

Development of a dose calibrator to nuclear medicine laboratories

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Keywords: dose calibrator; electrometer; radio pharmaceuticals.

Introduction

Dose calibrators are devices used in measuring activities of radioactive substances (radio pharmaceuticals) to be given to patients in nuclear medicine laboratories. In nuclear medicine, radio pharmaceuticals are used in certain activity levels to diagnose and treat patients. In this report, the development of a prototype dose calibrator is presented. The aim of the work is to develop an equipment with features similar to those found in modern dose calibrators and to fulfill the needs of nuclear medicine centers and hospitals. It should be also emphasized that this equipment is part of a set of instruments produced in Brazil that satisfy the requirements of the regulatory standard CNEN NN 3.05 to nuclear medicine centers on basic radiation protection equipment [1].

Instrument design

The equipment will consist basically of an ionization chamber to measure the radio pharmaceuticals activity, an electrometer (current-to-voltage amplifier) with a extremely high impedance pre-amplifier, a microcontroller unit and a microcomputer. The electrometer has the amplifier sensitivity controlled by the MSP430 device, an ultra-low power microcontroller with an integrated 16 bits A/D converter. An USB port enables communication with the microcomputer. For easy man-machine interface the microcomputer has a touch screen display.

The graphical user interface under development uses the human centered design approach, under guidance from LABUCH (Laboratório de Usabilidade e Confiabilidade Humana). The human centered design emphasizes the use of ergonomics methods to collect human performance data, so that the allocation of the user's needs in all phases of equipment design can be guaranteed [2].

The digitally controlled electrometer with ultra-low current sensitivity is the main work of this project. It should have low-noise, fast-response, high-sensitivity and be compact. The tested circuit topologies obtained good results.

The Figure 1 shows a drawing of the dose calibrator: the main part associated with electronics and the diver, which are more efficient, robust and easier handling of radiopharmaceuticals.



Fig. 1 – Main part of the dose calibrator

Conclusion

The dose calibrator is an essential equipment in any nuclear medicine laboratory. All Nuclear Medicine Services in Brazil are required to employ dose calibrators to measure the activity of solutions containing radionuclides prior to the administration of these radiopharmaceuticals to patients for the purpose of either diagnosis or treatment of illnesses [3]. The completion of this work, scheduled for 2013, will allow local support for this type of equipment.

References

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