2012 International Symposium on radiation Physics - ISRP 2012
Rio de Janeiro, RJ, Brazil, October 07-12, 2012
INTERNATIONAL RADIATION PHYSICS SOCIETY - IRPS

DOSIMETRIC APPLICATION OF A PENCIL IONIZATION CHAMBER IN RADIOTHERAPY X-RAY BEAMS

L. P. Neves[1]*, A. P. Perini[1], J. M. Fernández-Varea[2], V. Cassola[3], R. Kramer[3], H. J. Khoury[3], L.V. E. Caldas[1]

[1]*Instituto de Pesquisas Energéticas e Nucleares, Comissão Nacional de Energia Nuclear (IPEN-CNEN/SP); Av. Prof. Lineu Prestes, 2242, 05508-000, SP, Brazil; lpneves@ipen.br*
[2]*Facultat de Física (ECM and ICC), Universitat de Barcelona; Diagonal 645, E-08028, Barcelona, Spain*
[3]*Universidade Federal de Pernambuco, Departamento de Energia Nuclear; Av. Prof. Luiz Freire 1000, 50740-540, Recife, Brazil*

Usually, pencil-type ionization chambers are used exclusively for computed tomography beam dosimetry procedures. These ionization chambers present a special design and some particular properties; they are long and thin. The aim of this work was to study the performance of a pencil ionization chamber with a sensitive volume of only 1.06 cm^3, and length of 3.0 cm, developed at the Calibration Laboratory of IPEN, in radiotherapy X-ray beams. These beams are still used for some skin cancer treatments due to their rapidly attenuation in tissue. The ionization chamber was manufactured using polymethyl methacrylate (PMMA), polyvinyl chloride (PVC) coated with graphite, aluminum electrode and coaxial cables. The sensitive volume is delimited by the PVC cylinder, coated with a thin layer of graphite, and filled with air. The thickness of the PVC cylinder and aluminum collecting electrode is 0.26 mm and 1.20 mm, respectively. The chamber performance was evaluated in some tests proposed by the International Electrotechnical Commission: short- and medium-term stability, saturation curve, ion collection efficiency, polarity effect, linearity of response and energy dependence. These tests were made using an industrial X- ray unit, Pantak/Seivert. For a complete analysis of the ionization chamber response, the Monte Carlo code was utilized to study the influence of its different parts on the response. All results of the tests were obtained in accordance with the limits recommended by the IEC 60731 standard, and this work shows that it is possible to extend the applicability of this pencil-type ionization chamber developed at LCI.