

AbstractID: 10747 Title: Measurement of lateral dose distributions using GafChromic EBT films and PTW Starcheck 2-D array

Purpose: One-dimensional in-air scans have been proposed for accurate Monte Carlo commissioning of clinically linac beams. The purpose of this work was to extend the measurement of such electron and photon dose distributions to two dimensions, in order to confirm the circular symmetry assumption of the 1-D case and investigate differences previously reported between ion chamber scans and EGSnrc calculations.

Method and Materials: Two systems were investigated - GafChromic EBT film and the PTW Stacheck device - and dose profiles were obtained for electron and photon beams from a Vickers research accelerator. A range of scattering foils (electron beams) and target materials (photon beams) were investigated for a 20 MeV beam. Prior to the investigation, both systems were accurately commissioned in beams from an Elekta Precise clinical linac. All results were compared with previously published 1-D ion chamber and Monte Carlo data.

Results: The EBT film measurements confirmed the circular symmetry of both electron and photon beams for all scatter foils and targets. Electron relative dose profiles measured using film were consistently narrower than Monte Carlo simulations, while ion chamber scans were broader than simulation. For X-rays, relative dose profiles measured using film generally agree better with Monte Carlo than ion chamber profiles. X-ray profiles measured by the Starcheck also show better agreement with Monte Carlo than 1-D ion chamber scan. In comparing the two 2-D systems, EBT film shows a lower uncertainty and smoother uniformity response than the Starcheck. Absolute X-ray dose measurements using film and Starcheck showed significant target-dependent differences of up to 5%.

Conclusion: Both EBT film and Starcheck can be used to obtain relative dose profiles with uncertainties at the 2% level. The systematic difference between absolute dose measurement with the two systems suggests that the Starcheck is more sensitive to changes in X-ray spectra.