AbstractID: 7319 Title: Determination of exit skin dose for MammoSite^(R) RTS with TLD

Purpose: To accurately determine the exit skin dose from MammoSite® Radiation Therapy System treatments using thermoluminescent dosimeters (TLDs) placed on the surface of the skin during each treatment fraction.

Methods and Materials: Well-characterized TLD-100 chips were calibrated using ^{137}Cs to establish an energy response correction factor for ^{192}Ir measurements. TLD response vs. material thickness was measured and compared for thicknesses of Virtual Water™ and breast-equivalent material from 2 to 10cm. Monte Carlo simulations were performed to determine the relationship between the dose to TLD and dose to basal skin layer for a range of treatment parameters (size and content of balloon, distance from skin, etc). Treatment planning system (TPS) predicted skin doses were also compared to the TLD measured skin dose for 29 patients and two phantom setups.

Results: The TLD-100 energy response for ^{192}Ir relative to ^{137}Cs was determined to be 1.045. The TL vs. thickness curves for Virtual Water™ and breast-equivalent material were found to be within 2.5% for all thicknesses studied for ^{192}Ir, and can be used interchangeably within the 2.5% limit, which falls within our measurement uncertainty of 3%. The Monte Carlo calculated dose to TLD agreed with the $1/r^2$ corrected basal skin dose to within 0.5% for the entire range of treatment parameters studied when the dose to TLD vs. dose to water correction factor of 1.2 was applied. TPS predicted doses overestimated the TLD measured skin dose by an average of 26% for the group of 29 patients studied, and by an average of 40% for the two phantom setups.

Conclusions: TLDs placed on the surface of the breast during MammoSite RTS treatments can accurately measure the skin dose when the proper correction factors are applied. The TLD measured dose is much more accurate than the TPS predicted dose.