Purpose: To investigate the scatter dose received by a CT-scanner operator from walls and ceiling as a function of the height of the shielding barrier between the operator and the scanner. To compare Monte Carlo (MC) simulated data with measurement.

Methods: MC simulations were performed, using the Penelope algorithm. The CT scanner and a typical, lead-shielded control console were modeled in cylindrical coordinates. An x-ray photon spectrum of 120 kVp impinging on a water-phantom was modeled and the resulting scatter dose profile obtained in CT suite and operator room. This simulation was repeated with varying heights of the lead shield: between 6 ft. and 15 ft (height of the concrete ceiling). Finally measurements were obtained of a cross section of the scatter dose profile in the operator room, using a 64 slice CT scanner (Toshiba Aquilion), a water-equivalent phantom and an NaI-based survey meter; the measured dose profiles are compared with the simulated ones. Dose reduction at the operator console resulting from increased wall height was measured and compared to simulation.

Results: Simulating the extension of the lead shield from a height of 6 ft. all the way to the ceiling resulted in dose reduction at the operator console of two orders of magnitude. Measured dose profiles show good qualitative agreement with the simulated profiles. Measured dose reduction for increased barrier height was larger than simulated, likely owing to the simplified geometry used in simulating the CT scanner and room geometry.

Conclusions: Additional contribution of dose scattered at the ceiling and back wall of an operator console can be significant; its varying contribution is given as a function of barrier height. MC simulation provides good qualitative agreement with the measurement. Improved modeling of the CT-suite is likely needed to enhance quantitative agreement.