



HEARTS@CERN 2024 user pilot campaign at a glance (v1)

December 2024



**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.



Rubén García Alía, on
behalf of the HEARTS
project

The Facility

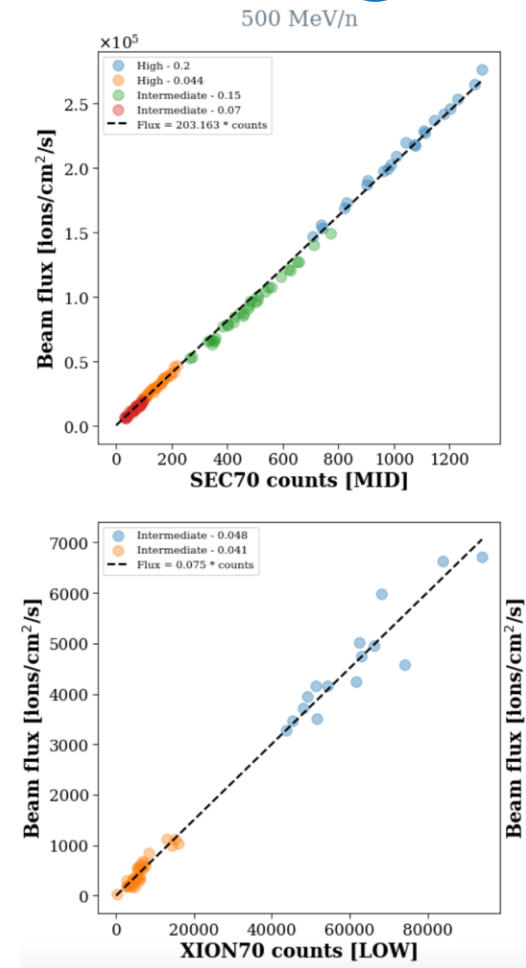
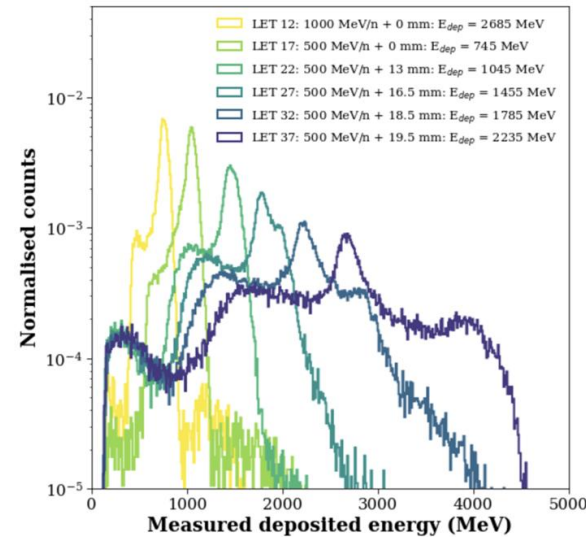
- Hosted at IRRAD in the T8 East Area beam line
- Main elements (from right to left, i.e., in the direction of the beam):
 - PMMA degraders, to locally tune the beam energy
 - Tungsten masks, to locally shape the beam
 - Multi-Wire Proportional Chamber (MWPC), as beam profile monitor
 - Device-Under-Test holder, with remote x/y/angle movement
- Area accessible 24/7 during user run, thanks to permanent presence of RP agent
 - Relatively frequent user access for board exchange, etc.
 - Long setup time (~1.5 hours) typically needed, especially for initial setup, and mostly related to alignment and connection checks
 - Minimum total access beam downtime is typically ~35min (~10min between beam OFF and access, ~15min intervention and ~10min between end of access and beam ON)



The Beam

- Need of rapidly and accurately changing between different energies (and hence LETs and ranges) and fluxes
 - Energy control: from the PS (1 GeV/n and 500 MeV/n) and through local degradation
 - Flux control: through PS tune shift (low energy quads) and RFKO parameters
- Importance of locally (from IRRAD control room) controlling degrader and mask configuration, beam ON/OFF, run flux and fluence, real-time monitoring of key beam properties... → achieved thanks to HEARTS@CERN operators, through WRAP tool developed by BE-OP

$^{208}\text{Pb}^{82+}$		FLUKA		SRIM
PS extraction energy [MeV/n]	Degrader set [mm]	Energy (FWHM spread) [MeV/n]	LET in Si (FWHM spread) [MeVcm ² /mg]	Range in Si [mm]
1000		908 (10)	12.3 (0.1)	50.0
	13.0 (10 + 2 + 1)	387 (10)	16.5 (0.1)	14.5
500	16.5 (10 + 4 + 2 + 0.5)	210 (12)	22.2 (0.5)	6.0
	18.5 (10 + 8 + 0.5)	153 (14)	26.6 (1.1)	3.5
	19.5 (10 + 8 + 1 + 0.5)	113 (14)	31.7 (2.2)	2.3
	20.0 (20)	88 (16)	36.3 (3.3)	1.5
		77 (17)	40.1 (5.4)	1.2



The Users

- 10 different user teams, with 150+ hours of beam time delivered (100% of original plan)
 - Hybrid access scheme: 4 teams through EU projects (i.e., research/scientific modality) and 6 teams via industrial-like access
- 24/7 facility operation during 12 consecutive days
 - Only significant downtime period were the ~10h of unforeseen over refill, but the users of that day could complete their hours during the night
- Huge user management effort: registration, trainings, technical preparation meetings, material shipment, etc.
- Thorough user feedback being collected, through interviews and electronic surveys (outsourced to external company)
- Many different device technologies tested, with a focus on complex architectures requiring high energies for reaching sensitive depth
- Internal STI/R2E users: mainly for self-assessment of testing workflow and SEE result benchmark against conventional/well-established facilities



Communication



Matthew Gill • 1st

Radiation Consultant - Former Nuclear Engineer turned Rocket Scientist
17h • 🌐

Last week I had the pleasure of smashing some ~1 GeV/n lead ions into a mixture of electronics at CERN. Thanks to [HEARTS@CERN](#) team for doing an amazing job at bringing this facility online for industry users - it's a beautiful facility with an incredible capability for [#space](#) [#radiation](#) testing.

I highly recommend for anyone looking for high-LET, high-penetration heavy ions :)



👍👍 You and 119 others

12 comments · 2 reposts



HEARTS
408 followers
19h • 🌐

❤️ Two weeks, 150+ irradiation hours, 10 teams from global companies and institutions – the HEARTS user run at [CERN 2024](#) comes to a successful close.

🚀 The goal of the pilot run was to demonstrate CERN's IRRAD facility's capabilities in providing high penetration, heavy ion [#radiation](#) testing of [#electronic](#) components and modules destined for use in [#space](#).

🗨️ Based on the positive feedback from the users, it has been a great success and marks an important step forward for space [#electronics](#) qualification in [#Europe](#). Keep an eye out for more results, user testimonies and data that will be available soon.

🙌 A huge thank you to the users, the CERN technicians, operators, engineers and scientists, and the HEARTS team for all your dedication and hard work.

🇪🇺 We go into 2025 full of optimism

Find out more about HEARTS - <https://hearts-project.eu/>

[#innovation](#) [#HorizonEurope](#) [#EUfunded](#) CERN Innovation Partnerships



👍👍 You and 69 others

1 comment · 1 repost



HEARTS@CERN 2024 at a glance



Knowledge Transfer
Accelerating Innovation

Thanks for your attention! Questions?



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.



HEARTS