STABILITY OF TANDEM IONIZATION CHAMBERS FOR USE IN QUALITY CONTROL PROGRAMS IN RADIOTHERAPY AND DIAGNOSTIC RADIOLOGY

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Body of Abstract: A quality control program of X-ray equipments used in diagnostic radiology and radiotherapy requires the check of the beam qualities constancy in terms of the half-value layers. Two special double-faced parallel-plate ionization chambers, with inner electrodes of different materials, in tandem system, were designed, constructed, tested and calibrated at the Calibration Laboratory of Instituto de Pesquisas Energéticas e Nucleares, Brazil. The different energy response of the two faces of each chamber allowed the development of tandem systems useful for the check of beam qualities constancy. The main application of these ionization chambers will be in quality control programs of diagnostic and therapeutic X-ray equipments for confirmation of half-value layers previously determined by the conventional method. Moreover, the tandem chambers may also be utilized for measurements of air kerma values (and air kerma rates) in kilovoltage X-radiation fields used for diagnostic and therapeutic procedures. In this developed system no absorbers or special set-ups are necessary. A methodology for use of the chambers in the quality control of diagnostic and therapeutic X-ray systems was established, with the elaboration of the respective procedures. In this work, the results of the long term stabilitity tests of the combined response of the tandem ionization chambers and electrometers are presented and discussed. The ionization currents from the tandem chambers were measured using an electrometer model MULTIDOS and an electrometer model UNIDOS 10001, both from PTW (Physikalisch-Technische Werkstätten). A stability check device also was utilized. This device consists of a radioactive source of Sr-90 from PTW, type 8921, and a special holder was developed in order to provide a reproducible geometry for the measurements. The results showed a satisfactory level of performance of the chambers in relation to the long term stability tests.