Monte Carlo study of virtual versus physical wedges for photon beams of 6-10 MV.

A virtual wedge, realised by a moving collimator jaw, offers an alternative over a set of fixed wedges for producing a wedged photon dose distribution. This system does not require handling of physical wedges and therefore may allow faster treatment. Furthermore, any arbitrary wedge angle and length can be created instead of the traditional four fixed wedges. It has been stated that virtual wedges do not alter the photon spectrum compared to fixed wedges, which introduce beam hardening and loss of uniformity in the unwedged direction. In this study we investigated the influence of the virtual wedge on the photon spectra of a 6-10 MV Siemens MD2 accelerator.

The Monte Carlo code BEAM/EGS4 was used in this work to model the complete accelerator for 6 and 10 MV photon beams. The dynamic wedge was modelled by calculating phase space information at the exit plane of the accelerator for a range of field settings from 20x20 cm^2 to 20x1 cm^2. The phase space data was then combined to give wedged fields of 15°, 30°, 45° and 60°. The photon spectra and dose distributions with a virtual wedge were compared to those obtained with a physical wedge. It was found that photon spectra from a virtual wedge are softer compared to the open field situation, whereas a physical wedge introduces beam hardening. Good agreement for the dose distributions was obtained.