# AbstractID: 9516 Title: Monte Carlo characterization of a medical linear accelerator for small animal irradiation

**Purpose:**
Characterize a medical linear accelerator using Monte Carlo methods to investigate the precision and exactitude of dose delivery on small animal irradiation, particularly Wistar rat species.

**Method and Materials:**
A dedicated 6.0 MV linear accelerator (Novalis®, BrainLAB, Germany) for stereotactic radiosurgery (SRS) was simulated using BEAMnrc. A phase space (PS) data file was generated. The Monte Carlo (MC) calculations were tuned and validated to match depth and off-axis dose profile data measured using a shielded diode detector ($PFD^{3G}$, IBA-dosimetry, Germany) for a 15.0 mm circular collimator. The animal model was based on a computed tomography (CT) scan of a Wistar rat for medullar trauma lesion model.. An in-house mask fixation system compatible with the treatment planning system (TPS) was developed to immobilize the rat. The CT scan images were imported to DOSXYZnrc using ctcreate tool and to the TPS via DICOM network. Dose distribution was calculated by the TPS using 2 non-coplanar circular (NCAs). The NCAs were simulated using 20 static beams. The MC dose calculations were exported for analysis and compared with TPS dose calculations. On the other hand, absolute dose measurements were performed using the $PFD^{3G}$ inter calibrated using a Farmer type ionization chamber.

**Results:**
Absolute dose measurements showed that dose difference between TPS and treatment delivery is less than 4.3% on the selected points. Difference between TPS and MC dose calculations showed an over-estimation by the TPS up to 15.0%. However, in the spinal cord lesion there is a good agreement between TPS and MC calculated data.

**Conclusion:**
Dose delivered by the dedicated linear accelerator is reliable to perform spinal cord irradiation in trauma lesion models. These preliminary results must be improved including an accurate source model of an arc radiation beam instead of the 20 discrete static beams.

**Conflict of Interest (only if applicable):**
None