

Purpose: To measure the field size factor and establish reference values for clinical use

Methods and Materials: The field size factors (FSF), which is the ratio of output factor of a certain field size to the output of a reference field size, were measured for five clinical proton beams. The proton ranges of the selected beams are from 5.35 cm to 13.0 cm and modulations are from 3.3 cm and 8.9 cm. For each beam, the output was measured using a 0.01 cc compact chamber for field sizes of 11.6 cm diameter (open field), 5.6x5.6 cm², 4.5x4.5 cm², 3.0x3.0 cm², 2.0x2.0 cm² and 1.1 cm diameter. A 1D-translational water phantom was used. The point of the measurement is on the central axis in the center of the Spread Out Bragg Peak (SOBP), aligned with the isocenter.

Results: For field size larger than 3.0 cm diameter, the FSF is close to 100%. The FSF started to drop when field size became smaller than 3.0 cm diameter for the five beams. It decreased to about 90% for field size of 2.0 cm diameter and further decreased to about 45% for field size of 1.1 cm diameter.

Conclusions: The FSFs were measured for five beams with either square or circular apertures. It was observed the FSF changes significantly with field size. The values of FSF measured with square or circular apertures may not be directly used for irregular shaped patient fields, they however provide reference values for these fields.