

## AbstractID: 5836 Title: The Effect of MLC Geometry on Monte Carlo Simulated Beam Output for IMRT

**Purpose:** This work studies the effect of detailed multileaf collimator (MLC) geometry on beam output for small MLC segments in Monte Carlo dose calculation for IMRT planning and quality assurance.

**Method and Materials:** An analytical examination of the geometrical structures between the linac extrafocal source and the isocenter plane was evaluated. The main source, a small extended source, can contribute almost the same to every point at the isocenter plane while the extrafocal source, at the level of the flattening filter, may be partially blocked by the MLC leaves. The Siemens MLC geometry, with 7.7cm thick leaves was used to investigate the blocking effect. The flattening filter is 18.3cm above the MLC and the isocenter is 64 cm away from the MLC. The Monte Carlo method is an accurate method to predict the deliver doses to the patient; however, the beam output variation due to the detailed MLC geometry may introduce uncertainties in the Monte Carlo dose calculation.

**Results:** A 1x1 cm opening at the isocenter plane 2.5cm away from the central axis can project a 0.24x0.33 cm area on the secondary source plane. While in Monte Carlo calculations, a 0.33x0.33 cm area is used. In order to precisely predict the effect of MLC blockage on beam output, a multiple Gaussian source at the secondary source plane (S. Jiang et al, Med. Phys. 28, 55, 2001) was used in this work. The integral scatter contribution from the real case differs from that used in Monte Carlo calculation by about 1.0%. This means the Monte Carlo method will predict a 1.0 % higher accumulated dose due to the overestimation of the extrafocal source.

**Conclusion:** Small (1-2%) uncertainties on the IMRT dose distribution calculated by the Monte Carlo method are predicted using reconstructed intensity maps rather than using detailed MLC geometry.