

MEASURING THE RADIATION YIELD COEFFICIENTS OF SMALL FIELDS WITH IBA DETECTORS

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The objectives of this work are: measurement of the data set of coefficients of radiative output (Output Factors - OF) using five detectors and data validation; determine how OF changes when using two types of field formation, namely, collimator shutters and a multileaf collimator (MLC); investigate the dependence of the output factors on the source-to-surface distance (SSD) and measurement depth, as well as on the type of detector used in the measurements.

The measurements were carried out in 6 MV photon beams with a smoothing filter on a TrueBeam linear accelerator. Five IBA detectors were used: two diode detectors (PFD and SFD) and three ionization chambers (CC 01, CC 04 and CC 13). Margins varied from 10cm x 10cm to 1cm x 1cm. Measurements were made with various combinations: SSD = 100cm and depth = 10cm, SSD = 95cm and depth = 5cm. The fields were formed by collimator shutters and MLC.

The radiation yield coefficient increases with decreasing SSD and measurement depth. An unshielded SFD diode detector has an insufficient response at low fields, a shielded PFD diode, on the contrary, has an excessive response. Ionization chambers have insufficient response at a field size of 1 cm x 1 cm due to their finite volume. At a field size of 1 cm x 1 cm, for any given SSD and depth, there is a large scatter in measured output factors between detectors. A particularly weak response in this field is observed in the CC13 ionization chamber with a volume of 0.13 cm³, which is largely due to the effect of volume averaging; this chamber is not suitable for measurements in such low fields.

To correct the output factors, it is necessary to use correction factors or calculate the coefficients based on the measurement results [1].

1. Dosimetry of Small Static Fields Used in External Beam Radiotherapy: An International Code of Practice for Reference and Relative Dose determination. / IAEA TRS 483, Vienna, 2017.

The speaker is a student or young scientist

No

Section

1. Nuclear technology and methods in medicine, radioecology

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