

## AbstractID: 6544 Title: Special Dosimetric/Masurement Considerations in Commissioning a Novel Integrated MiniMLC Linear Accelerator

**Purpose:** To present an overview of commissioning a novel integrated miniMLC linear accelerator system, including the complete steps in final clinical implementation. Special precautions due to the collimator design are identified. Reference datasets for electrons are included.

**Method and Materials:** Elekta Beam Modulator has 40 pairs of 4mm leaves. There are no movable backup diaphragms and the field is defined only by the open leaves. Smaller field sizes and more precise leaf positioning (<1mm) are specified.

The film scanning system was verified to within 0.2mm accuracy. Microchambers were used for in-water scanning. Brass and graphite miniphantoms were constructed for head-scatter factor measurements of fields from 0.8cmx0.8cm to 16cmx16cm. A complete set of scan and point measurement data was collected for photons and electrons.

Beams were modeled in XIO and PrecisePlan and an independent calculation program (RADCALC). Before actual clinical implementation, periodic QA baselines were established, and site specific IMRT plans and QA measurements were performed on phantoms.

**Results and Conclusion:** An extensive and comprehensive program was employed in commissioning. Beam data collection and calibration were internally verified by at least two independent measurements and checked against standard datasets. Treatment planning system modeling followed the guidelines of TG53. When compromises had to be made, the best fits were chosen for situations mimicking IMRT segments (4cmx4cm and 4.8cmx4.8cm).

QA measurements of 3D conformal plans and IMRT plans achieved the following agreement statistics: 3mm DTA, 3% difference, produced pass rate of 97.8% average (2.6%STD). Dose point measurements with chambers agreed to plan values within 3.6%. After comparisons between 3D dose, independent monitor unit(MU) and manual calculations; Radcalc and XIO independent MU calculation programs were deemed unusable (the discrepancy reaching 5.4%), due to incorrect modeling of head-scatter factors for this collimator.

Additionally, measured electron cone factors varied up to 13% from standard Elekta linacs.