# AbstractID: 10974 Title: Tumor volume delineation: a comparison of imaging protocols for lung tumors

**Purpose:** To investigate differences in tumor contours delineated on free breathing (FB), four dimensional (4D), maximum intensity projection (MIP), average intensity projection (AIP), and slow-CT (SCT) images.

**Methods and Materials:** Data from ten patients who underwent stereotactic body radiation therapy of lung cancers were retrospectively investigated. For each patient, a FB CT and a 4D CT scan was acquired during simulation. Following the scan, MIP and AIP images were reconstructed. Since the 4D CT scan was acquired at a low pitch, a slow-CT scan was also reconstructed. These scans were repeated prior to each treatment, resulting in 48 CT data sets. The GTV was delineated on FB, MIP, AIP, and SCT images and was compared with the internal target volume (ITV), which comprised the union of GTVs delineated on each phase of the 4DCT. Three evaluation metrics were used for contour comparison: GTV volume, overlap index (OI), and root-mean-squared (RMS) distance.

**Results:** On average $GTV_{FB}$, $GTV_{MIP}$, $GTV_{AIP}$, and $GTV_{SCT}$ volumes were $0.66\pm0.13$ ($p<0.01$), $0.88\pm0.08$ ($p<0.01$), $0.64\pm0.13$ ($p<0.01$), and $0.64\pm0.12$ ($p<0.01$) times smaller than the ITV, respectively. The OI of the ITV with $GTV_{FB}$, $GTV_{MIP}$, $GTV_{AIP}$, and $GTV_{SCT}$ was 60%, 81%, 61% and 64%, respectively. The average RMS distances of the $GTV_{FB}$, $GTV_{MIP}$, $GTV_{AIP}$, and $GTV_{SCT}$ relative to the ITV were 0.44cm, 0.30cm, 0.45cm and 0.40cm, respectively. The OI of $GTV_{FB}$ with $GTV_{MIP}$, $GTV_{AIP}$, and $GTV_{SCT}$ was 62% 68% and 71%, respectively and the corresponding RMS distances were 0.34cm, 0.36cm and 0.35cm, respectively.

**Conclusions:** ITV is statistically larger than $GTV_{MIP}$, and they are both larger than $GTV_{FB}$, $GTV_{AIP}$ and $GTV_{SCT}$. Even though $GTV_{FB}$, $GTV_{AIP}$ and $GTV_{SCT}$ have similar size, the surface mismatch among them is still distinguishable.