

AbstractID: 8374 Title: Evaluation of the accuracy of Helical Tomotherapy Planned Adaptive software by film and ionization-chamber measurements

**Purpose:** To assess the accuracy of Tomotherapy planned adaptive (PA) software in homogeneous and inhomogeneous phantoms by ionization-chamber and film measurements. **Method and materials:** Three plans were made mimicking a clinical situation covering a target volume while sparing nearby structures using kVCT images. The first study was performed on a homogeneous phantom. To simulate setup errors, shifts of 2 to 15mm were introduced in 4 directions and film and ionization-chamber measurements were performed. The same phantom was used to check if PA correctly adds kVCT information beyond the field of view (FOV) of the MVCT. The phantom was positioned half inside, half outside the FOV. Point measurements were performed in both regions. An inhomogeneous phantom constructed of solid water and cedar wood was used to check the accuracy of PA in inhomogeneities using ionization-chamber and film measurements. All results were compared to the original planned dose on kVCT and to the PA calculations on MVCT data using the same treatment plan.

**Results:** In the first series, with the displacements of the phantom, differences of up to 1% between measurements and PA were observed. The film measurement showed a gamma within 1 for 2%, 2mm. The second experiment shows that PA properly extends MVCT-data with kVCT information showing deviations in the range of -0.1 to 2.5% when compared to measurements, 0 to 1% compared to planning. In case of inhomogeneities, measurements with ionization-chambers showed agreement within 2%. Film showed good agreement in the low density and water equivalent region. When comparing PA to the planning dose distribution, deviations of -0.6% to 2% were observed.

**Conclusions:** This work shows excellent agreement between ionization-chamber and film measurements and PA in homogeneous and inhomogeneous situations and in objects extending beyond the FOV of the MVCT. Good agreement is also shown between planning, measurement and PA.