Purpose: To evaluate delivered dose differences between 3D and 4D dose calculation with AAA and XVMC in Stereotactic Body Radiation Therapy for lung cancer.

Methods: We acquired 4D-CT images for three patients and performed SBRT planning on respiratory phase images and average images. ITV delineated on the average images expanded to provide planning target volume (PTV) with 5 mm. We used six non-coplanar, static 6-MV photon beams whose apertures were determined by adding 5 mm margin from the PTV for penumbra. Eight treatment plans with the same beam apertures and arrangement but having different monitor unit (MU) were produced per patient with two different dose calculation algorithms (XVMC implemented in iPlan and AAA implemented in Eclipse). Prescription by the ITV mean dose was performed on the average images to calculate MU. Prescription by the GTV mean dose was performed on the peak inhale images and peak exhale images to calculate MU. MU for 4D dose distribution was calculated so that the GTV mean dose calculated by accumulation of several respiratory phase dose distribution using deformable image registration to be the prescription dose.

Results: MU calculated from AAA tended to be larger than calculated from XVMC. Few MU difference was seen among peak inhale dose, peak exhale dose, and 4D dose. The largest difference (4.6%) was seen between 4D dose from XVMC and average dose from AAA.

Conclusions: This work indicates that various treatment planning approaches (e.g., 3D or 4D and dose calculation algorithm) have the potential to estimate different delivered dose in target. This work also suggest that the moving target dose might be estimated from delivered dose on just one respiratory phase images when beam apertures are large enough to encompass whole moving target.