AbstractID: 9524 Title: Validation of calculation for electrons and feasibility study of penumbra generator utilized electron Monte Carlo Algorithm

**Purpose:** To evaluate the performance of a commercial TPS equipped with Monte Carlo algorithm for electron beam calculations. This study also tests the feasibility of the design of penumbra generator by the Monte Carlo algorithm.

**Method and Materials:** Different size cutouts (circular aperture with diameters range 3.8-10cm) and circular inserts (block shield with diameters range 3.8-8cm) were created for the cutout factors, off axis point dose, PDD, electron beam energy profiles (9MeV and 16MeV) and varying SSD (100cm and 115cm). We measured in water tank for those cutouts and block inserts for PDD and profiles for 9MeV and 16MeV on Varian’s Trilogy. Measurements were done with 100cm and 115cm SSD. Monte Carlo calculations with Eclipse were compared with measurements. Different materials (range 0HU-2600HU) were designed for simple step wedge shape and combined with air to simulate penumbra generators through the Monte Carlo calculation.

**Results:** For cutout <4cm, the dose output calculation inaccuracies were up to ±7%. For cutout >6cm, the output accuracies were within ±2%. The point dose accuracy for off axis positions with different inserts were within 3.5%. At extended SSD (115cm) the calculation slightly increases the error by 1%. The calculated Vs measured profiles at different depths for different inserts agreed well. At 115cm SSD, the profiles within fields still matched well, profiles around or under the blocks were slightly off (<5%). The PDD beyond dmax matched within 1mm. The calculated surfaces dose was slightly lower. Different materials with air have different penumbra effects, which show the feasibility of the MC simulation for the design of penumbra generator.

**Conclusion:** The current beam model needs to be modified for cutouts smaller than 4cm. For larger cutouts, Monte Carlo electron dose algorithms produced reasonable results compared with measurements. Further measurement is warranted for the validation of the penumbra generator.