

## AbstractID: 5813 Title: Dosimetric Comparison of an Elekta “Synergy S” Beam Modulator & Radionics MMLC Using Monte Carlo Simulations & Measurements

**Purpose:** To compare dosimetric parameters of a new Elekta “Synergy S” dedicated stereotactic radiosurgery MLC, namely the beam modulator (BM), with Radionics mini-multileaf collimator (MMLC).

**Methods and Materials:** The Beam Modulator maximum opening is 16cmx21cm and consists of 40 pairs of Tungsten leaves of 4mm thickness at the isocentre, with no back up jaws. Radionics MMLC has a maximum field size of 9.6cmx12cm and 3.75mm leaf thickness at the isocentre. Leakage and transmission, percentage depth doses (PDD) and dose profiles were measured and calculated for different field sizes and depths and for different source to surface distances (SSD). Kodak XV films, photon diode detector (diameter of active area 2mm), CC13 Wellhofer ion chamber (cavity volume 0.13 cm<sup>3</sup>) and Wellhofer water tank were used for measurements. BEAMnrc code was used for the Monte Carlo (MC) simulations. All the data are for a 6MV photon beam.

**Results:** It is shown that the BM beams are slightly more energetic so that PDD at 10cm depth is 2% more for a 10.4cm x 9.6cm field, compared to Radionics MMLC. Dose profile results are generally comparable, except for the penumbra which is sharper for Radionics MMLC, especially in the leaf travel direction by up to 1.1 mm. Maximum and average leakage was 1.7 and 1.1 for BM and 1.2 and 0.9% for MMLC, respectively. MC calculation and measurement results for PDD and profiles agreed well to better than 1% and or 0.5mm. The uncertainty in simulation was less than 0.5%.

**Conclusion:** Elekta “Synergy S” beam modulator and Radionics MMLC have successfully been modeled for the first time using the BEAMnrc MC simulations. The MC results showed an excellent agreement with the measurements. BM has a wider penumbra, mainly due to the larger isocentric distance and rounded leaf ends.