AbstractID: 6618 Title: Monte Carlo dose calculations for serial tomotherapy

The use of a Monte Carlo simulation system for accurate dose calculations for a commercially available serial tomotherapy system (MIMiC, NOMOS Corp., Sewickley, PA) is presented. A source-parameter model of the accelerator treatment head was commissioned for Monte Carlo calculations. The EGS4 user code MCDOSE was modified to simulate the delivery of a continuously rotating slit-multileaf collimator. A fluence map was used to apply particle weights to implicitly account for leaf blockage and transmission. The gantry rotation was then divided into fixed gantry angles separated by 0.01˚ or 0.25˚ and the continuous rotation approximated by these hundreds or thousands of static fields. Alternatively, a true continuous rotation could be simulated by randomly sampling gantry angles. A Monte Carlo simulation of a patient plan in a homogeneous water phantom was then performed, and shown to give agreement with the Corvus implementation of the finite-sized pencil beam to within 4% or 3 mm lateral shift in isodose lines. These results are consistent with literature values for comparisons between Monte Carlo and FSPB and served as verification of the Monte Carlo implementation. A simulation in a head CT phantom was then performed and good qualitative agreement observed between Monte Carlo and FSPB. Differences were observed in regions of electronic disequilibrium in a manner consistent with previously published results for static gantry angle IMRT. The potential utility of this Monte Carlo system for evaluating MIMiC plans is discussed.