AbstractID: 13549 Title: Geometric Accuracy of Imaging Systems on Trilogy MX Using an Automated Geometric Test Tool

Purpose: To characterize the geometric accuracy of the imaging systems of a newly designed accelerator (Trilogy MX, Varian Medical Systems, Palo Alto, CA) using a fully automated, geometric calibration tool.

Methods: A geometric calibration tool - consisting of a phantom containing 16 tungsten carbide ball-bearings and a MV collimator insert with a central pin - has been used to characterize the geometric coincidence of MV and kV imaging equipment with the radiation isocenter of Trilogy MX. Three sets of data are acquired: MV images at multiple MV collimator rotations, and both MV and kV images at multiple gantry angles. The MV collimator images are used to identify the central axis of the MV beam, and the MV images at different gantry angles are then used to identify the MV radiation isocenter. Calculations then determine the corrections needed to move both the MV and kV imagers so that their central pixels exactly align with the projection of the radiation isocenter. The Trilogy MX employs a new control system so corrections can be downloaded to the control system and used to physically correct the imager positions while the gantry is being rotated. The positions of the imagers have been verified using the geometric calibration tool and a Winston-Lutz test.

Results: Coincidence between the MV isocenter - measured using the geometric tool - and the central imager pixels of both imagers was less than ±0.1mm. The coincidence between the central pixels of both imagers and the projection of the Winston-Lutz BB was better than ±0.3mm.

Conclusions: An automated tool for calibrating the geometry of MV and kV imaging equipment has been developed and tested. The tool gives similar results to conventional Winston-Lutz measurements. The geometric accuracy of the imaging systems of Trilogy MX is better than ±0.3mm.