

# AbstractID: 6609 Title: Dosimetric evaluation of penumbra for conformal and intensity modulated radiotherapy

## **Purpose:**

To evaluate the penumbral characteristics as function of collimation systems, conventional detector, depth, energy and MLC travel orientations using diode detectors.

## **Methods and Materials**

The experiment was carried out in a Clinac 2300C/D linear accelerator for 6 and 15 MV. For penumbral width determination, cross-beam profiles were measured using Blue phantom radiation field analyzer, 0.13cm<sup>3</sup> ionchamber and diode detectors, CU-500E dual-channel electrometer and OmniPro beam-data acquisition system. The penumbra was measured for both Jaw and MLC-defined field sizes of 4x4 to 30x30cm<sup>2</sup> depths at d<sub>max</sub>, 5, 10, 15 and 20cm and also for cross-plane and in-plane MLC travel orientations at 100cm SSD. The penumbra width was calculated as the distance between 80%-20% intensity in the profiles.

## **Results**

The MLC penumbra was in the range of 3.6mm to 4mm for 6MV and 5.4mm to 7.1mm for 15MV at d<sub>max</sub> depth for field sizes of 4x4 to 30x30cm<sup>2</sup> as measured by diode detector. The mean differences between Jaw and MLC-defined field's penumbra were 0.8mm ± 0.2, and 1mm ± 0.2 for 6MV and 1.2mm ± 0.2 and 1.8mm ± 0.5 for 15MV at d<sub>max</sub> and 10cm depths. The maximum difference of 1.9mm ± 0.3 for 6MV and 2.2mm ± 0.2 for 15MV between diode and 0.13cm<sup>3</sup> detectors were found. Use of diode detectors, maximum differences of 3.4mm ± 3 at 20cm depths between energies and the differences of 3.3mm ± 2.2 for 6 MV and 1.2mm ± 0.3 for 15MV between cross-plane and in-plane MLC penumbra were found.

## **Conclusions**

The rounded-end MLC penumbra was larger as compared to Jaw penumbra. The penumbra measured by diode was increasing with energy upto a certain depths and field sizes and then it increases more with low-energy at larger depths and field sizes as compared to high-energy. The adequate accounting of penumbra is important in intensity modulated beam dose calculation.