AbstractID: 6779 Title: Characterization of helical electron beams for radiotherapy: A Monte Carlo study

The characteristics of helical electron beams generated with the aid of longitudinal magnetic fields applied to electrons from a linear accelerator were studied. Contrary to previous studies where the magnetic field encompasses the patient, we investigated the effect of applying a field to the electron beam before reaching the patient. Dosimetric improvements similar to those from internal magnetic field application can be achieved by applying the field above the patient surface. In addition, this approach significantly reduces the volume in which the field is applied resulting in magnet designs that are more feasible.

The EGS4/BEAM Monte Carlo code was used to study the confinement of electron beams by magnetic fields. The code was used to model electron beams from a linear accelerator with a standard electron cone attached to the accelerator head. A uniform axial magnetic field parallel to the beam direction was applied to the interface region between the cone and the phantom. Dose in a water phantom placed immediately beyond the field was calculated. Field strengths from 0-50 kG were studied.

Application of the magnetic field effectively enhanced the dose at d_{max} relative to the dose at the surface. In addition, the field sharpened the beam penumbra. These effects have the potential to improve electron dosimetry. For example, in breast cancer treatment this technique could reduce heart and lung dose while maintaining the target dose.

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