

AbstractID: 9534 Title: Scaling the prescription dose: how accurate is the Varian delivery system?

Purpose: The prescribed dose of an IMRT treatment plan may need to be scaled without changing any other parameters of the plan (e.g. relative fluence-maps). Examples include changing the prescription as ordered by the physician, or rescaling the dose to avoid overexposure of a dosimeter. In these instances, it may be advantageous and more efficient to rescale the dose without recalculating fluence maps and leaf sequencing, as is possible with the Varian delivery system. This is work in progress to determine the consequences of such dose-scaling.

Methods: A complex 9-field IMRT treatment plan was created in the Eclipse planning system to treat the head and neck IMRT credentialing test, which prescribes a dose of 6.6 Gy to the primary PTV. A modified RPC head phantom incorporating a PRESAGE 3D dosimeter required a maximum dose of 4 Gy to the PTV to avoid overexposure. The prescription dose was correspondingly scaled in the Eclipse system without changing any other aspects of the plan. Other plans were also created scaling the prescription dose to deliver 10 Gy, 4 Gy, 3 Gy, 2 Gy and 1 Gy to the primary PTV. These plans were delivered to the MapCHECK2 device to determine dosimeter errors. Dynalog files were collected to investigate changes in leaf positioning errors and beamhold errors.

Results: As the prescription dose was decreased, the number of beamhold errors and the error in leaf positioning increased. Reducing the prescription dose by a factor of 6 resulted in a 60% increase in the number of beamhold errors of 0.5 mm and caused 17.5% of MapCHECK2 files to fail a relative dose difference threshold of 0.3% with a maximum relative dose difference of 2.2%.

Conclusion: These results indicate that scaling the prescription dose by < 40% has a negligible effect on dosimetric measurements. However, reducing the prescription dose by > 40% can introduce significant errors in measurements.