

AbstractID: 5053 Title: Penumbra measurement with the use of a 2D pixel ionization chamber

Purpose: To attest the accuracy of the penumbra measurement with the use of a 2D pixel ionization chamber.

Method and Materials: Penumbra measurements were carried out for several clinical cases, treated with Intensity Modulated Radiation Therapy, with a pixel ionization chamber and with radiographic film as reference. The pixel chamber consists of a matrix 1020 detectors, each 4.5 mm diameter and 5 mm height at a pitch of 7.62 mm. Each of the 1020 ionization chambers was read out independently with no dead time. Standard radiographic films have been used, scanned with a pitch of 0.16 mm and 0.40 mm. Both detectors were irradiated with 6 MV photon beams, using a linac equipped with a 120-leaves multileaf

collimator. Measured dose profiles were fitted with a “Fermi-like” function: $f(x) = \frac{1}{1 + e^{a(x-x_0)}}$ with x_0 and a as free parameters; the value for the penumbra could then be derived from the fit. The two sets of data were compared.

Results: The data for the penumbra measured with the pixel chamber and the film for several IMRT fields show a strong linear correlation. This made it possible to correct the penumbra values obtained with the pixel ionization chamber to obtain a precise measurement even in a range well below the pixel dimensions.

Conclusion: The 2D pixel ionization chamber has been shown to be able to measure the penumbra down to ~ 2mm with an accuracy of ± 0.6 mm. This device can then efficiently replace radiographic film in some QA procedures with a significant gain in time as it gives results in real-time and data are immediately available.

Conflict of interest: Research sponsored by MAESTRO, European project on Methods and Advanced Equipment for Simulation and Treatment in Radiation Oncology