AbstractID: 3497 Title: Wide Energy Metallic Build-up caps for MOSFET Dosimeters: Monte Carlo Simulation and Experimental Study of Dose Correction Factors at Dmax

Purpose: Current MOSFET dosimeters use large size (2cm) solid water build-up caps at high energies for patient dose measurements at Dmax, less practical for routine use. Dense metallic materials have been studied to reduce the amount of build-up needed to achieve electronic equilibrium at Dmax, and extend the MOSFET clinical use.

Method and Materials: The caps studied were hemispherical, with a groove to secure the MOSFET detector. The radiation tests were performed on brass, aluminum and plastic-water equivalent caps. Monte Carlo simulations of depth dose curves in the central axis of the geometry were performed to evaluate the cap effect on the dose measurements. Correction factors to scale the dose value at Dmax in water were also measured for each cap at 6 and 23 MV photon beams. Linearity and angular responses were also evaluated.

Results: At 6 MV and 10x10 cm^2 field (100 cm SSD), the correction factors were for aluminum (R 10 mm), brass (R 6.35 mm) and solid water (R 2 cm) caps, 0.96, 0.9 and 0.97 respectively. At 23MV and for similar caps, the correction factors were 0.97, 1.19 and 0.84 respectively. The brass cap is the only cap to achieve electronic equilibrium at both energies for the smallest size possible (6.35 mm). Its slight over response at 23MV is linked to its high atomic number. Its hemispherical shape ensures isotropic response up to 40 ^{o}, and only 3 % SD was observed for angles close to 90 ^{o} around the central axis at 6 MV.

Conclusion: The smallest brass build-up cap is highly suitable to create a full build-up for MOSFET measurements at high energies. Correction factors can be obtained for all photon energies, making routine in-vivo dosimetry easily feasible for different beams.

Conflict of Interest: Research supported by Thomson Nielsen Inc.