Research, Development and Innovations on Applied Physics in IFIN-HH

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Research, Development and Innovations on Applied Physics (R&D&I) in IFIN-HH

R&D&I Activities on Applied Physics

- Atomic, Nuclear & Particle Physics
- Life & Environmental Physics
- Radioisotopes & Radiopharmaceuticals
- Technological Irradiations
- Radioactive Waste Management –Treatment, Conditioning, Storage or Disposal
- Decommissioning of Nuclear Facilities
- Nuclear engineering
- Training in nuclear activities

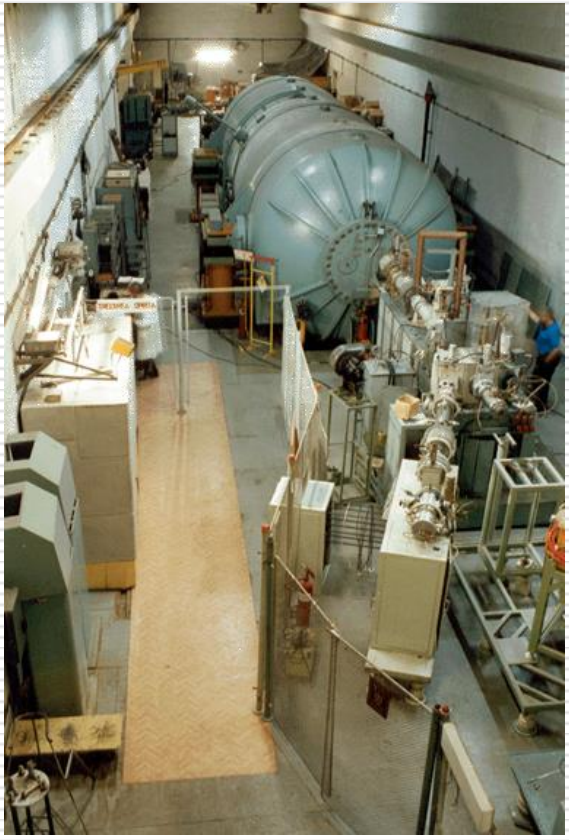
Certified Laboratories in IFIN-HH – Notified by Regulatory Body (CNCAN) (1)

- Ionizing Radiation Calibration Laboratory;
- Ionizing Radiation Testing Laboratory;
- Laboratory for Testing and Certification of Compliance for Radiopharmaceutical, Radio-chemicals and Radioactive Sources;
- Radionuclide Metrology Laboratory;
- Laboratory for α,β,γ Spectrometry and Radon Measurements;
- Whole Body Monitoring Laboratory;
- Environmental and Personnel Dosimetry Laboratory;

Certified Laboratories in IFIN-HH – Notified by Regulatory Body (CNCAN) (2)

- Spectrometry Analysis Laboratory;
- Microbiology Laboratory;
- Detection of Irradiated Foods Laboratory;
- Physical and Chemical Testing Laboratory;
- Radiological Characterization Laboratory;
- Law Background Gamma-Ray Spectrometry Laboratory;

Major Research Infrastructure (1)



Major Research Infrastructure (2)






Services and Collaborations (1)

- Specialized services

- Occupational radiation exposure monitoring
- Microbiological testing and certification
- Decommissioning of nuclear facilities, including research reactors, critical and subcritical assemblies
- Radioactive sample analysis
- Basic and advanced nuclear training

Services and Collaborations (2)

- Specialized services

- Supply of accelerated particle beam;
- Radwaste collection, treatment, storage and disposal
- Irradiation processing of products and materials
- Legal metrology in ionizing radiations
- Ionizing radiation methods, technologies and device testing;
- Training in nuclear field

Radiation processing – Technological Irradiation

- Gamma (Co-60) Irradiator Multipurpose – IRASM- max capacity- 2 million Ci.

- Sterilization medical products, microbiological decontamination for raw materials for pharmaceutical industry, fodder for hens;
- Dosimetry for high rate dose, duration of irradiation
- Preservation of the cultural heritages, national cultural patrimony;
- Analyzing the food products to establish if were treated by irradiation;
- Assurance Quality and Quality Control according SR EN ISO 9001/2015, SR EN 17 025, 13 485, 11137

Decommissioning nuclear and radiological facilities (1)

- Nuclear Research reactor VVR-S, 1957-1997, 2010-2020, in decommissioning
- Decommissioning strategy: immediate dismantling
- Decontamination methods and technologies;
- Mechanical and thermal technologies for decommissioning;
- Decommissioning underground structures: pipes, pond;
- Radiological characterization direct measurements or by HP Ge gamma spectrometry
- Radiological characterization to demonstrate clearance and then free release of materials resulted from decommissioning;

