

A NEW PARALLEL PLATE GRAPHITE IONIZATION CHAMBER AS A ^{60}Co GAMMA RADIATION REFERENCE INSTRUMENT

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The accuracy and traceability of the calibration of dosimeters is of great interest to those involved in the dose delivery in radiotherapy. The calibration procedure in radiotherapy treatments is very important and a sensitive task due to the high doses delivered to the patients. Although ^{60}Co gamma beams are nowadays rarely utilized in radiotherapy treatments, they are still important because they are utilized for the calibration of ionization chambers and other dosimeters in terms of air kerma and absorbed dose. Generally, the air-kerma cavity standards for ^{60}Co gamma rays are graphite cavity ionization chambers. In this work a new parallel plate graphite ionization chamber was studied to analyze its potential use as a reference instrument at the Calibration Laboratory of the IPEN. The ionization chamber was manufactured utilizing graphite and Teflon, and coaxial cables. The collecting electrode has a diameter of 42.0 mm and thickness of 2.0 mm, and the sensitive volume is 9.4 cm³. The entrance window is made of graphite and has a thickness of 4.0 mm to reach electronic equilibrium for ^{60}Co radiation. In order to evaluate its performance in ^{60}Co beams, it was submitted to the following tests: stability, leakage current, saturation curve, ion collection efficiency, polarity effect and angular dependence. The characterization tests were performed using a Gammatron ^{60}Co unit. Moreover, Monte Carlo simulations were undertaken using the EGSnrc code to study the influence of the chamber components on its response. The results obtained showed that this new ionization chamber presented an excellent performance in all evaluated tests.