

## Investigation of a tertiary attached photon multileaf collimator module for advanced mixed beam radiotherapy :Title 13071 :AbstractID

**Purpose:** To investigate the characteristics of electron beams collimated by an existing photon multileaf collimator, which is attached to the Siemens treatment head by dosimetric measurements and Monte Carlo simulations.

**Material and methods:** In this work, a Siemens Moduleaf mini multileaf collimator (mMLC) was used as a template for a future design that is more practical for advanced mixed beam radiotherapy (MBRT). The module is attached as a tertiary collimator to the Siemens Oncor<sup>TM</sup> linear accelerator and is located at 60cm source-collimator distance. The mMLC is constructed with 40 tungsten leaf pairs of 7.5 cm thickness, which is more than enough for attenuation of electron beams. The mMLC weights 40 kg, however, a motorized fast mounting system can be used to mount it in less than 5 minutes. Dosimetry measurements were performed to obtain percentage depth dose curves and profiles for regular electron fields formed by the mMLC for all available energies. Measurements were conducted at different SSDs with different gap sizes between the bottom of the mMLC and the surface of the phantom. MCBEAM and MCSIM Monte Carlo codes were used for treatment head simulation and phantom dose calculation, respectively.

**Results:** Good agreement has been achieved between measured and simulated PDDs and profiles. The PDD for electron beams shaped with the mMLC did not show any noticeable difference from that collimated by an electron applicator for all energies. An SSD as low as 70cm would be required to obtain a penumbra comparable to that collimated by applicators.

**Conclusion:** Monte Carlo simulations are capable of modeling both photon and electron beams with a reliable accuracy. The characteristics of the electron beams collimated by a tertiary photon multileaf collimator have been investigated.