

Purpose:

Two Elekta Synergy linacs were installed; one with the Elekta MLCi2 collimator and the other was installed with the Elekta Beam Modulator collimator. The concept of beam matching nominally includes the capability for patients to be switched between machines during the course of treatment with nominal replanning. However with the two different MLC designs and treatment head configurations, a precise beam match is not possible and lies outside the scope of this investigation. Nevertheless, we set out to characterize the physical radiation machines parameters between the machines and highlight any significant deviations.

Methods:

The acceptance scanning was performed with a Blue Phantom2 from IBA Dosimetry. In conjunction with the standard Elekta acceptance testing criteria, d_{max} values, depth dose curves and beam profiles were acquired for all energies on both machines. The Beam Modulator MLC has a maximum field size of 16x21 cm so the 8x8cm and 16x16cm field sizes were selected for flatness and symmetry measurements. This machine incorporates 4mm leaves and therefore could not produce the standard 10 x 10 cm field of the MLCi2 with its 10mm leaves, hence a 10.4 x 9.6 cm field was used. The resulting data was normalized, smoothed and central-axis corrected.

Results:

Corresponding points on the percent depth dose curve differed by up to 0.5% beyond d_{max} . The d_{max} values for all energies were within 1mm of each other. The largest deviation in flatness and symmetry was 1.1% and 0.7% respectively. The maximum discrepancy between the penumbra widths of the profiles was 1.1mm.

Conclusions:

The physical characteristics of the photon beams were found to be surprisingly similar for the chosen reference fields even though the treatment heads and MLC design were markedly different. These results were not anticipated by installation engineers, site physicists or the manufacturer's specifications.