

**A PMMA Graphite Coated Ionization Chamber for ^{60}Co Beam Dosimetry:
Experiments and Monte Carlo Simulation
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The accuracy and traceability of the calibration of dosimeters is of great concern to those involved in the dose delivery in radiotherapy, mainly due to the high doses received by the patients. The Calibration Laboratory of the IPEN offers calibration services for radiotherapy dosimeters, and has developed a special parallel-plate ionization chamber for use as a work standard dosimeter in ^{60}Co beams. The ionization chamber was tested in the ^{60}Co teletherapy unit, Gammatron II S80, which is used to calibrate clinical dosimeters (radiotherapy). The irradiation conditions for all measurements in this radiation unit were a field size of $10 \times 10 \text{ cm}^2$ and a source-detector distance of 100 cm. The experiments followed the recommendations of the IEC 60731 standard (IEC, 2011), and the undertaken operational tests were: saturation, ion collection efficiency, polarity effect, short- and medium-term stability, leakage current, angular dependence and linearity of response. All obtained results are within the recommended limits. As the ionization chamber, evaluated in this work, presents differences in relation to the dosimeters usually employed for ^{60}Co dosimetry (cylindrical type), Monte Carlo simulations, utilizing the PENELOPE code, were adopted to study the chamber configuration (design and materials). The simulation results showed that the maximum effect was observed for the ionization chamber stem. The experimental and simulation results pointed out that the dosimeter evaluated in the present work presents several advantages to be employed in ^{60}Co beam dosimetry: low-cost, easy assembling, robustness, good performance in the characterization tests and a configuration with low influence on the chamber response.

IEC, 2011; *Medical electrical equipment - Dosimeters with ionization chambers as used in radiotherapy*. IEC 60731. International Electrotechnical Commission, Genève.

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