

AbstractID: 8956 Title: Evaluation of an Ion Chamber Array for Volume Modulated Radiation Therapy and Helical Tomotherapy

Purpose: The primary objective of this study was to determine if the MatriXX could be used as a substitute for radiographic film in rotational IMRT delivery techniques.

Method and Materials: Twenty random patients treated with helical tomotherapy were selected for this comparative analysis. The tomotherapy and VMAT QA plans were created in the respective planning systems by copying the patient's plan to the CT images of the MatriXX and re-computing the dose. Horizontal profiles, vertical profiles, Gamma pass/fail analysis, and Gamma histograms were calculated for each test case. For the Gamma calculations, the threshold parameters were set to a 3% dose difference and a 3-mm distance-to-agreement. The analysis region of interest was defined as the area of the film receiving over 10% of the prescribed dose.

Results: A total of twenty helical tomotherapy and volume modulated arc test cases have been measured and evaluated. From the gamma analysis, the percent of pixels exceeding the threshold with a 3% dose and 3-mm distance-to-agreement criteria was $10.8 \pm 6.9\%$ for the film versus $23.4 \pm 14.7\%$ for the MatriXX.

The MatriXX appears to function well in high-dose low-gradient regions and low-dose low-gradient regions. However, the MatriXX has difficulty in regions with steep dose gradients. This is likely due to 1.) Volume averaging across the 4.5 (\varnothing) x 5 (h) mm chambers, and 2.) the coarse 7.62 mm center-to-center spacing of the chambers.

Conclusions: Based on the analysis of the MatriXX data, half of the patients in this study would not have passed our institution's patient-specific IMRT QA testing. In contrast, only one patient would not have passed for measurements taken with film. As with all array devices, the MatriXX is limited in its spatial resolution. It is difficult to adequately verify plans with steep dose gradients using the MatriXX.