AbstractID: 4428 Title: Monte Carlo I: Source Modeling and Beam Commissioning for Treatment Planning

In this presentation, we will discuss source modeling and beam commissioning for Monte Carlo treatment planning. We will review the current status of Monte Carlo simulations of clinical photon and electron beams and the theories and methodologies used in particle phase space representation and reconstruction for Monte Carlo dose calculation. We will discuss the sensitivity of beam characterization to simulation details, such as beam energy, angle, intensity, and details of the treatment head design. We will review different source models for photon and electron beam characterization and discuss the accuracy and efficiency tradeoffs between full phase space and simplified source models. We will describe the methods and software that have been developed for source modeling and beam commissioning for the clinical implementation of the Monte Carlo method for treatment planning and beam delivery verification. We will present different methods for source parameterization based on simulated phase space data and a standard set of measured beam data including in-air and in-phantom output factors and in-phantom dose distributions.

Educational objectives:

1. Describe the Monte Carlo method for clinical photon and electron beam simulations
2. Review theories and methodologies for phase space representation and reconstruction
3. Present different source models for Monte Carlo dose calculation
4. Describe different methods for source parameterization and beam commissioning