

AbstractID: 3128 Title: The dose discrepancies between Monte Carlo calculations and measurements in the build-up region for high-energy photon beams

Purpose: To study the dose discrepancies between Monte Carlo calculations and measurements in the build-up region for high energy photon beams. There are previous studies which show that neutrons present in a high-energy photon beam are unlikely to be responsible for the reported discrepancies (Ding *et al* 2002, Hartmann Siantar *et al* 2001) in the build-up region for large fields. It is necessary to figure out if the discrepancy could be a result of flaws in the Monte Carlo simulation or uncertainties in the measured data in the build-up region.

Method and Materials: The EGSnrc Monte Carlo code, BEAMnrc, has been used to simulate dose distributions produced by 23MV photon beams from a Siemens Primus Linac for 5x5cm², 10x10 cm², 15x15 cm², 25x25 cm² and 40x40 cm² field sizes. The simulation of the accelerator was accomplished in two stages. The stored phase space file from the first stage was used repeatedly for the second stage as source data. The corresponding depth-dose curves in the build-up region for the above field sizes were measured in the solid water by a plane parallel chamber and in water by a cylindrical chamber.

Results: Comparisons between the calculations and measurements reveal the dose discrepancies in the build-up region fields increase with increasing field size. However, the differences between the measurements by different measurement detectors are far less than those between the calculations and measurements.

Conclusion: The discrepancy is caused by the simulation itself. Just as Hartmann Siantar C L *et al* (2001) hypothesized, it may be caused by a source of electrons in the accelerator head that was not fully accounted for in the treatment head simulation.