

## AbstractID: 13476 Title: Experimental verification of clinically-relevant Monte Carlo x-ray simulations

**Purpose:** Verify that Monte Carlo simulations of clinically-relevant x-ray fields based on open-field simulations agree with measured dose distributions. Incident beam energy and spot-sized were determined independently, previously; the only simulation parameters varied here were the jaw/MLC positions.

**Methods & Materials:** Monte Carlo simulations using EGSnrc/BEAMnrc of small x-ray fields and fields modified with wedges were compared to measured dose distributions and output factors at 6 and 18 MV. Simulation parameters were derived from a match of open field simulation to measurement using independently measured energy of the electron beam in the waveguide and spot size, and measured jaw/MLC positions. Asymmetry, for example in the positioning of the flattening filter, was accounted for in the simulations. Output factors were measured with a CC13 ion chamber for large field sizes and an Exradin A14 for small field sizes. Transmission through the jaw was determined.

**Results:** Simulated and measured dose distributions were in close agreement. Profiles and PDD curves agreed as well as the open field measurements, to within 1.5%/1.5 mm. Output factors were in agreement to within 2% down to a square field of size of 1.6 cm. Measured and simulated penumbra agreed, as expected because the spot size was measured.

**Conclusions:** Simulations of clinically-relevant x-ray fields based on open field measurements were in close agreement with measurement. This validated both the simulations and the methods used to determine them, namely matching open field measurements with independently measured spot size and incident beam energy.

Support from NIH R01 CA104777-01A2.