



Contribution ID: 33

Type: Oral

## CyberKnife Preliminary Commissioning Model for a Twinned Beam

Thursday, 27 October 2022 10:45 (10 minutes)

### Purpose

To establish a beam twinning procedure and develop a model for accelerated TPS commissioning for all three collimators of CyberKnife M6 & S7 models.

### Methods

Beam twinning was performed in two phases: initially with PTW Octavius 1000 SRS 2D panel with real-time feedback, then in 3D water tank with PTW SemiFlex 3D 0.3 cc chamber for cone-60 (0-300 mm PDD, 50 mm profiles) and the primary beam (50 mm profiles). Gamma matching against the twinning reference comprised: PDD 1mm/1% local, profiles 1mm/0.7% global.

10 linacs were twinned, then fully commissioned using PTW microDiamond with independent sets of fixed, Iris and MLC collimators. For each linac, all 35 beams (FS 5-115 mm) were measured for: TPR, dose profiles at 15, 100 and 300 mm depth, output factors (OF).

The commissioning data were analyzed to develop a model for each of 35 beams with respect to OF, TPR, profiles. Each linac was tested against this BDI model using strict and relaxed matching criteria.

### Results

Commissioning was greatly accelerated with PTW BeamScan tank and took 32 hrs/linac.

Comparing each of 10 linacs vs the model, OF showed: FS 10+ mm 0.3%/0.5% (RMSE/max) errors, two smallest FS (5, 7.5 mm) > 0.5% errors.

For TPR, gamma 1 mm/1% local in 0-200 mm, and 1.5% local in 200-300 mm passed 95+%.

For profiles the following gamma passed 95+%: for cones & Iris, 0.3/0.6 mm (small/large FS), 0.5%, 0.7%, 1.5% global (15, 100, 300 mm depth); for MLC, 0.3-1 mm (smallest-to-largest FS), 1%, 1%, 1.5% global (same depths).

### Conclusion

Preliminary model provides strict beam control deemed to be acceptable for SRS/SBRT.

Two linac failures for energy twinning called for manufacturing improving. Iris radiation FS calibration, similar to MLC, can reduce its data variance.

**Primary authors:** TARANENKO, Valery (Accuray); NOLL, Matt (Accuray)

**Presenter:** TARANENKO, Valery (Accuray)

**Session Classification:** Session I: QA, Dosimetry, Treatment Planning

**Track Classification:** Radiation Therapy