AbstractID: 4868 Title: A method to increase the resolution of IMRT plan verification with a two-dimensional ionisation chamber array

Purpose:

We have developed a method for high resolution dosimetric plan verification with two-dimensional ionization chamber arrays.

Methods and Materials:

The used 2D-Array (PTW Freiburg, Germany) contains a matrix of 27 x 27 ionization chambers, each with an entrance window of 5 mm x 5 mm and with 5 mm wide ridges between the chambers. For an IMRT plan verification, the calculated dose distribution of the patient is exported to a CT of a phantom containing the 2D-Array. The finite size of the chambers is accounted for by convolving the calculated dose distribution with the lateral transfer function of a single chamber. Considering the Nyquist theorem the chamber-to-chamber distance of 10 mm permits to resolve spatial frequencies up to 0,5/cm.

Results:

The resolution of the system can be doubled to 1,0/cm by shifting the array 5 mm in both x and y-direction and repeating the measurement. By this the chambers will be positioned where the ridges have been in the first measurement. In most IMRT sequences the sizes of field elements are usually not smaller than 1 cm x 1cm, therefore the verification of these techniques can be achieved with sufficient resolution. Since lateral dose gradients are much higher in segmental than in dynamic IMRT techniques, the sampling distance may be increased for the latter.

Conclusion:

As most planning systems offer the possibility of limiting the field size to areas larger then 1 cm x 1 cm, a single measurement will mostly be sufficient for the verification. Clinical examples show the wide and easy applicability of the described methods.

Conflict of interest: The method was developed in cooperation with PTW-Freiburg, Germany.