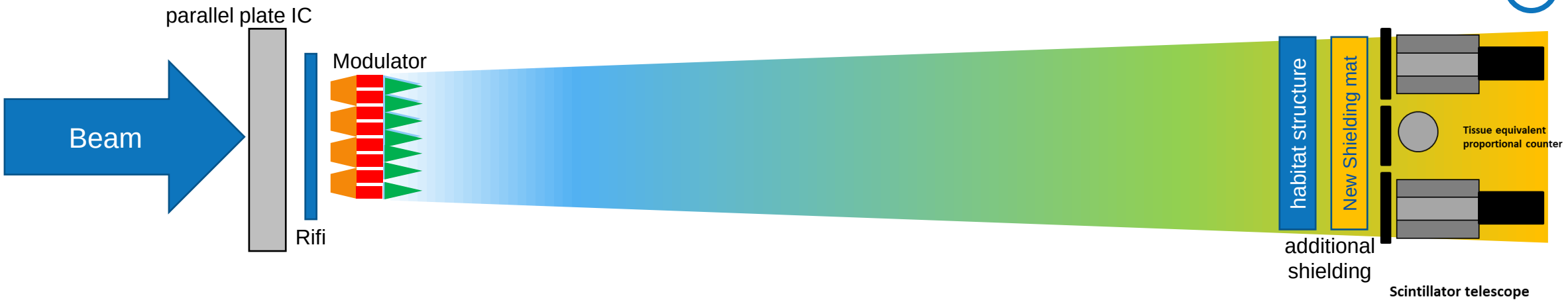
Content

- Task 6.1: Standardized setup for the GCR/SPE simulation experiments
- Task 6.2:
  Quantitative measurement of shielding effectiveness
- Task 6.3: Radiobiological characterization

Task 6.1: Standardized setup for GCR/SPE simulator experiments

- Ripple filter (RiFi):
  - New mesh design validated at HIT
- Modulators
  - Design optimization for metal printing
  - GCR field validation in April 2024
- Simulation framework:
  - development in progress in collaboration with TAS

Task 6.2:
Quantitative measurement of shielding effectiveness

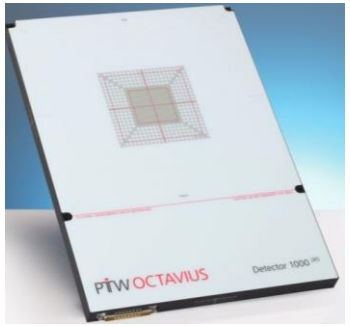


- Standardized setup → partially based on WP4
  - Dose reduction
  - Charged particle yields
  - Microdosimetry

new Postdoc hired Dr. E. Pierobon

performed in close collaboration with TAS

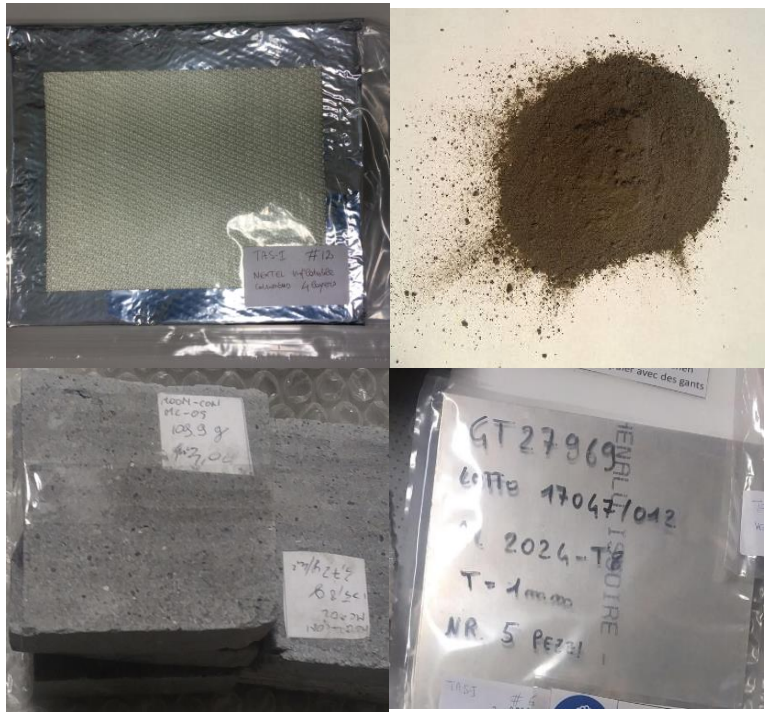
- Target station and automatic beam components to reduce the experiment time (e.g., robotic arm for radiobiology experiments)



Task 6.2:
Quantitative measurement of shielding effectiveness

Identification of **preliminary shielding materials / configurations** of interest on-going in synergy with the Sim framework

- **Habitat structure material**
  - Aluminum alloy (e.g. Al6061 and Al2219)
  - Possible inflatable structures materials
  - Composite materials
  - Multilayer materials
  - Honeycomb panels
- **ISRU materials**
  - Lunar regolith
  - Lunar concrete
  - Mars regolith
- **Reference shielding material**
  - Polyethylene, PMMA



Examples of ROSSINI space materials

Task 6.3: Radiobiological characterization

- Normal mammalian cell line model (typical CHO)
- Measurement of the RBE with and without additional shielding compared to standard X-rays
- RBE as a function of shielding thickness (can the equivalent dose increase with thick shields?)
- In the future the experiment can be reproduced in an animal model

C. Vandervoorde

Deliverables due in Y1

- No deliverables due in Y1 for WP6

Deliv. No.	Deliverable name	Due date	Status	Summary
-	-	-	-	-

The achieved deliverables are available on HEARTS website page:
https://hearts-project.eu/project/deliverables/

Milestones due in Y1

- No milestones due in Y1 for WP6

Milest. No.	Milestone name	Due date	Status	Summary
-	-	-	-	-

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Upcoming Deliverables & Milestones

Deliv. No.	Deliverable name	Due date	Status
D6.1	GCR/SPE simulator setup	2024-12-31	Pending
D6.2	Dosimetry of the GCR/SPE simulator with shielding	2025-12-31	Pending
D6.3	Radiobiology of the GCR/SPE simulator with shielding	2026-12-31	Pending

Milest. No.	Milestone name	Due date	Status
M18	First experimental demonstration of dose increase behind thick shields in Europe	2024-12-31	Pending
M19	Achievement of TRL6-7 for the SIS18 GCR/SPE simulator	2025-21-31	Pending

Plans for the future

- Task 6.1: Standardized setup for the GCR/SPE simulation experiments
  - GCR Field validation in April 2024 with various detectors
  - Plan to offer the GCR simulator to users in 2025
- Task 6.3: Radiobiological characterization
  - First movement tests of flasks with cells with the robotic arm planned for early 2024
  - Irradiation of cells with the field produced by the GCR simulator planned for april 2024

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