AbstractID: 9669 Title: X-ray spectra optimization for dual-energy imaging using dual-source CT

Purpose: To optimize the filtration of the two x-ray tubes of a dual-source CT (DSCT) system in order to achieve better separation between the low and high energy spectra used for dual-energy imaging, thereby increasing the sensitivity of dual-energy material discrimination techniques. **Method and Materials:** The x-ray spectra used in DSCT were simulated using proprietary software. Additional filtration of the low-energy spectrum would decrease the number of photons reaching the detector resulting in unacceptable image noise. Thus, we reduced the factory-installed filtration for the 80 kVp spectrum in order to increase the number of low-energy photons and concentrated our efforts on optimizing the filtration for the high-energy spectrum. We evaluated 15 filter materials, with the aim of minimizing the overlap between the two spectra. For simplicity, only single-element materials (nonvolatile, solid at room temperature, machinable, etc.) within the atomic number range $40 \leq Z \leq 83$ were considered. The filter thickness was selected in 0.1 mm increments so that the detector signal (integrated energy) at isocenter was similar for both spectra at the same mAs. The difference between mean energies and the ratio of the 140 and 80 kVp detector signals, each integrated below 80 kVp, were evaluated. The optimization was performed for both head and body virtual phantoms. **Results:** Seven materials were found to perform similarly well at proper thicknesses. Spectral separation was increased from 25.7 to 50.1 keV (head phantom) and 28.6 to 52.6 keV (body phantom). The spectral overlap was reduced from 427% to 5-7% (head) and from 458% to 1-2% (body). **Conclusion:** Using independent filter materials and thicknesses, separation of the two DSCT spectra used for dual-energy imaging can be increased by almost a factor of 2 and the spectral overlap reduced by more than a factor of 425. **Conflict of Interest:** Research partially supported by Siemens Medical Solutions.