

Summary/Results

In this first stage of the project dedicated to the development of an innovative ion irradiation platform for exploring the resistance of nano-satellites to space radiation, all the proposed activities were carried out. These activities were essential for the definition, design, simulation and preliminary development of the platform. An extensive scientific and technical documentation activity was carried out, including the analysis of the systems currently used for radiation testing, used internationally and of the current radiation testing methodologies. In parallel, ion optics simulations were performed to optimize the ion beam transport, as well as FLUKA simulations to calculate the dose distribution in different experimental configurations over a proton energy range between 3 and 6 MeV. In the engineering area, the CAD design of the mechanical positioning system for the electronic components of the CARDSAT nanosatellite was completed, as well as its realization, and the design of the dosimetric system, which includes the use of a Markus camera, radiochromic films, but also the possibility of using a Faraday cup and particle detectors. The mechanical and optical alignment of the beam scattering foil was performed, followed by high vacuum testing. Tests and diagnostics of the ion beam were performed, using a proton beam. The beam was extracted into the air and directed onto the Markus camera, then onto radiochromic films, Si single crystals and radiation-resistant polymer films. Preliminary results were disseminated within the scientific community through participation in conferences both at national and international level, contributing to the validation of research directions and the initiation of possible collaborations. The current stage has established the necessary foundation to advance towards the actual testing phase of the CARDSAT nanosatellite's electronic components in the beam, planned for the next stage.

Dissemination of results

The dissemination of the results of this phase was achieved through participation in national and international scientific conferences. These are listed below. A scientific article is being written, it will be submitted to an ISI journal, by the end of the phase.

National conferences:

1. **I. Burducea**, M. Lechintan, M. Focsaneanu, M. Petruneac, R.F. Andrei, D.G.Pacesila, D. A. Iancu, A. T. Hotnog, D. G. Ghita, G. Velisa, M. Straticiuc, *An Innovative Ion irradiation Platform for Exploring Nano-Satellites Resilience to Space Radiation*, Bucharest University Faculty of Physics 2025 Meeting, May 23rd 2025, Magurele.

International conferences:

1. **I. Burducea**, *Current status of the Ion irradiation Platform for Exploring Nano-Satellites Resilience to Space Radiation and future perspectives*, Carpathian Summer School of Physics 2025, Exotic Nuclei and Nuclear/Particle Astrophysics (X). Physics with small accelerators
July 22nd – July 3rd 2025, Sinaia, Romania – **invited talk**.

2. **M. Petruneac**, A. T. Hotnog, D. G. Ghita, D. A. Iancu, G. Velisa, I. Burducea, M. Focsaneanu, M. Straticiuc, M. Lechintan, R. F. Andrei, *FLUKA-simulations for the optimization of an ion irradiation platform for radiation hardness studies*, 12th International Congress of the Balkan Physical Union, BPU 12, 8 -12 July 2025, Politehnica University, Bucharest.

3. **I. Burducea**, M. Petruneac, M. Focșăneanu, R.F. Andrei, A.T. Hotnog, M. Lechințan, D.A. Iancu, D.G. Ghiță, G. Velișă, M. Straticiuc, A. Totu, C. Gogu, M.I. Lazăr, *A novel radiation hardness testing facility at the 3 MV Tandetron from IFIN-HH- Status report*, 15th European Conference on Accelerators in Applied Research and Technology (ECAART 15), September 8-12, 2025, Zurich, Switzerland.

Scientific articles

1 scientific article is in progress and will be submitted to an ISI journal by the end of the current stage, 31.12.2025.

Also as part of dissemination, we would like to mention the posts on our department's Meta (Facebook) page with the project status: <https://www.facebook.com/DFNA.IFIN.HH/>, and also IFIN-HH,

<https://www.facebook.com/share/p/19wjWRysPf/>

<https://www.facebook.com/share/p/1AF3JJjDDQ/>

<https://www.facebook.com/share/p/1Ztfc3qL9J/>

Applied Nuclear Physics Department - DFNA • Se simte recunosător cu Miroșă ...
Lechințan • Burducea Ion is IFIN-HH
5 martie Magurele

We are very happy that today we had the kickoff meeting for the #SPACERAD project, led by Ion Burducea.

SPACERAD represents a partnership between IFIN-HH and Mazorom Impex SRL that aims to design, develop and calibrate an universal experimental platform for Radiation Hardness Assurance Testing of Microelectronic Devices and Integrated Circuits.

