AbstractID: 8297 Title: Dose outside the treatment volume following removal of the flattening filter

Purpose: To evaluate out-of-field dose from a medical accelerator with the flattening-filter removed as compared to with it present.

Method and Materials: A previously developed Monte Carlo model of a Varian 2100 accelerator was used to calculate the out-of-field photon dose with and without the flattening filter present. Calculation were done for static fields of 5x5, 10x10, and 15x15 cm^2 at 6 and 18 MV incident on a water tank. Additional calculations were conducted for IMRT treatments of the prostate at 6 and 18 MV and for a pediatric brain lesion at 6 MV. To compare the relative out-of-field dose from the IMRT treatments, the risk of secondary malignancy in the low dose region was calculated for each.

Results: For both static fields and IMRT treatments, the out-of-field doses were comparable or higher with the filter removed than with it present at locations near the treatment field. At locations farther from the treatment field, the out-of-field doses were substantially lower without the filter. More reduction in the out-of-field dose was observed at 18 MV than at 6 MV. For the clinical treatments, as evaluated by the risk of secondary malignancies, there was an overall reduction in out-of-field photon dose of 10-30% when the flattening filter was removed.

Conclusion: The reduction in out-of-field dose from removal of the flattening filter depends on the clinical case being examined, including the target volume and the location of sensitive organs. Treatments involving large target volumes near sensitive organs are likely to produce as much, or more, out-of-field dose when the flattening filter is removed. However, for several common clinical scenarios, such as IMRT for the prostate or a small pediatric brain lesion, an overall reduction in out-of-field dose was found on the order of 10-30%.

Conflict of Interest: Supported by Varian Medical Systems.