

AbstractID: 11644 Title: Development of an easy to commission electron beam model using highly accurate fluence benchmarks from full Monte Carlo treatment head simulations and measurements.

Purpose: Development of an easy to commission electron beam model using highly accurate fluence benchmarks from Monte Carlo treatment head simulations and measurements. **Method and Materials:** A simple electron beam model consists of the key treatment head components: a circular primary source for electrons, a disk representing the secondary scattering foil and a ring representing the monitor chamber sidewall. The primary source accounts for scatter in the exit window and primary foil. The angular distribution of the primary source is chosen to match the lateral dose profiles from measurements with only the primary foil in the treatment head. The energy spectrum is derived from unfolding measured depth dose curves from large fields. The angular distribution of the primary source is broadened analytically using accurate scattering theory to account for the secondary scattering foil. The lateral extent of the beam is restricted to account for the collimation by the sidewall of the monitor chamber. Phase space data generated from the simple electron beam model is used with the EGSnrc user code BEAMnrc to simulate the secondary collimators and scattering of the electrons in air. **Results:** Primary foil simulations with the beam model, with no secondary scattering foil or monitor chamber in the beam line, match measured dose profiles of large fields within 1%-2%. Fluence profiles were in comparable agreement with the benchmark. Energy spectra were cleanly unfolded from measured depth dose curves from large fields. Peak energy was within 0.05 MeV of the fluence benchmark. Preliminary results for the full clinical beam with the secondary foil and chamber in place are promising. **Conclusions:** The influence of the different treatment head components on the beam were accurately determined with the detailed fluence benchmarks, which proved instrumental in development of this beam model. Research sponsored by NIH R01_CA104777.