

DETERMINATION OF TRANSMISSION FACTORS IN TISSUE USING A STANDARD EXTRAPOLATION CHAMBER

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The ionization chambers of the extrapolation type consist of the most appropriate instruments for the determination of the absorbed dose rates of beta radiation sources. They allow accurate and precise absolute measurements, and they are recommended by primary standard laboratories. At the Calibration Laboratory (LCI) of the Instituto de Pesquisas Energéticas e Nucleares (IPEN) there is an extrapolation chamber PTW, model 23392, which has been tested to be used as a primary standard system for the calibration and dosimetry of beta radiation sources and detectors. This commercial chamber, Böhm extrapolation chamber, is highly recommended for measurements in low energy X-rays and beta radiation fields. The objective of this work was to perform characterization tests of the extrapolation chamber when exposed in the $^{90}\text{Sr}+^{90}\text{Y}$ standard beta radiation beams of the two beta secondary standard systems (BSS) at LCI: BSS1, Buchler GmbH & Co, Germany, and BSS2, Isotrak, Germany. For these measurements, an electrometer Keithley, model 6517B, was utilized. Initially, extrapolation curves were obtained at the conditions specified at the calibration certificates of the sources, calibrated at Physikalisch-Technische Bundesanstalt (PTB). All extrapolation curves presented linear behavior, with linear correlation coefficients above 0.999. From the angular coefficients of the extrapolation curves, calibration factors were obtained for the extrapolation chamber. The transmission factors were obtained positioning foils of polyethylene terephthalate (Hostaphan) and polymethylmethacrylate (Lucite) of different thicknesses and equivalent to the tissue, successively, in front of the entrance window (Mylar material and superficial density of 0.71 mg/cm^2) of the chamber. The results showed a decrease in the transmission factors after an initial increase of the tissue equivalent depth, and they were comparable to those presented in the source calibration certificates. The preliminary conclusions of this work confirmed the very good behavior of the extrapolation chamber.