ABSORBED DOSE DETERMINATION FOR MEGAVOLTAGE X-RAYS AND ELECTRONS

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Abstract—Local absorbed dose in the human body irradiated with megavoltage X-rays or electrons may be determined from ionization measurements at the place of interest by means of the cavity ionization relationship. An air-filled small ionization chamber having a 0.5 mm lucite wall, 0.68 cm^3 volume and 6 mm diameter has been developed to measure the cavity ionization.

Methods for detecting the collected charge through a resistor or a capacitor have been compared with the Townsend balance method. Then, the stem leakage of the chamber has been examined for ^{60}Co γ-rays, 10–29 MeV electrons and 10–29 MV X-rays. The results show that the stem leakage is less than 0.2 per cent of the cavity ionization, and hence the leakage may be neglected in the practical use of the chamber. Subsequently, cavity ionizations in water phantom have been measured by this chamber covered with different thicknesses of lucite caps, and the true cavity ionization without lucite wall has been given by means of extrapolation. It was found that the effect of the wall is negligible for megavoltage radiations, provided the wall is less than 150 mg/cm^2. Absorbed dose in soft tissue relative to the cavity ionization has been estimated on the assumption that water is equivalent to tissue. For example, the values are 0.88–0.82 rads per esu/cm^3 for 10–29 MeV electrons, and 0.98–0.95 rads per esu/cm^3 for 10–29 MV X-rays.