Decommissioning nuclear and radiological facilities (2)

- Using the own equipment for decommissioning and own workers;
- Safely management of the nuclear spent fuel assemblies stored under water (1960-2012) , all spent fuels repatriated in the Russian Federation finalized on December 2012 ;
- Integrated Management System (nuclear safety and security, environmental protection, health and safety, physical protection, safeguards, cyber security);

Radioactive waste management

- Collecting, transportation, treatment, conditioning, storage, disposal of the institutional radioactive waste low and intermediate levels;
- Liquid Radioactive waste treatment and conditioning, disposal
- Solid materials: segregate, super compacting, conditioning by cementation,
- Radiological characterization of the package in the aim to verify complying with waste acceptance criteria for disposal;

Nuclear Forensics

- Nuclear Forensics shall provide information on nuclear material of immediate relevance to law enforcement;
- Nuclear Forensics aims at providing clues on the history (production process, date of production, place of production, intended use) of nuclear material;
- National Laboratory for Nuclear Forensics: Radioactivity measurements, Material ID, Physical inspection, Basic characterization, Comparisons with domestic materials, Standardized laboratory quality assurance protocols;
- I/C portable radiological equipment alpha-beta, beta-gama contaminometer, dose rate, HP Ge gama spectrometry, XRF, XRD, ICP-MS, SEM, TEM, AMS, PIXE, PIGE
- MEST-Mobile Expert Support Team

Arheometry and AMS, cyclotrons

- Applied physics with Tandetron 1 MV- AMS, dating with C-14,
- Applied physics with Tandetron 3 MV- environmental sample analysis, PIXE, PIGE, ions implantations;
- Quantitative measurements for : 2H , 3H, 10B, 10Be, 14C, 26Al, 129I Range 10 E-13-10 E-14 (ratio radioizotop/stable izotop) with Tandem accelerators 1 MV and 9 MV IFIN-HH
- Irradiation of optical materials, CaF2, BaF2, Al2O3, ZnSe, at 1,5 MeV deuterons, and 3 MeV alpha, space applications , influence of radiation dose, types of ions, elemental compositions of sample, cyclotron applications.

New materials , new radiopharmaceuticals , research and development activities

- Source ECR –coupled with positron facilities PALS (Positron Annihilation Lifetime Spectroscopy) şi CDBS (Coincidence Doppler Broadening Spectroscopy) for study in situ of ions implantation in polymers.
- With new cyclotron 14-19 MeV proton accelerated to obtain new radiopharmaceuticals with very low half time (< 2 hours) for medical applications , R&D&I activities
- Study of condensed matter and biological using techniques of small angle neutrons scattering (collagen and polysaccharides
- IBA analyses at Tandetron 3 MV

Training in nuclear field

- Courses authorized by Romanian Regulatory Body in Nuclear field
- Course level 1- Basic in radiation protection.
- Course level 2 for future responsible for radiological safety in radiological zones for closed sources, open sources, Particle Accelerators, Reactor Nuclear, Radiation generator;
- Course level 3 for experts in radiation protection in various domains in nuclear applications;
- Course with practical exercises in gamma spectrometry, radiological measurements (dose rate, contaminations, environmental sample analysis, etc) at request of clients;
- Course for nuclear safety and security culture;
- Course for training to prevent, detection, intervention for nuclear terrorism;
- Training Center in nuclear field from IFIN-HH with QMS, ISO 9001/2015 authorized.

Services for Emergency Situations

- Computer Codes to evaluate evolution and consequences during and after nuclear/radiological accident;
- Cooperate with Emergency Situations Inspectorates, local, regional and national communities, with National Nuclear regulatory Body for technical assistance, organize the joint exercises to verify and enhancement the Plan for intervention in Emergency situations-CBRN ;
- Evaluate the risks and vulnerabilities for critical infrastructures and applied the measures foreseen in Security Plans.

Services for calibration of the radiological instrumentation, gama spectrometry

- International authorized laboratory for calibration the radiological portable equipment;
- Calibration HP Ge gama spectrometry with sources : Co-60, Cs 137, Am 241, etc with various geometry.
- Activity Bq as primary etalon for Romania;
- Equipment for measurements Radon calibration;
- Establish the program for natural radioactivity measurements;
- Establish the Derivative Emission Level for IFIN-HH, by calculus and measurements from place where there gaseous and liquid effluents are produced; periodical monitoring.

Thank you for your attention

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