Abstract ID: 16879   Title: VMAT dynamic QA for moving lung tumors.

Purpose: Development of a novel QA phantom and technique designed to evaluate the accuracy of VMAT delivered dose to the GTV when tumor motion is present.

Materials and Methods: We have modified the Arccheck cylindrical QA phantom for VMAT delivery by designing a dynamic insert that can be accommodated in the central cavity of the detector and dosimetrically monitored. This was achieved by the use of a custom made water equivalent sphere with 5 imbedded mosfets. This sphere was encapsulated in a lung insert that can be accommodated by both the cylindrical QA phantom AND a thorax dynamic phantom. The motion of the dynamic phantom was preprogrammed for different trajectories including prerecorded traces of lung implanted fiducials from a previous study. A 4DCT scan was performed on the static/moving target and a VMAT treatment plan was correspondingly generated. These plans were mapped and calculated on the corresponding VMAT QA phantom (static/dynamic). The mosfets and the arccheck dose measurements from the treatment delivery were compared with the expected values obtained from the TPS.

Results: Arccheck absolute dose analysis between measurement and calculation using γ (3%/3mm) shows more than 98% of diodes passing for both static and dynamic phantom with and without the lung phantom insert. Mosfet static measurement showed 2% agreement with the calculated value (5450 ± 120 vs 5250 ± 20 cGy). The dynamic measurement showed a larger spread than calculated (6900 ± 140 vs 7000 ± 250 cGy) indicating an accentuated interplay effect between MLC motion and tumor motion.

Conclusion: We have developed a novel device to perform VMAT QA on moving tumors and to quantitatively estimate the dosimetric difference between the treatment plan and delivery. Our method is used to investigate a large variety of dose discrepancies including interplay effect and respiratory motion variation.