

Air Kerma Calibration Factors and k_{ch} Values for PTW Soft X-ray, NACP and Roos Ionization Chambers at Very Low X-ray Energies (0.035 mm- 1.0 mm Al HVL)

Abstract

Several national and international protocols have been established for the dosimetry of x-ray beams used in radiotherapy. For the very low energy x-rays (0.035 mm- 1.0 mm Al HVL) only two codes are available: the UK IPEMB Code of Practice and the German standard, DIN 6809 Part 4. The measurement of very low energy x-ray beams is normally performed with parallel plate ionization chambers calibrated at a standards laboratory and characterized by an air kerma calibration factor N_k . According to the IPEMB Code of Practice the absorbed dose in the user's beam should be determined by taking measurements with the parallel plate chamber positioned such that its entrance window is at the surface of a full-scatter water equivalent phantom. The absorbed dose to water can then be determined using an equation which includes a factor, k_{ch} , which accounts for the change in response of the ionization chamber between the calibration in air and measurement at the surface of the phantom. Measurements were performed at the National Physical Laboratory, UK, to determine N_k and k_{ch} for the PTW soft X-ray, NACP and Roos ionization chambers. A maximum value of 1.09 was obtained for k_{ch} , for the large soft x-ray chamber at a HVL of 1mm of Al, using a solid water equivalent phantom.