AbstractID: 8329 Title: A mutlidetector CT model using BEAMnrc/DOSXYZnrc code for estimating radiation doses: phantom study.

Purpose:
Most of Monte Carlo based methods to estimate radiation dose in computed tomography (CT) were performed using MCNP or EGS codes. However, They can't really simulate the CT source, such as the x-ray tube and the bowtie filter. The purpose of this study is to verify the feasibility of using BEAMnrc/DOSXYZnrc code to develop a real multidetector CT (MDCT) model and estimate radiation doses based on CT image voxelized phantoms.
Method and Materials:
A Siemens Somatom Sensation 64 MDCT scanner system was established to achieve the objective in this study. Detailed inner structures of the MDCT source were constructed by component modules in the BEAMnrc/DOSXYZnrc code to simulate the x-ray tube, filtrations, bowtie filter, collimators and geometry factors. Furthermore, simulated CT source results, such as spectra, off axis ratio (OAR), half-value layer, and radiation beam profiles, were compared with the measured results. Next, utilizing cylindrical and anthropomorphic phantom calculate CTDI and organ dose in the single axial and helical scan.
Results:
The simulated x-ray spectra have been compared with those in Xcom5r calculations and they agreed with each other. Comparisons between simulated and experimental results for the lateral in-air OAR, half value layer, and the radiation beam profiles were completed and the differences were within 3%. The CT dose index (CTDI) in air, in phantoms and organ dose have been simulated and calculated to confirm with measurements.
Conclusion:
This study illustrates the feasibility to extend the BEAMnrc/DOSXYZnrc code to model MDCT sources. The X-ray tube and bowtie filter model really constructed by the BEAMnrc code. Future works devote to simulating specific patients' organ doses and effective doses in CT examinations.
Conflict of Interest (only if applicable):