

AbstractID: 5102 Title: Direct Aperture Optimization based step-and-shoot IMRT with Respiratory Gating

Purpose:

Validation of respiration gated IMRT on Siemens linear accelerator has not been reported. This work investigates the reliability, accuracy and efficiency of the delivery of respiratory gated IMRT on a Siemens accelerator.

Method and Materials:

A Siemens Primus accelerator was interfaced with a pressure sensor belt (Anzai Gating system) to deliver step-and-shoot IMRT. A series of IMRT fields, including actual patient, as well as custom segmented fields including the “Picket Fence” were delivered with and without gating (interruption) using a variety of different gating parameters (e.g., duty cycle). Radiographic films and 2D diode array (MapCheck , Sun Nuclear) were used to measure dose distributions. The dose distributions measured with and without gating were compared to identify any delivery error from gating. IMRT with multiple beam angles was also delivered, with and without gating, on a cubic motion phantom. Special measurements were made to individually evaluate dark current, small MU non-linearity and flatness degradation and their cumulative effects on multiple times interrupted fields. Delivery times for MLC and compensator IMRT plans with various segmentations for sample lung and breast cases were compared.

Results:

Beam characteristics for the Siemens accelerator was not altered by gating and gated IMRT with Siemens/Anzai systems was found to be accurate and reliable. Measured dose distributions agreed with the calculated results and/or with those delivered without gating. Picket fence results with and without beam gating indicated same MLC positioning accuracy during the gating. The delivery times for the DAO-based IMRT plans that had small numbers of segments were shorter than those for any other types of IMRT plans including compensators and were comparable with those for 3DCRT.

Conclusion:

The delivery of gated-IMRT with Siemens/Anzai systems is reliable and accurate. The DAO-based IMRT is preferred for gated delivery in terms of treatment times.