Development of frontier research infrastructure in nuclear physics and related fields–IFIN-DIC
C3. Tritium Laboratory with Multiple Users (TRITIULAB)

Scientific context and motivation

The aim of Tritium Laboratory with Multiple Users is to realize a performing infrastructure for research, technological transfer and education of human resources dedicated to the activities with tritium sources in Romania and European Union area.

Romania is the only European country which develops the CANDU technology. After the moment of Unit 1 and Unit 2 from Cernavoda NPP became operational and after investment finalization for Unit 3 and 4, Romania will become the most powerful tritium source from Europe. Therefore the management of tritium wastes represents an important component of National Nuclear Plan.
The development of international EURATOM FUSION program, respectively JET and ITER projects created the necessity of technological development in the management of tritium field.
TRITIULAB is a facility with national and regional interest which at the moment of project proposal and probably at the operational moment will be unique in Romania and European Union. The new created infrastructure will facilitate the access of Romanian experts at European research programmers.

The implementations of modern investigation techniques will permit the accomplishment of the compatibility and competitively levels needed for integration of Romanian research units focused on studies of biological processes at genetic, molecular, cells and tisular level, pharmacological studies, toxicological studies, pathology, etc in the European research area.

Objectives

TRITIULAB a facility with national and regional interest which at the moment of project proposal and probably at the operational moment will be unique in Romania (respectively in European Union) and will facilitate the access of Romanian specialists to the European research programs (FP 7 PT 4 Advanced engineering materials and technologies, PT 11 Innovative medicines, EURATOM, etc).

The development of Research Base with Multiple Users will permit the free access of the researchers from Romanian and European Union public and private systems to a modern infrastructure aligned to European regulation in the field.
The research base will be an infrastructure dedicated to the formation of human resource in the field of global management of tritium and the applications of nuclear techniques in the field of life sciences.

The research activity from the TRITIULAB center has a major role in the functioning of the center as the representative unit for interdisciplinary scientific research. The activities for development of research project can be divided in three main directions:

- Basic researches (radiation chemistry, computational simulation, tritium effect in materials)

- Applied researches in the field of life sciences (biochemistry, pharmacology, medicine, etc)
- Applied research targeted to the field of global management of tritium

These directions define the thematic space in which the research from TRITIULAB center will develop.

Infrastructure

Presently the Tritium Laboratory is integrated in Radionuclide and Radiation Metrology Department from National Research Institute for Physics and Nuclear Engineering "Horia Hulubei". The present structure and the majority the existing equipment are old and they need an important reabilitation.

Present infrastructure: Nuclear authorized facility with radiochemistry laboratories, laboratory equipment (HPLC with UVVIS and β and γ radio-detectors, Ion Chromatograph, Radio TLC, TRICARB 2800 LSC, Tensor 27 FTIR ATR, spectrometers, Tritium Manifold, High vacuum pumps, Tritium Monitors, Rotavapors, Oven, etc).
Infrastructure achieved in the project: New tritium laboratory with "state of the art" equipments (FT NMR, Beta Imager, ESR Spectrometer, and Electron Microscope)

Human resurces

The present personel from the Tritium Laboratory is having a high level competences in this domain and implicitly the capacity of accesing research funds at national level (in the last 10 years: 5 PNCDI2 projects, 3 CEEX projects, over 8 PNCDI-CERES, VIASAN, BIOTECH, CALIST projects) and internationals (in the last 10 years: 2 EURATOM projects, 1 COST project, 1 EURECA project).
Obtained results in last 10 years:

- more than 30 articles indexed in the Web of Science database
- more than 90 work papaers presented at International Conference, simposium or WorkShops
- 2 patent request applications
- More than 50 products and technologies

Impact, relevance, applications

Scientific impact. Increase the visibility of the Romanian research by publishing papers in ISI quotation journals and participation at scientific manifestations.
The **exploratory results will be capitalized** as part of oriented project in cooperation with Romanian and European RD institutes and potentially beneficiaries–economic agents/private institution. The target is "tritium management wastes"
Potentially beneficiaries of the results

- The most important Romanian user of the results is represented by Cernavoda NPP, followed by ICIT Rm. Valcea and IFIN HH Magurele. Other targeted users are the economic agents implied in performing of activities with tritium as part of the National Nuclear Program (ANTICOROSIV S.A, S.C MATEFIN, etc.).
- Another priority targeted group is represented by the partners from European Union implied in the EURATOM FUSION Program (FZK Karlsruhe, Germany,

SCK Mol Belgium, etc).

Social Impact: Development of human resources (PhD in physics, radiochemistry biochemistry and pharmacology area).

Environmental Impact: significant decrease of radioactive wastes resulted from Cernavoda NPP by improvement