AbstractID: 13776 Title: Overcoming the Angle Dependence of a Solid State Dosimeter in Direct Measurement of CT Dose

PURPOSE: This paper presents a new approach to correct for the angle dependence of a small volume solid state dosimeter. Because of its significant angle dependence, the current dosimeter is inappropriate in measuring CT dose.

METHODS & MATERIALS: A solid state dosimeter has been evaluated and demonstrated significant angle dependence. To overcome the angle dependence, multiple sensors of the device have been combined into one single detector, with each sensor positioned in such a way that the angular sensitivities compensate with one another. The device has been verified using a variety of phantoms, including anthropomorphic adult head and body phantoms as well as pediatric head and body phantoms. In addition, cylindrical acrylic phantoms are utilized with varying diameters from 6 cm to 32 cm. The CT scanners tested include a 64 slices VCT and a 320-detector row volume scanner.

RESULTS: The angular sensitivity of the detector combined from multiple sensors shows steady angle responses with averages of 85% to 87% of the maximum for kVp stations of 120 kVp down to 80 kVp. This is a significant improvement in angle dependence considering the angular sensitivity of a single sensor at 90 degree is only 12% of that at 0 degree. Therefore, the detector made of multiple sensors is much more appropriate in CT dose measurements as the radiations incident upon the detector in all directions. The ion chamber measurement is used as a gold standard and the results from the solid state detector are verified with cylindrical acrylic phantoms and anthropomorphic phantoms.

Conclusion: With the approach presented here, the angle dependence of the solid state detector can be minimized and the device provides a useful tool for direct and instantaneous measurement of CT dose. This allows individualized CT dose reporting that considers the patient size, tissue composition and scan protocol.