AbstractID: 13691 Title: Reproducible QA of RapidArc treatment plans with MapCHECK2 and MapPHAN

Purpose:
To report on an investigation of “best practices” for achieving precise and reproducible results with the MapCHECK2/MapPHAN (MC2/MP) dosimetry system (Sun Nuclear Corporation) for QA of RapidArc (Varian Medical Systems) volumetric modulated arc therapy (VMAT) treatments.

Method and Materials:
MapCHECK2 (MC2) is a 2D diode array developed for planar IMRT dosimetry; MapPHAN (MP) is a water equivalent phantom that adapts MC2 for rotational dosimetry. The MC2/MP system was checked to verify uniform and equivalent response to 6 MV photon beams incident from anterior and posterior directions. A CT scan of the system was ported to the Eclipse planning system, (v8.0) where it was assigned a generic mass density of 1.05 g/cm^3. RapidArc treatment plans (15 prostate, 2 SBRT lung, and 1head/neck) were projected onto this phantom and planar dose was computed at 5 cm depth. Parameters for specification of phantom and QA delivery were varied to deduce best practices for reproducible QA of RapidArc VMAT plans. Parameters included mass density assignment, collimator/MLC rotation, position of diode array relative to MLC leaves, and resolution of the dose plane exported from Eclipse. QA results were evaluated by absolute dose agreement and by the percentage of points passing a Gamma analysis with criteria 3% dose difference or 3 mm distance to agreement.

Results:
The most important steps for reproducible QA of RapidArc plans with MC2/MP were zero collimator rotation for QA beam delivery, and a positional offset of the diode array by half the width of an MLC leaf. These actions enhanced the ability of MC2 to measure dose modulation, and increased the percentage of points passing the Gamma analysis by approximately 5% and 3%, respectively.

Conclusion:
With simple setup interventions, the MapCHECK2/MapPHAN system is capable of measuring precise and reproducible QA of RapidArc-delivered VMAT plans.

Conflict of Interest: None

Fig 3

Fig 4