INFRASTRUCTURE DEVELOPMENT FOR FRONTIER RESEARCH IN NUCLEAR PHYSICS AND RELATED FIELDS - IFIN-RID

National Plan for Research, Development and Innovation

for 2007 – 2013 (NP II)

Programme: ***Capacities***

tract Holder: ***"Horia Hulubei" National Institute for Research and***

Development in Nuclear Physics and Engineering

Contract Duration: ***2010-2014***

Project Value: ***RON 70,641,102 (approx. EUR 15,698,500)***

General Objective: ***Developing and upgrading IFIN-HH research infrastructure, according to the current European and international level and standards*** (consolidating IFIN-HH status as representative institute of Romania for the 21st century physics).

Specific Objectives:

- **supporting the participation in large European research infrastructures where Romania is involved (CERN Geneva, FAIR Darmstadt, SPIRAL2, ITER) by:**
  - **creating laboratories for experimental setups and specific equipment, for the development and testing of experimental methods, essential support for an efficient research activity within international projects.**
- **developing applications of nuclear technologies by:**
  - **developing specialised nuclear centres endowed with *state-of-the art* equipment, designed to carry out interdisciplinary studies with applications in fields of major societal interest: life and environmental physics, medical applications of nuclear technologies, development of advanced materials, cultural and historic heritage investigation and preservation.**

Research Directions:

- **developing detection techniques of nuclear radiations, gamma spectroscopy with state of the art detectors, development of techniques and equipment for life time measurements of excited nuclear levels (through the models of recoil distance and rapid electronics - NUSTAR/FAIR and ISOLDE/CERN);**
- **developing new types of detectors and their associated electronics, having a high degree of novelty and performance, designing, creating and testing front-end electronics and developing the distributed computing system for experimental data processing and analysis (CBM/FAIR, ALICE/CERN and LHeC/CERN);**
- **studying the radiocarbon as tracer of the bio-geochemical cycle of carbon, key cycle of the climate system, the study of the carcinogenic potential in food;**
- **diagnosis of nuclear fusion plasmas for JET and ITER. Environmental monitoring through elemental high-resolution analyses. Characterizations of materials obtained through accelerated beam implants. Elemental high-sensitivity determinations for medicine and biology. Using accelerated beams to analyse samples in the historic and cultural heritage;**
- **research in the field of radiochemistry and procedures for the synthesis and coupling of short-lived radioisotopes (of interest for PET investigations) to molecules biologically compatible with human body. Research to improve algorithms for data processing and for improving sensitivity parameters, response time and spatial resolution in PET/CT and microPET imaging. Research in nuclear physics and accelerated particle interaction with solid, liquid and gaseous state matter;**
- **research concerning expert systems for assessing the impact of nuclear activities on the environment;**
- **developing techniques for the measurement of radioactive content at extremely low levels in environmental samples.**

Beneficiaries:

- **research entities, state institutions and economic operators involved in the national and European nuclear programme** (EURATOM), pharmaceutical manufacturers.
- research institutes, universities and other institutions in the field of medicine, biochemistry, environmental protection, agronomy, etc.
- **the international nuclear physics community** involved in large European projects (CERN, FAIR, SPIRAL2, etc.);
- **CNCAN, CNE Cernavodă** (for radioactive pollution monitoring);
- **faculties of physics, institutes for research in environmental protection, museums, institutes and faculties of history, for C14/C13 determinations, studies of large climate change, greenhouse effect;**
- **medical radiology and imaging clinics, oncological institutes;**
- **population at large** – developing a sustainable healthy environment, institutions for environmental protection and interventions in radiological emergency situations;
- **LAGUNA and ILIAS next consortiums** (FP 7 Infrastructures);
- **CELLAR** – the European excellence network of underground laboratories;
- **JET, ITER, The Ministry of the Environment, CNCAN, UMF Carol Davila, INFIM, INFLPR, The Museum and the Faculty of History - Bucharest, The National Art Museum.**

Social and economic Impact:

- **creating high-performance laboratories** having a unique expertise at national level;
- **generating technology transfer**;
- **improving and developing existing facilities**;
- creating a sound basis to generate new international collaborations;
- extending current departments/laboratories to regional entity level;
- training centres for students of the faculties in the field and young researchers;
- opening new jobs in a highly technical field.