AbstractID: 12652 Title: The Applications of MatriXX to Electron Beam Dosimetry

Purpose: The objective of this study is to investigate the properties of I'mRT Matrixx device in electron beams, and to develop methods of electron dosimetry using Matrixx.

Method and Materials: The measurements were conducted using Matrixx in electron beams from Siemens linacs. The Matrixx was placed horizontally on the linac tabletop, supported with solid water blocks. Solid water layers were used for dose buildup on top of the Matrixx. For all the measurements, the linac gantry angle was 0°, and the SSD was 100 cm from the surface of solid water buildup. The depth ionization was measured for different energies and field sizes, thus the depth of maximum ionization and the effective water equivalent depth of Matrixx could be determined. The electron cone factors and beam profiles were measured at the maximum ionization depths. The 2D dose maps and cutout factors of custom blocks were studied using Matrixx.

Results: It was estimated that the intrinsic effective water equivalent depth of Matrixx is about 4.5 mm. When measuring at the respective depth of maximum electron intensity (peak of ionization), the Matrixx has slightly different dose responses for different electron energies. The cone factors measured by Matrixx are nearly identical to those derived by ionization chambers. Beam profiles (thus the flatness and symmetry) can be easily determined using Matrixx, and they are comparable to water tank results. The planar dose map of cutout blocks can be visually observed, and the cutout factors can be conveniently measured.

Conclusion: The MatriXX dose response to electron beams is different from photon beams, and separate dose calibration factors should be established for electron dosimetry. The ionization chamber array in Matrixx has the ability to display planar dose map in a single measurement. Matrixx has the potentials in electron beam dosimetry and routine QA.