

AbstractID: 2044 Title: A Flattening Filter Free Photon Treatment, Concept Evaluation with Monte Carlo

In principle, the concept of flat radiation dose distribution across the beam is unnecessary for IMRT. Dynamic leaf positioning during irradiation could appropriately adjust fluence distributions of an unflattened beam that are peaked in the center and deliver the desired uniform or non-uniform dose distributions. Removing the flattening filter would lead to faster treatments through higher dose rates, reduced scatter and, for high energy beams, to reduced neutron contaminants since there would be substantially less material in the beam. Also an improvement of the sharpness of the penumbra as a consequence of reduced scatter in the incident beam could be achieved with such a system. This work aims to evaluate the properties a flattening filter free machine (FFF), and to investigate possible advantages in clinical IMRT applications with Monte Carlo techniques to simulate a Varian 2100 based treatment delivery system. Several depth dose curves and lateral dose distribution profiles, used for commission an IMRT planning software, have been created for various energies and field sizes, without the flattening filter. Plans computed with this system were used to evaluate the overall quality of such a system in terms of changes in the penumbra, reduction in out-of-field stray dose from the scattered component, as well as improvements of the dose distribution, and to compare this data to equivalent IMRT plans for the conventional accelerator design.