

AbstractID: 7021 Title: Comprehensive Monte Carlo evaluation of absorbed dose in computed tomography using water and polymethyl methacrylate cylinders from 1 cm to 50 cm in diameter

## Abstract

Computed tomography utilization has increased markedly in recent years, as the performance of modern scanners improves. The increased utility of CT also brings with it concerns about the radiation dose associated with these procedures. Additionally, computed tomography systems are being deployed for research investigations involving small animals, and other specialized systems such as breast CT are also being evaluated for efficacy. Given these uses of CT technology, patient (mice and humans) size span a considerable range of diameters. In this investigation, Monte Carlo simulations were used to evaluate the radiation dose to long cylinders of water and polymethyl methacrylate (PMMA) over a comprehensive range of cylinders from 1 cm to 50 cm in diameter. In addition, monoenergetic x-ray beams were studied ranging from 5 keV to 150 keV. Radiation dose was assessed at three different locations, including the Center, periphery, and over the entire volume of the cylinder. The geometry of a commercial CT scanner was simulated, and the influence of both the body and head bow tie filters as well as no bowtie filter was studied. The results of this investigation demonstrates the continuum of radiation dose across a wide range of patient diameters. In addition to demonstrating specific trends in CT dosimetry, a spreadsheet is available which allows the computation of radiation dose over a wide range of object diameters, for water and PMMA, for a large number of x-ray spectra.