Data Analysis Software for Radionuclide Standardization with a Digital Coincidence Counting System

Franco Brancaccio, Mauro da Silva Dias, and Marina Fallone Koskinas

Abstract–**The Nuclear Metrology Laboratory (LMN), at the IPEN in São Paulo, developed a Digital Coincidence System in order to improve its standardization capabilities. The Software Coincidence System performs data-acquisition, using a digital acquisition card, coupled to a desktop computer, configured and controlled by a proper acquisition-program. Up to four detectors can be connected to available analog inputs, for independent signal digitalization and recording of pulses time-stamps (occurrence time) and amplitudes (heights). The present work focuses on the Coincidence Analyzing Task program, developed to carry out measurement and calculation procedures, used for data-analysis. Object Oriented Programming technique was employed in order to define useful software entities and algorithms, accessible from general-purpose libraries.**

I. INTRODUCTION

THE Coincidence Counting Methodology comprises measurement and calculation techniques for primary standardization of radionuclides. In principle, the activity of a radioactive sample can be determined from detecting and recording related decay events, such as beta and gamma transition, including the number of time-coincident events. Usually, a $4\pi\beta$-γ radiation detection assembly is employed. Nowadays, digital techniques bring advantageous improvements to the methodology. A digital standardization process is accomplished in two steps: data-acquisition and data-analysis. In the first step (measurement), the detection signals are sampled, digitalized and recorded into data-files. Second step (analysis) is accomplished by means of software tools which perform several tasks, such as amplitude discrimination, signal gating, delaying and counting. Therefore, most of the electronic modules of a conventional system can be replaced by software entities, and the standardization process becomes easier, faster and more reliable. In order to improve its standardization capabilities, the Nuclear Metrology Laboratory (Laboratório de Metrologia Nuclear – LMN), at the IPEN in São Paulo, Brazil, developed a Digital Coincidence System (DCS). The two steps for radionuclide standardization are carried out, respectively, by the Software Coincidence System (SCS: data-acquisition) [1] and the Coincidence Analyzing Task (CAT), the data-analysis software package presented in this work.

II. CONCLUSION

The DCS validation was accomplished by several successful measurements. The standardizations of ^{152}Eu and ^{67}Ga were specifically performed for the validation of the CAT software package, presented in this work. Compared with conventional measurement systems, DCS standardization process is easier, faster and more reliable, and the obtained precision and accuracy levels are compatible, or even better. Therefore, DCS, composed by SCS and CAT package (presented in this work), represents a reliable improvement in LMN measurement capabilities. A detailed description will be presented in a full paper.

REFERENCE

[1] De Toledo, F.; Brancaccio, F.; Lapolli, A.; Dias, M. S., Design of Electronic System with Simultaneous Registering of Pulse and Event Time Applied to $4\pi\beta$-γ Coincidence Method, *Proceedings of the IEEE 2008 Nuclear Science Symposium, Medical Imaging Conference and 16th Room Temperature Semiconductor Detector Workshop*, 19-25, Dresden, Germany, CDROM October 2008.