

**RADIOPROTECTION OF THE ENVIRONMENT,
In situ nuclear metrology as a tool for radioecology**

**INTERNATIONAL SYMPOSIUM, 27 – 30 th
September 2004, Albena, BULGARIA**

**INSTITUTE OF NUCLEAR PHYSICS,
MISSION AND
SCIENTIFIC RESEARCH ACTIVITIES**

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TIRANA, SEPTEMBER 2004

Establishment of the Institute of Nuclear Physics (INP) and its main mission

- The INP was established in the 1971 year as a scientific research institution in the fields of nuclear and atomic physics.
- The activity of the INP, historically, derives from the activity of the Nuclear Radiations Laboratory, established in 1970 year.
- In the beginning, the INP was under the jurisdiction of the Tirana University, and later, after the establishment of the Albanian Academy of Sciences, it became part of the Academy research institutions network. Actually, the INP is in the structure of the Academy of Sciences.

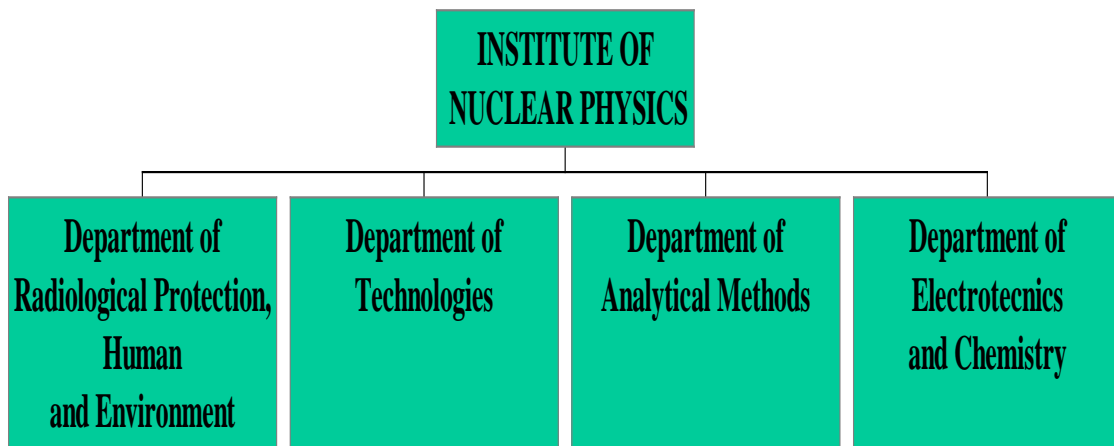
- **Scientific research activities, mainly applied research, transmission the basic scientific knowledge and transfer the new methods and technologies of nuclear physics at the country economy is the main mission of the INP.**
- The INP carry out its scientific activity in cooperation with research institutions, universities and companies through research and development projects.
- The INP serve as a transfer centre of the nuclear technology to the different fields of the economy.
- The INP is National Atomic Authority.
- The INP is the only Institute of the country in the field of nuclear physics.

Personnel of the Institute of Nuclear Physics

- **The structure of Scientific staff, Technicians and Administrative Personnel of INP is:**
- **Scientific research staff : 27**
- **Prof. Dr. : 9**
- **Prof. Ass. Dr. : 3**
- **PhD. : -**
- **Researcher : 1**
- **Assistant : 14**
- **Technicians : 23**
- **Administrative & Services personnel : 19**

Organizational Structure of the INP

Actually, the INP is organized in four Scientific Departments, 1 economic – administrative Division



DEPARTMENTS

Department of Human and Environmental Radiological Protection

- **Radiological Emergency and Professional Protection Division**
- **Public and Environment Protection Division**

Laboratories : Measurements of activity and Doses; Measurements of alpha, beta and gamma radioactivity; Calibration of dosimetric equipments; Treatments of radioactive sources and conditioning of consumption radioactive sources; Emergency radiological network and its administration; Measurements of Radon.

Department of Technologies

- **Irradiational changes Division**
- **Environmental and artificial tracers Division**

Laboratories: Measurements of hydrochemical tracers; Measurements of stable isotope ratios (mass spectrometry laboratory); Measurements of artificial tracers (spectrophotometry laboratory); Van de Graff accelerator laboratory.

DEPARTMENTS

Department of Instrumental Analytics

- **Multielemental analysis Division**
- **Materials Structure Division**

Laboratories: Neutron activation analysis; X ray fluorescence; Atomic absorber; Messbauer spectroscopy; Raman spectroscopy.

Department of Chemistry and Electrotechnics

- **Chemistry and Biology Division**
- **Electronics and technique Division**

Laboratories: Radiochemistry, Production of Radiopharmaceuticals; Quality control of radiopharmaceuticals; Nuclear Electronics; Radioactivity dating by ^{14}C method.

Research Areas

Main research areas of the INP are in conformity with its main mission.

