

Measurement Unit

Nuno Rombert Pinhão

The Measurement Unit (MU) of DPRSN was created in January 2005 (following an expert visit to verify compliance with Artº 35 of the EURATOM treatise), with the aim of consolidating the radioactivity measurement laboratories under a single organizational unit. The MU, together with the laboratories of the Environment Radioactivity group (which is responsible for the chemical preparation of the samples), forms the infrastructure that carries out the fulfillment of Portugal's international obligations in the area of radioactive control of the environment.

The MU is composed of four laboratories:

- Gamma Spectrometry laboratory, equipped with six germanium detectors and one Si(Li) detector;
- Alpha Spectrometry laboratory, with a total of 41 surface barrier detectors;
- Total Alpha and Beta Countings laboratory, with two systems equipped with gas flow proportional counters, two liquid scintillation systems and two ZnS solid scintillators;
- Ion Chromatography laboratory, equipped with an ultra-pure water system and an ion exchange chromatograph.

The main task of the MU is to provide radioactivity measurement services:

- For the National Radiological Surveillance Program;
- to support economical activities, and
- together with the ion chromatography analysis, to support and collaborate on the research activities of other groups.

In the short term, the MU is also involved in the reorganization of the laboratories according to ISO 17025 standard. Preparations are under way for laboratory accreditation.

In parallel with these main task, the MU also conducts research and development on the analytical techniques used in this field. The Unit also promotes the profes-

sional qualification of the personal, and other related educational activities.

In 2005, the MU has undergone several transformation:

Infrastructure:

- Upgrade of the power support in the laboratories through the installation of a power generator and the repair of a UPS unit to ensure unattended operation;
- repair, recover and upgrade of equipment;
- installation of a new laboratory facility for Ion Chromatography;
- installation of a network server and partial installation of a private network.

Measures to implement the ISO 17025 standard:

- Development of a customized data backup software application to allow the traceability of data;
- Implementation of uncertainty evaluation and expression of results according to ISO GUM and EA-4/16 recommendations;
- Acquisition of radioactive calibration sources;
- Participation in intercomparison exercises.

Training and education:

- Organization of courses on “*Measurement and Data Treatment*” and “*Detection and Measurement of Ionizing Radiations*”;
- two group members are involved in a Master degrees program;
- one FC/UL student is making the final year training in the MU;
- Participation in the activities of the *Ciência Viva* program through the activity “*Radioactivity measurement in environment samples by gama spectrometry*”

Research Team

Researchers

N.R. PINHÃO, Auxiliar

Analysis Contractor

L. SILVA, physicist

J. ABRANTES, physicist

L. MACHADO, chemical engineer

Technical Personnel

J. M. OLIVEIRA

G. SILVA

L. RAMOS

Students

G. CARVALHAL, MSc. Student, FCT grantee

R. MENDES, Undergraduate student, FC/UL

Analysis Services and Technical Assistance on Radioactivity Measurement and Ion Chromatography

J. Abrantes, G. Carvalhal, L. Machado, J. M. Oliveira, L. Silva and N. R. Pinhão

Objectives

The Measurement Unit provides analysis services on radioactivity measurement and ion chromatography for external entities and ITN groups. These services aim to support the following:

- the National Radiological Surveillance Program;
- economic agents that require radioactive analysis of food products or construction materials; and
- other groups' research activities.

Results

In 2005, effort was made to improve the accuracy of the results reported through the improvement of laboratory conditions, thorough statistical treatment of data, introduction of quality control practices on laboratory work, and revision of the analysis reports according to ISO recommendations.

In terms of the services offered, the range of ions measured by ion chromatography was extended to include NH_4^+ and F^- .

Analysis services

Almost 4300 analysis were conducted using the following techniques: alpha spectrometry (41,3%), total alpha or beta counting techniques (26,9%), gamma spectrometry (17,5%), liquid scintillation (9,5%), or ion chromatography (4,8%).

About 30,4% of these analyses were for the National Radiological Surveillance Program, 27,8% for external entities and 41,7% for research projects, either of DPRSN or other ITN sectors.

It is worth mentioning that 95% of the alpha spectrometry, 54% of the ion chromatography and 30% of the gamma spectrometry analysis were on samples for research projects of the DPRSN, Chemistry sector or Physics sector. This is the result of an effort to improve the laboratories' services, including to offer this type of analysis to groups outside the department and to involve the group staff on research projects.

Services for external entities, mostly companies in the private sector, represent 70% of the analysis based on total alpha or beta counting or liquid scintillation techniques, 6% of the gamma spectrometry analysis and 3% of the alpha spectrometry analysis.

In terms of value, and considering only the fraction of the price of the analysis attributed to services offered by the Unit, the external services represent an income of around 48 kEuros.

The analysis performed for the National Radiological Surveillance Program represent a total value of 148 kEuros.

Technical assistance

Technical assistance was provided for the configuration and calibration of alpha spectrometry equipment on EDM laboratories on Urgeiriça.

Considering the operational costs, we estimate that the results obtained in the Measurement Unit laboratories represent a net added value of over 70 kEuros.