AbstractID: 6742 Title: Effects of Scatter in Dual-Source CT

Purpose:
To investigate the magnitude and distribution of scatter for dual-source CT (DSCT) and its impact on image quality.

Materials and Methods:
Apart from forward scatter which is given for all CT scanners, the measurements at a dual-source system is also affected by cross scattered photons from the second tube-detector system arranged at 90°.
Simulations and measurements of homogenous phantoms of increasing diameter (100– 400 mm) and of anthropomorphic phantoms were conducted for a DSCT scanner (SOMATOM Definition, Siemens Medical Solutions, Forchheim, Germany). The simulations of both forward and cross scatter were carried out using combined analytical and Monte Carlo simulation methods using a collimation of 19.2 mm for both tube-detector systems. Measurements of cross scatter were performed by switching one tube off, still reading out the corresponding detector. Cross scatter was evaluated with respect to anthropomorphic and homogeneous phantoms for different imaging conditions such as different tube voltages, bow--tie filters. Dual-energy scanning was included in the evaluations.

Results:
The forward scatter fraction increased with increasing diameter to 10% for a PMMA phantom of 400 mm diameter; for cross scatter, the mean intensity was lower or equivalent to forward scatter for small phantoms but was larger for increased phantom diameters. For large objects the ratio of cross scatter intensity to the sum of primary signal and forward scatter intensity reaches values higher than 100%. The outer dimensions of the object appear to be decisive for cross-scatter whereas the influence of phantom inhomogeneity appears to be negligible. For dual energy - dual source scan modes the tube current setting for each tube should be adapted to achieve a minimization of cross scatter.

Conclusion:
The cross scatter magnitude is non-negligible for a DSCT system and a compensation of its contribution is necessary for the assurance of high image quality.