Studies and applications of the nuclear methods in the different fields of the albanian economy :

- **Medicine and public health**
- **Environment and its protection**
- **Agriculture and Biology**
- **Industry (Heavy and Light)**
- **Geology (general, petroleum and gas etc.)**
- **Hydrology and Hydrogeology, etc.**

Medicine

- **Among the first applications is the use of the radioactive isotopes for diagnostic and therapeutic purposes.**
- **In Institute is located the Laboratory of Radiopharmaceuticals Production, where are prepared ^{99m}Tc cold kits and gelatinous capsules.**
- **The all qualitative parameters of radiopharmaceuticals are realized at the Laboratory of the quality control.**

Environment and its protection

- **The INP realizes the evaluation of the radioactivity in environmental, biological and food samples for research and monitoring.**
- **It was completed the r/ac. measurements to evaluate the effects of Chernobil nuclear accident (1986) in environment and public health.**
- **There are conducted measurements related to the pollution from depleted uranium, as result of its use during the Kosovo conflict (1999).**
- **From many years it is evaluated the level of r/ac. in drinking, superficial and thermal water systems.**

Radiological protection

- **Protection and safety from the ionising radiations are among the traditional activities of the INP.**
- **INP carries out the monitoring of the exposure dose for its staff and workers of centres that used ionising sources, keeping the exposure dose register in the national level.**
- **The INP performs the management of the r/ac. waste and consumed r/ac. sources in the national level too.**

Radiological emergencies

- **Radiological emergencies are parts of the civil emergencies.**
- **In the INP, already, is functioning the Radiological Emergencies Centre in the national level, connected to the monitoring network of radiation dose.**
- **The network consists of five automatic stations for the radiation dose measurement and its transmission to the Emergencies Centre. The automatic stations are located in Tirana (C), Shkodra (NW), Kukesi (NE), Korca (SE) and Vlora (SW) cities.**

Agriculture and Biology

- **The INP makes use of nuclear radiations for seeds stimulation, genetic mutations via physical and chemical mutagenesis in different cultivars and conservation of agricultural products.**
- **Radioactive and stable isotopes are used in agrochemical and livestock studies, rational fertilization of lands, effective use of micro and macro-elements in animal's food etc.**

Industry

- **Many studies are achieved in metallurgical, chemical etc. using r/ac. isotopes as tracers in technological processes, as :**
 - **The effectiveness of the filters in the iron-nickel metallurgy**
 - **The corrosion processes of the fire-enduring coverings in blast furnaces**
 - **The determination of the mixtures homogeneity etc.**
- **Studies and experiments for the characteristics modification of polyethylene layers and PVC tubes (memory effect) through irradiation.**

Geology

- **Using unique analytical techniques in the country (neutron activation, X-ray fluorescence, mass spectrometry etc.) the INP achieves : multi-elemental analysis of geology and petroleum samples, determination of the absolute geological age by Potassium-Argon method etc.**
- **The INP has contributed in the preparation of the Geochemical Atlas of Albania through the determination of many elements in soil and sediment samples.**

Hydrology

- **Study of the superficial and underground waters movements, using stable and r/ac. isotopes has started 20 years before. Using the environmental, hydrochemical and fluorescent tracers are realized, last years, complex studies on the reserves of water basins, their underground communications, water time transition, water balances etc.**

Sedimentology

- **The study of the sea sediments and soils movement is realized by the r/ac. methods using environmental and short-life r/ac. isotopes.**

Nuclear methods are used to :

- The study of the dynamics of sediments at the Bays of Durresi and Vlora

- The erosion of lands and the filling up of the water basins.

Science of materials

- **By the use of specific techniques as Mossbauer spectroscopy and Raman spectroscopy are realized studies on the magnetic and crystallographic structures of crystalline, nanocrystalline and amorphous materials, the structural stages of carbon, the thin layers protective coat against oxidation and corrosion etc.**

Metrology

- **The metrology of radioactivity and X, gamma and neutron radiations fields, the sources preparations for use in industry, medicine, radioprotection etc. are among the important activities accomplished in the INP.**
- **The Secondary Standards Dosimetry Laboratory will be effective very soon and will realize specific talks in the national level.**

Electronics and Informatics

- **A special team take care for the control, maintenance and parameters upgrading of the electronic equipments.**
- **It is realized the design and production of detecting and measuring systems for some applications of nuclear methods in industry.**
- **The Local Area Network and the database of the scientific activities will be effective soon.**

- **The INP, actually, feels the effects of the long transition period of the albanian society and economy. There are present the follow problems :**
 - Financial budget, relatively low**
 - Emigration of the scientists and technicians**
 - Laboratories infrastructure**
 - Difficulties of the recruitment of the scientists**
 - Difficulties of the preparation of the young researchers**
 - Difficulties to get the projects from the public and private sectors etc.**
- **The staff of the INP is working to overcome difficulties of the transition period.**

**Thank you for
your attention**