

AbstractID: 2874 Title: Improved Temporal Resolution by Respiratory Gated Segment Reconstruction: Towards Four-Dimensional (4D) Radiation Therapy for Heavy Ion Beams Using the 256-Detector-Row CT-Scanner

Purpose: To perform more precise treatment planning for respiratory-moving tumors, we developed a respiratory gated segment reconstruction method (RS) based on the Feldkamp-Davis-Kress algorithm (FDK) which can achieve high temporal resolution and high signal-to-noise ratio. We compared full scan (FS-FDK) and RS-FDK with regard to the image quality and the obtained dose distributions for heavy ion treatment planning.

Method and Materials: Data acquisition for RS-FDK relies on the assistance of the respiratory sensing system in a cine scan mode with a 256-detector row CT. We compared the image quality for RS-FDK to that for FS-FDK in phantom and animal studies. To evaluate the accuracy of the actual irradiation for the moving tumors, we compared the dose distributions of both algorithms in heavy ion treatment planning with the beam parameters of FS-FDK.

Results: RS-FDK provided images without motion artifacts and visualized the edges of the liver and pulmonary vessels more clearly than FS-FDK. With regard to the iso-dose distributions, FS-FDK covered the target volume. RS-FDK, however, had an insufficient dose to the target and a considerable dose was deposited to the normal tissue around the target.

Conclusion: RS-FDK has good capabilities for providing useful information to give accurately prescribed dose-to-target volume. It is possible to achieve more precise radiotherapy including 4D radiation therapy using the RS-FDK. Now we investigated 4D radiation therapy using the moving phantom, however we can summarize RS-FDK using lung cancer patients and 4D radiation therapy planning using carbon ion beam and its movie files by AAPM annual meeting.