AbstractID: 8974 Title: Measuring CT incident flux using CT sinogram data

Purpose:
The value of incident flux in a multi detector CT scanner is necessary to model noise properties of a CT scan. A novel method is proposed to determine the incident flux of any clinical CT scan by utilizing direct exposure (air) regions of the sinogram data.

Method and Materials:
17 clinical patient scans, with tube current modulation on (11 scans) and off (6 scans), were collected from three sixteen-row scanners at different locations. In addition a non-symmetric object (skull with contrast) was scanned with two mAs settings (low and high), and with tube modulation on and off. Air regions of sinogram data were segmented by setting a threshold and collecting samples of direct exposures. Meanwhile, the extracted data were normalized using predetermined information about Case-a: the bowtie profile, or Case-b: the bowtie profile and the tube current (which was extracted from the header of CT sinogram data file). The variance of the gradient of the selected points of normalized data in transmission space as a function of gantry angle was obtained, which is inversely proportional to the incident flux. With this innovative method the result of Case-a is proportional to the tube current, and the result of Case-b is a constant scaling factor(K) relating incident flux to tube current for a given CT scanner.

Results:
The rms relative error between predicted and measured K was found to be 2.2%. The standard deviation in the value of K was 4.5%, indicating the scan-to-scan variation in flux scaling for an individual scanner. Computing a mean inter-scanner variation indicates calibration of individual scanners is required to achieve simulation noise accuracies less than 5%.

Conclusion:
Utilizing this method, the incident flux or scaling factor characterizing incident flux for particular CT scanner can be computed.

Conflict of Interest (only if applicable):
None