This platform will be integrated in the first phase at the 3 MV Tandetron™ multipurpose facility of IFIN-HH and commissioned by monitoring in real time the response of CARD-SAT Nano-satellite, previously developed by Mazorom, to extreme conditions (i.e., high dose and flux).

We remind you that ion beams, also available in our department, are extremely versatile tools which can improve a microprocessor or even intervene in the preparatory phase of sending a satellite into orbit or in the design of a new type of nuclear reactor.

Some ions come into play and have a deciding word by probing an advanced material for which the radiation hardness is tested. Currently accelerated ion beams are used worldwide in a variety of applications in areas of study such as corrosion resistance, radiation resistance, wear and friction reduction or improved adhesion, but also for tackling medical applications and fundamental astrophysics studies.

#radiationhardness #spaceapplications #ionbeamsforsociety

IFIN-HH • Se simte plin(ă) de recunoștință.
26 iunie

🎉 **CSSP25 Updates - Day 2!** 🎉
A deep dive into ion beam physics, defect dynamics in materials, small accelerators, and cutting-edge radiation research — all under one roof, surrounded by the Carpathians. 🏔️

🔴 Yesterday morning's lectures explored how radiation reshapes materials and how we can analyze these changes with precision:

Dr. Stefan Facsko (HZDR): Ion Beam Modification and Analysis in Contemporary Materials Research

Dr. Gihan Velisa (IFIN-HH): Advances in Ionization-Induced Annealing of Defects in Semiconductors

Dr. Joseph Graham (Missouri S&T / CSIC): Radiation-Induced Defects in Solids: Properties & Characterization Techniques

Dr. Yuri Venturini (CAEN, MixedTech): Gamma Spectroscopy of Natural Radionuclides – along with a sponsor-led experiment 📊

🕒 **Afternoon session: Small Accelerators (II)**, chaired by M. Straticiuc:

Dr. Ion Burducea (IFIN-HH): Ion Irradiation Platforms for Nano-Satellite Testing in Space-Like Conditions

Dr. Daniela Pascal (IFIN-HH): Cosmogenic Nuclide Dating in Geosciences – RoAMS Lab Highlights

👉 Student communications wrapped up the day with impressive contributions from:

Andrei Hotnog – Matrix Ion Detector development for CRYRING@ESR

Denis Barbu – Neutron Shielding for Large Underground Detectors

☕ And of course, strategic coffee breaks and group chats to spark ideas and collaborations.

📸 Enjoy a glimpse into yesterday's dynamic sessions through our photo gallery below!

🔗 Stay tuned and follow us: <http://cssp25.nipne.ro>

#CSSP25 #Day2 #IonBeams #RadiationPhysics #SmallAccelerators
#PhysicsConference #YoungResearchers #ScienceinSinaia #IFINHH #HZDR
#MissouriS&T #CAEN



Applied Nuclear Physics Department - DFNA

se simte recunosător la IFIN-HH

15 septembrie · Magurele

The 3 MV Tandatron Laboratory from IFIN-HH proudly took part in the 15th European Conference on Accelerators in Applied Research and Technology (ECAART15), held in Zurich from 8-12 September 2025. This international gathering, hosted by ETH Zurich, brought together the accelerator community to explore the latest applications of ion beams in materials science, cultural heritage, and beyond.

Our lab was represented by two oral contributions:

- ◆ Ion Burducea – unravelling the development of a radiation hardness testing platform for devices using MeV ion beams, within the SPACERAD Project (PN-IV-P7-P7.1-PED-2024-2029/53PED).
- ◆ Gihan Velisa – shedding light on the athermal recovery of defects in Ge under ionizing radiation, in the framework of PN-IV-P1-PCE-2023-0567.

These talks mirror our team's constant drive to push the frontiers of ion beam physics and materials research, while strengthening our role as a vibrant user facility.

A gentle reminder: the next PAC Meeting for Tandatron users is scheduled for 27-28 November 2025 (online, via Zoom). Access to our facility is free of charge for projects selected on scientific merit — more details at <https://useroffice.nipne.ro/index.php>.

And, of course, being at ECAART15 stirred fond memories of ECAART14 in Sibiu (2022), when our department had the honour of hosting the community in Romania. Such a remarkable event, such wonderful memories — and now, such exciting perspectives ahead!

More about ECAART15 here: ecaart15.ethz.ch

We gratefully acknowledge the support of the Ministerul Educației - România and Autoritatea Națională pentru Cercetare - România, whose funding has made these results possible.

#ECAART15 #IFIN-HH #DFNA #UEFISCDI

