

A MULTIPLE SOURCE MODEL FOR MONTE CARLO PHOTON DOSE CALCULATIONS IN RADIOTHERAPY

M. Fix¹, M. Stampanoni¹, H. Keller¹, E. Born², R. Mini², P. Ruesegger¹

¹Institute for Biomedical Engineering and Medical Informatics, ETH Zurich, Switzerland

²Division of Med. Radiation Physics, Clinic of Radio-Oncology, Inselspital-University of Berne, Switzerland

A multiple source model (MSM) for MC dose calculations in radiotherapy was developed for the 6 MV photon beam of a Varian Clinac 2300 accelerator. The MSM consists of 12 planar and linear sources representing the main elements of the beam defining system. The characteristics of the sources for all square fields were extracted from phase space data resulting from MC simulations of the radiation transport through the treatment head for a set of square fields.

Using the MSM, phase space data, depth doses, lateral dose profiles and output factors were calculated and compared to measured data or to the original phase space data, respectively. Comparison of the depth dose curves at the depth of 10 cm showed deviations of less than 2% for all field sizes. The lateral dose distributions and the reconstructed phase space data showed good agreement with the measurements or original data, respectively. Also, the deviations between measured and calculated output factors for 10 cm water depth were less than 2%.

In summary, the MSM showed good agreement between measured and calculated data for square fields. The MSM has the potential to characterize more complex geometries for MC photon dose calculations.