

## AbstractID: 6648 Title: Clinical Beam Tuning of Low-Energy Electron Beams: Matching Varian and Siemens Linear Accelerators

**Purpose:** Tuning nominal energies on linear accelerators is useful for matching machines of different vendors and for altering energies to match clinical needs. In this study we investigated matching a Varian 2100EX 4MeV electron beam to a Siemens Primus 5MeV electron beam.

**Method and Materials:** The 4MeV beam of a Varian 2100EX linear accelerator was tuned via a significant shunt-voltage adjustment to match the 5MeV beam of a Siemens Primus linear accelerator. The percent depth-dose (PDD) curves and off-axis profiles for multiple field sizes were compared to validate the beam matching. Data was collected with a CC04 cylindrical chamber in water and with a parallel-plate ion chamber in plastic water® (Computer Imaging Reference Systems, Inc., Norfolk, VA).

**Results:** The PDD from the parallel-plate and cylindrical ion chambers agreed within 1.1% and 2.5% for the 3x3cm<sup>2</sup> and 10x10cm<sup>2</sup> fields respectively. There was also good agreement in the PDD of the tuned 4MeV (referred to as 4MeV\* post-tuning) and 5MeV beams. The depth of D<sub>max</sub> was identical. Differences in the practical range were only 1mm. The PDD had the best agreement for the 3x3cm<sup>2</sup> field (≤1.5% to depth of D<sub>90</sub>), followed by the 10x10cm<sup>2</sup> field (≤2.0% to depth of D<sub>90</sub>) and the 25x25cm<sup>2</sup> field (≤2.5% to depth of D<sub>90</sub>). Larger disagreements occurred in the dose falloff region beyond D<sub>90</sub>, typically 2-7%. The off-axis profiles for the 4MeV\* and 5MeV beams showed good agreement for the 10x10cm<sup>2</sup> field (≤2%). However, there was a substantial loss in flatness for the 25x25cm<sup>2</sup> field (5.5% for 4MeV\*, 2.4% for 5MeV). We believe these differences are caused by the original 4MeV Varian scattering foil, which was not changed to reflect the greater energy of the 4MeV\* beam.

**Conclusion:** The Varian 4MeV and Siemens 5MeV beams were successfully matched, allowing oncologists to utilize these machines interchangeably.