AbstractID: 11779 Title: Complete 3D QA for Rapid Arc using BANG Polymer Gel and OCTOPUS-IQ Fast Laser CT Scanner

Purpose: To provide rapid 3D QA and treatment verification for Varian's Rapid Arc.

Method and Materials: Our 3D QA system is composed of a fast laser CT scanner (OCTOPUS-IQ, MGS Research, Inc., Madison, CT), re-usable acrylic cylindrical inserts for self-developing polymer gels (BANG gel, MGS Research, Inc.), and a Virtual Water solid pelvic phantom (Med-Cal, Inc., Verona, WI). A single focused laser beam is moved at 10 Hz frequency across a rotating gel cylinder immersed in a refractive-index matching liquid in an aquarium. The field of view is adjustable up to 250 mm, the maximum length of scan is 250 mm, and the spatial resolution is adjustable down to 0.25 mm. The 3D distribution of optical attenuation coefficients in the polymer gel is reconstructed by a filtered back-projection open-source program written in Matlab (MathWorks, Inc., Natick, MA). Image registration and data analysis are performed using Matlab's Image Processing Toolbox.

The gel phantom was scanned with a GE lightspeed 16 slice CT scanner. The gel's CT DICOM images were transferred to Eclipse treatment planning system. A QA plan was then generated by projecting a patient's RapidArc plan onto the gel's phantom CT data set. The calculated dose was exported via DICOM for analysis. The gel phantom was then set up on the Linac and irradiated with Varian 2300iX equipped with RapidArc.

Results: With isotropic voxel size 2.5 mm (equivalent to TPS grid resolution), it takes less than half hour to scan the entire irradiated gel volume. Gamma maps indicate agreement within 3% dose difference, 3mm distance to agreement level.

Conclusions: Our study demonstrates excellent performance of our fast 3D QA system for Rapid Arc. The system is very robust, easy to use, and saves time for 3D QA and treatment verification for Rapid Arc and other complex 3D treatment techniques.