Electron beam dose modification using transverse magnetic fields

Sion Koren
Fox Chase Cancer Center

Abstract

This work demonstrates the feasibility of using transverse magnetic fields with electron beams for radiation therapy purposes. The use of the transverse B field was suggested in the past using clinically available electron beams and super conducting magnets, applying the transverse B field as a step function in depth. This work demonstrates the clinical benefits in using a 30 to 60 MeV electron beam combined with < 2.0 T transverse B field, generated by a pair of Helmholtz coils. Monte Carlo simulations were conducted using FLUKA, a particle physics transport package. The B field flux density maps were imported to Fluka and executed according to the electron position. The transverse magnetic field was simulated using the AC/DC module of COMSOL Multyphysic®. Results showed an about two-fold increase in the maximum dose at a depth compared to the dose at the surface and good feasibility of the transverse field application.