

AbstractID: 7417 Title: Investigation of Gated, High Dose Rate IMRT Step and Shoot Delivery

Purpose: To determine the effect of organ motion and gating on high dose rate IMRT step and shoot delivery and to investigate the feasibility to high dose rate IMRT delivery with a gating system.

Method and Materials: A 6-field IMRT plan for liver cancer with different monitor units (77 to 225 MUs) was delivered with an in-house made motor driven phantom, which allows sinusoidal movement with a changeable motion period between 1 second and 10 second. The motion of phantom was set along patient superior-inferior direction with a 1-cm amplitude and a 5-second cycle. A 0.6 c.c. ion chamber was put at the isocenter inside the moving solid water phantom. A gating system was applied with a variety of gating settings, including the phase range and the length of the breathing period. Repeated measurements were taken for gated and non-gated delivery with different gating settings and two dose rates, 500 and 1000 MU/Min.

Results: The separate segment doses and total doses of the IMRT plan were compared crosswise with 30~70%, 30~60% phase gating, and without gating with 1000 and 500 MU/Min. A reproducible 3.1% difference of the total dose between 1000 MU/Min and 500MU/Min at 30~70% phase gating setting was observed. The value was verified with the XiO treatment planning system, indicating that the delivery at 1000MU/Min dose rate with gating is closer to the original plan calculation. Our results also show that there was no significant effect from the gating system on small MUs or large fields.

Conclusions: Our results using 1000 to 500 MU/Min dose rate suggests that higher dose rate is feasible and beneficial for IMRT treatment delivery with gating; there is no significant effect for small MU numbers or large field size on dose output.