AbstractID: 13294 Title: Evaluation of MatriXX in peripheral dose regions for IMRT and VMAT dose verifications

Purpose: To evaluate MatriXX and to develop a MatriXX correction technique for IMRT and VMAT dose verifications in peripheral (low) dose regions. **Method and Materials:** We compare a 2D ion chamber array – MatriXX with a reference Exradin A12 ion chamber in solid water phantoms. Comparisons were performed for a number of cases that involve different gantry and MLC dynamics including open beam, sweeping MLC gap mimicking IMRT, oscillating sweeping MLC gap mimicking VMAT, as well as clinical IMRT and RapidArc plans. **Results:** We have identified four types of error associated with MatriXX dose in peripheral regions: (1) Pixel-dependent positive bias which is independent of dose level, cumulative over time, and dependent on operation parameters; (2) Over-response to scattered beams by 2.0% on average for regions 2 – 15 cm from the field edge where patient and collimator scatters dominate; (3) Angular dependence up to 11% and 8% for primary and scattered (peripheral) radiations, respectively; (4) Round-off error due to insufficient precision in conversion of raw signals to MatriXX software data for very small doses. In order to extend the application of MatriXX to peripheral regions, we have developed a method to correct for these errors. With corrections, MatriXX shows good agreement with A12 in all cases involving different gantry and/or MLC dynamics as well as the clinical plans. For both primary and peripheral doses, MatriXX shows good dose linearity down to about 1 – 2 cGy with an accuracy of within 1% of the local doses. **Conclusion:** Inherent dose errors of MatriXX were identified and thoroughly studied. A correction method was developed and successfully tested by a series of experimental and clinical plans. Therefore, we have demonstrated that, with proper corrections, MatriXX can be used for accurate 2D peripheral (low) dose measurements.