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### Evaluation of the performance of radioprotection ionization chambers used in radiometric survey of radiology clinical systems

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**Introduction:** The discovery of ionizing radiation and its application in medicine was an important advance for society due to the various possibilities of use for treatment and diagnosis of diseases. On the other hand, the knowledge about the damages caused by the biological effects of the ionizing radiation, requires a continuous improvement of the quality control in diagnostic radiology. Radiation detectors are equipment used to measure the levels of radiation emitted by sources, be they natural or artificial. Among the most commonly used detectors are ionization chambers (IC). During transport for clinical routine use, sudden changes in temperature and humidity may affect the behavior of these detectors at the time of measurement. For the equipment to recompose its stability, it is necessary a time that is often incompatible with the free time available for the tests. The objective of this work was to evaluate the performance of an ionization chamber used in radioprotection measurements in diagnostic radiology, considering the climatic variations in the different regions of Brazil<sup>[1]</sup>. For that, a system of air conditioning was developed to simulate the environmental situations found for the parameters of temperature and humidity at the moment of the clinical measurements, making possible to estimate the influence of these factors in the obtained values.

**Methods:** Before submitting the IC to the proposed climatic tests, the dosimetric system composed of an ionization chamber for radioprotection (Radcal®, 10x15 - 1800) and electrometer (Radcal® 9015) was calibrated in the instrument calibration laboratory of the Instituto de Pesquisas Energéticas e Nucleares (LCI-IPEN), in the ISO N series radiation qualities<sup>[2,3]</sup>. In order to evaluate the behavior of the detector in different environmental conditions, a system of air conditioning was constructed, which allows the control of humidity and temperature in an acrylic box with dimensions appropriate to the test, and a control source of  $^{90}\text{Sr} + ^{90}\text{Y}$  [PTW®, model 8921, 33MBq (1994)] for the irradiation of IC. The IC was then positioned within the acclimatization chamber for

15 minutes for stabilization according to the manufacturer's manual. A series of measurements was made with the source of the check to analyze the behavior of the CI with the typical environmental conditions of the city of Manaus, capital of Amazonas state that is located in the north of Brazil.

**Conclusions:** Preliminary results indicate an increase in the accumulated dose values obtained with the ionization chamber due to increase in temperature. The humidity parameter interfered in the background value measured by the ionization chamber and after the test, the ionization chamber showed a significant current leakage. Determining the influence of environmental factors is not an easy task, but it is fundamental to the reliability of measurement and optimization of quality control. The methodology proposed in this work pointed to a repeatable character, allowing the simulation of environmental tests for the parameters of humidity and temperature of several models of ionization chambers.

**References:** [1] INMET - Instituto Nacional de Meteorologia, Disponível: <<http://www.inmet.gov.br/portal/index.php?r=estacoes/estacoesAutomatica>>, accessed on June 15<sup>th</sup>, 2018.  
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[3] TECHNICAL REPORTS SERIES No. 457, Dosimetry in diagnostic radiology: an international code of practice, 2007 (IAEA TRS 457).