AbstractID: 11486 Title: XBeam: An Accurate, Easily Commissioned Radiotherapy X-ray Beam Model

Purpose: To develop a simple x-ray beam model which is accurate in both fluence and dose and easy to commission, validating against recently developed gold standard Monte Carlo fluence benchmarks for Siemens and Varian clinical beams. **Method and Materials:** Dose distributions and relative output factors were measured in water for 6 and 18 MV clinical beams for 1-40 cm wide square fields. A compact ion chamber and photon diode was used to measure the profiles, a parallel-plate chamber for percentage depth dose (PDD). The beam model consists of three sources: a spot and a ring for photons and a ring for electrons. The free parameters were adjusted based on select measurements. The central axis energy distribution was sampled from the thin-target Schiff bremsstrahlung spectrum, and attenuated through a flattener of thickness adjusted to match the measured PDD in small fields. Particles statistical weights were adjusted at different positions to match the measured profiles. Analytical sampling procedures were developed to generate the full phase space above the jaws. **Results:** Spectral reconstruction resulted in a good match to the measured small field depth dose curves for the Siemens beams. The energy distribution is in good agreement with the fluence benchmark. XBeam fluence and dose along the diagonal of the largest field for the Siemens beams are in good agreement with measurements out to 25 cm. An overestimate outside of the penumbral region will be improved by adjusting the spot size. Comprehensive comparisons to fluence benchmarks for Siemens and Varian beams are in progress and will be presented. **Conclusion:** XBeam has a minimum number of free parameters, which are fitted to dose measurements within realistic limits. Preliminary results indicate the model will be easy to commission and accurate in both fluence and dose. The fluence benchmarks greatly facilitated development of the beam model.