AbstractID: 1490 Title: A Monte-Carlo based method to estimate radiation dose from Multidetector Helical CT: Verification in Anthropomorphic phantoms

The purpose of this work was to extend the verification of Monte Carlo based methods for estimating radiation dose from CT from cylindrical phantom measurements using single detector CT to a physical anthropomorphic phantom using a multidetector CT (MDCT) scanner. A physical anthropomorphic phantom was scanned on a MDCT under specified conditions while a radiation detector (Skin dose Monitor-SDM) recorded measurements at the phantom's surface. Detailed Monte Carlo models were developed for the MDCT to describe the X-ray source (spectra, bowtie filter, etc.) and geometry factors (distance from focal spot to isocenter, source movement due to axial or helical scanning, etc.). Image data from the phantom scan were used to create a detailed voxelized model of the phantom's geometry. Phantom material compositions were provided by the manufacturer. A simulation of the physical scan was performed using the mathematical models of the scanner, phantom and scan parameters. Tallies were recorded at all locations, including those of the SDM physical measurements. For the specified scanning condition, SDM measured values ranged from 15.2 mGy to 18.2 mGy at the phantom surface. Comparisons between the SDM and the absolute dose value derived from the Monte Carlo simulations derived from the anthroporphic phantom scanned under the same conditions will be presented. This work demonstrates the ability to extend models from a single detector scanner using cylindrical phantoms to an MDCT scanner using anthropomorphic phantoms. Future work will be extended to models of patients of different sizes (adult, pediatric) and to other MDCT scanners.