# AbstractID: 14237 Title: RapidArc patient specific dose delivery accuracy under extreme mechanical limits using Linac log files

**Purpose:** To assess the accuracy of RapidArc (RA) delivery for treatment machine operation near allowable mechanical limits in DMLC leaf velocities, gantry speeds, and dose rates.

**Method and Materials:** Thirty RA patient plans were created for treatment of gastrointestinal and head and neck cancers on a Trilogy unit. Three RA plans per patient were generated; one with medium MLC velocities, highest gantry speeds and dose rates (case 1); one with maximal allowable MLC leaf velocities (case 2); and one with lowest gantry speeds (case 3). Combinations of dose rates (140 – 600 Mu /min), gantry speeds (2 – 5.4 deg/s), and DMLC leaf velocities (1.3 – 2.4 cm/s) were utilized to test the RapidArc delivery accuracy. Linac delivery log files were acquired after delivery of each plan. In-house software was used to read in the original RapidArc DICOM plan and update the plan to reflect the delivered plan taking into account the MLC leaf positions, gantry positions and MU. This DICOM RT plan was imported back to Eclipse and the delivered 3D dose map recomputed. Finally the planned and delivered 3D isodose maps were imported into a 3D gamma analysis algorithm to evaluate the dosimetric differences..

**Results**: For the three cases indicated above MLC leaf position discrepancies are: 0.8 ±0.2 , 1.2 ± 0.2, 0.8 ± 0.2 mm; maximum gantry position discrepancies are: 0.9 ±0.2, 0.9 ±0.2 , 0.6 ±0.1 deg, and maximum differences in delivered MU per control point are: 0.2±0.1, 0.2 ±0.1, and 0.04±0.01 respectively. The 3D Gamma factor acceptance rates are better than 97% . .

**Conclusion:** This work shows that the accuracy of RapidArc delivery holds across the full space of gantry speeds, leaf velocities, and dose rates with small dosimetric uncertainties. A novel technique to obtain the delivered 3D dose distributions using machine log files is also presented.