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Teste **Abstract: 94-1**

94-1 Evaluation of a Special Parallel-plate Ionization Chamber for Mammography and Digital Breast Tomosynthesis Dosimetry

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Abstract:

A special parallel-plate ionization chamber, developed at the Calibration Laboratory of IPEN (LCI), was tested to verify the possibility of its application in mammography and digital breast tomosynthesis dosimetry. It has a rectangular box geometric shape (146 mm x 46.4 mm x 24 mm), a sensitive length of 10 cm, and a sensitive volume of 3.2 cm^3. The chamber wall is made of PMMA, its collecting electrode is made of graphite, and its chamber window is a Mylar foil. The chamber was submitted to several characterization and quality control tests: leakage current, short- and medium-term stabilities, stabilization time, saturation, ion collection efficiency, polarity effect, linearity of response, and angular dependence. The maximum value observed in the leakage current test was 0.53% so within the recommended limit of ±5% by the IEC 61674 standard. In the short-term stability test, the highest coefficient of variation obtained was 0.17%. This value satisfies the IEC 61674 standard requirements (±3%). The maximum value observed in the medium-term stability was below the recommended limit of ±2%. For the stabilization time test, the difference between the ionization currents obtained between 15 min and 60 min after switching on the measuring system was only 0.62%. This result is within the recommended limits of ±2% of response variation, according to the IEC 61674 standard requirements. In the saturation test, it was achieved in the whole voltage interval evaluated. For all pairs of voltages tested during the saturation determination, the polarity effect was within the recommended limit of ±1%, as stated by IEC 61674. The ion collection efficiency, in turn, was better than 99.99%. The special ionization chamber presented a linear behavior, with a regression coefficient of $R^2 = 0.9999$. In the angular test, the maximum variation obtained was only 1.7%, so below the 3% recommended by the IEC 61674 standard. Results will also be presented about the energy dependence of the ionization chamber response in standard direct and attenuated mammography beams. The authors acknowledge the Brazilian agencies CNPq (Projects 403664/2022-5, 305142/2021-6, and 406303/2022-3) and FAPESP (Project 2018/05982-0) for partial financial support.

Keywords:

Ionization chamber, Mammography, Digital breast tomosynthesis, Dosimetry