Abstract ID: 16545 Title: A model for CT contrast agent evaluation

Purpose: A model is presented that has been designed to evaluate and optimize the use of CT based contrast agents. Initial validation of the model was undertaken and presented here.

Methods: The model employs computed spectra from the x-ray tube at a specified kilovoltage, attenuation correct ion applied to the spectra for filtration and projection of the spectra through a cylindrically symmetric phantom which may also contain a virtual contrast agent filled target at its center. Noise was applied to computed projection data based on photon counting and standard filtered back projection applied to provide a simulated image from which signal-to-noise (SNR) can be computed. In the case of a virtual contrast agent filled target, the contrast-to-noise ratio (CNR) can be determined as well. Dose at the center of the phantom is computed from the calculated photon fluence. In this model, the CNR per unit radiation dose and/or per unit of contrast agent may be computed. The impact of kilovoltage and filtration on this parameter may be assessed allowing for optimized imaging conditions. In this initial validation of the model a uniform water equivalent plastic phantom was assumed and the CT number and radiation dose were computed for a CT system operating at 120 kVp and 100 mAs. The results were compared to direct measurement for a GE CT system under these conditions.

Results: The CT number and dose provided by the model was -0.04 and 0.440 cGy respectively. This agreed within 3.5 H.U. and 11% of measured value when scatter is added to the model.

Conclusions: Computed tomography dose, and with further refinement, SNR and CNR may be accurately computed using this model. Placing a virtual contrast agent containing target at the phantom center will allow for prototype contrast agent evaluation and allow for the optimization of technical parameters.