AbstractID: 1848 Title: Pencil Beam Approach for Correcting the Energy Dependence Artifact in IMRT Film Dosimetry

The sensitivity of radiographic film to low energy scattered photons can lead to significant dosimetric error when the dose varies significantly within a field. Correcting for this artifact will provide greater accuracy for IMRT verification dosimetry. A procedure has been developed for correction of the film artifact by creating a pencil beam kernel within our treatment planning system to model the film response specifically. A 6 MV photon beam and Kodak XV-2 film in a polystyrene phantom are selected to test the method as they are often used in practice and can result in large energy dependent artifacts. The film kernel is obtained from EGSnrc Monte Carlo simulations of the dose distribution from a 1 mm diameter pencil beam in a model of the film placed at six depths from 1.5 to 40 cm in a polystyrene phantom. The Monte Carlo calculations were experimentally verified by comparing to film, ion chamber and TLD measurements in a narrow beam. The generated film kernel is then used in convolution calculations to predict the film response in IMRT fields. Difference maps between measured film dose and dose calculated with the film and water kernels were produced. For a large modulated field, the method reduces the number of pixels in these maps deviating by more than 3% from the mean, from 16% to 2%. The difference in dose distributions calculated with the film kernel and the standard water kernel can be applied to film measurements to obtain an artifact free IMRT dose distribution.