

AbstractID: 13020 Title: Gantry-Angle Dependence of a 2D Ion Chamber Array for IMAT QA

Purpose:

Gantry-angle dependence of dose measurement for intensity-modulated arc therapy (IMAT) quality assurance (QA) using a two-dimensional ion chamber array may be significant. A new device, the gantry angle sensor, has been provided to compensate for this dependence. However, the default correction factors (CF) assume that the ion chamber angular response is symmetrical, uniform across all chambers, and independent of field size. Our goal was to test these three assumptions, and verify the use of the default CF.

Method and Materials:

The Matrixx ion chamber array (IBA Dosimetry, Inc.) was irradiated every 5° gantry rotation with a 27x27cm² static field. The central ion chamber CF = calculation/measurement. To test the asymmetry, dose was delivered over 360°, and compared for symmetrical angles. To test for chamber response uniformity, CFs for off-axis chambers were calculated and compared to the central ion chamber. To test for field size dependence, the dose delivery was repeated with 10x10cm² and 2x2cm² fields, and the central ion chamber CF recalculated.

Results:

The measured chamber response is asymmetrical with gantry angle. The median difference between the default and measured central ion chamber CFs is 1.2% (range: -0.3%-8.5%) from Gantry 0-180°, and 2.9% (range: 0.7%-7.6%) from Gantry 180-360°. The asymmetry appears to arise from both the device itself (median 1.4%, range 0.1%-3.4%) and from the device holder (median 1.7%, range 0.5%-4.8%). The central-axis and peripheral CFs varied by up to 10%. There was no observed field size dependence at 10x10cm², but differences of up to 4.7% were seen with the 2x2cm² field.

Conclusion:

The CF table for gantry angle dependence of an ion chamber array should account for asymmetry, nonuniformity of chamber response, and field size effect for small fields. Clinics are recommended to verify their own CFs.