AbstractID: 7767 Title: Evaluation of a Noise Addition Software for Simulating Low Dose MDCT Images

Purpose: To evaluate the utility of a noise addition software in simulating realistic MDCT images at reduced radiation dose levels.

Methods and Materials: The utility of the software in simulating realistic low dose CT images was evaluated using a water phantom. The phantom was scanned on a GE LightSpeed VCT scanner at four different tube potentials (80, 100, 120 and 140 kVp) and eight different tube currents (400, 300, 200, 100, 80, 60, 40 and 20 mA). Actual images from the 400-mA scans were used to create simulated images at each reduced mA. For each combination of kVp and reduced mA, a set of three actual CT slices with no identifiable structures except water were picked together with their corresponding simulated images. Sixteen regions of interest (ROIs), 64 by 64 pixels each, were identified from each slice. Normalized noise power spectra were calculated from the ROIs using Fourier analysis and averaged over the three slices in each set. Noise power spectra of the simulated images were compared with that of their corresponding actual images to evaluate the relative magnitudes and textures of the simulated noise fields.

Results:
The noise power spectra of the simulated low dose images of the water phantom match well those of actual images in terms of spectral shape, but exhibit lower magnitudes especially when the mA in the simulated image is much lower than the original mA..

Conclusion:
The close match in spectral shape between the noise power spectra of the simulated and actual low dose CT images of the water phantom demonstrates the utility of the noise addition software to emulate actual textures of the noise. Further development is required to better match the magnitudes of noise in simulated and actual images over a wider range of mA values. Research sponsored by GE Healthcare.