

## QUALITY MANAGEMENT SYSTEM IMPLEMENTATION AT THE RESEARCH REACTOR CENTER

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*Keywords: neutron activation analysis, irradiation services, quality management system, certification, accreditation.*

The Research Reactor Center (CRPq), following institutional directives, has implemented a Quality Management System (QMS) based on the NBR ISO 9001 version 2000, in order to carry out its mission according to specified objectives. The QMS is supported by a documentation system composed of approximately 150 documents including quality manual, business and action plans and standard operational procedures. In addition to these there are documents related to the reactor safety, such as the IEA-R1 Reactor Safety Analysis Report. All documents are available at the Quality site of ipen's Intranet. Some of the corporative processes (internal audit, sales and purchasing services, customer service and training) also support the QMS. The QMS is periodically submitted to internal audits in order to verify its efficiency and effectiveness. The CRPq QMS includes two different scopes: 1. Multi-elemental determination in materials from different matrices (geological, biological, industrial and environmental samples) by neutron activation analysis (NAA) National and international commercial interchange barriers can emerge if quality requirements are not met. To overcome this difficulty, public and private organizations require that laboratories involved in their product characterization demonstrate reliability in their analytical results. For international acceptance of the decisions based on these results, accredited laboratories are required. Neutron Activation Analysis Laboratory (LAN) is implementing the QMS for this scope in order to accreditate the laboratory testing by the Brazilian Metrological Institute (INMETRO), based on the NBR ISO/IEC 17025: 2001 criteria. This QMS was recognized by IAEA in 2001. Since then LAN has been working in the improvement of some aspects, such as: method validation, uncertainty measurement and quality assurance. Internal audit results have demonstrated the improvement of the QMS and the results obtained in inter-comparisons and proficiency tests confirmed the good quality of the LAN analytical results. 2. Operation and Maintenance of the IEA-R1 Reactor and Irradiation Services As IEA-R1 Reactor provides irradiation services to the Center of Radiopharmacy at ipen, which has ISO certification since 1999, the top management of the institute decided it was also important to obtain the ISO certification for Operation, Maintenance and Irradiation Services of the Reactor. For this scope, the QMS also includes the requirements of other Brazilian appropriate standards, such as: CNEN IN 001 and CNEN NN 1.16. Carlos Alberto Vanzolini Foundation (FCAV) certified the QMS for this scope on December 13, 2002 (Certificate number 2610). The certification was maintained after two FCAV audits carried out in 2003 and 2004. There are only two Nuclear Reactors in the world that are known to have ISO certification for irradiation services. Recently the International Atomic Energy Agency (IAEA) has put great emphasis on the necessity of formulating Strategic Plans, including QMS in research reactors. The process of implementing the QMS would not be possible without the involvement and collaboration of the CRPq staff as well as the cooperation of the personnel in charge of the corporative processes at ipen and of the internal auditors.

## STANDARD RADIOACTIVE SOURCES

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*Keywords: standardization; activity; check sources; radionuclides.*

The Nuclear Metrology Laboratory (Laboratório de Metrologia Nuclear - LMN) at IPEN has been involved for many years in the field of radionuclide standardization. As a result, this laboratory can supply standard sources of several radionuclides used for calibrating instruments in research and teaching activities at IPEN, or other research institutes and universities in Brazil (FIG. 1). The LMN sells also check sources to industries.

The systems used for calibrating the sources are: two 4pb-g coincidence systems, one HPGe gamma-ray spectrometer; two ionization chambers systems and two surface barrier alpha spectrometer systems.

The source activity is supplied in the range from few Bq to many MBq. The sources can be sealed in solid or liquid form. Alpha sources may be supplied in electrodeposited form.

The quality assurance of the calibration has been obtained by means of international comparisons sponsored by the ICRM (International Committee of Radiation Measurement) of which the LMN have been participating since 1967.

The radionuclides usually supplied are:  $^{60}\text{Co}$ ,  $^{137}\text{Cs}$ ,  $^{152}\text{Eu}$ ,  $^{241}\text{Am}$ ,  $^{35}\text{S}$  and  $^{57}\text{Co}$ . Other radionuclides may be supplied on special request. The price of each source is about US\$ 220.00 and may change slightly depending on source activity and source holder.

At the end of 2003 the LMN began to supply standard sources of  $^{133}\text{Ba}$  and  $^{137}\text{Cs}$  prepared with epoxy resin, having activities in the range of 7 to 9 MBq to be used as check sources in ionizing chamber measurements by nuclear medicine centers. The activity is determined by means of a secondary standard ionization chamber calibrated at NPL (United Kingdom).

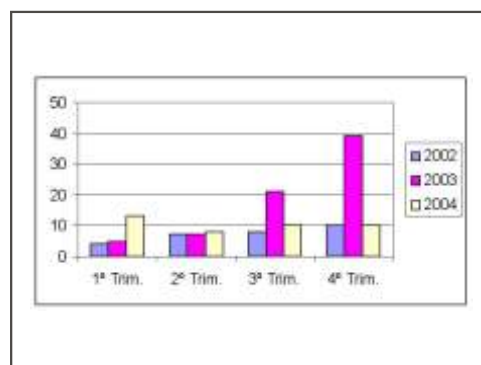


FIGURE 1 - shows the number of radioactive sources supplied in the 2003 to 2004 period.