

AbstractID: 6918 Title: Interplay Between Image Quality and Temporal Resolution in 4DCT Acquisition Protocols

Purpose: The accuracy and temporal resolution of 4DCT imaging depends on temporal characteristics of the acquisition protocol like gantry rotation speed and image reconstruction interval, in addition to the spatial and temporal characteristics of the motion itself. Therefore, a generic acquisition protocol might not be suitable for all patients. The aim of this study is to evaluate the interplay between the parameters affecting the accuracy and temporal resolution of 4DCT images.

Methods and Materials: Several 4DCT images were acquired of cylindrical phantoms under repetitive motion induced by a translation platform. Acquisition settings were varied with respect to image reconstruction interval, gantry rotation speed and motion period of the phantoms. Reconstructed images were sorted into ten phase bins and compared to CT images of static phantoms at corresponding positions of the respiration phase.

Results: Acquisitions with different image reconstruction intervals did not play a significant role in the amount of motion observed in full cycle maximum intensity projection (MIP) images. Single-phase image integrity was observed to be constant up to a threshold in the value of reconstruction interval, beyond which the image integrity varied somewhat arbitrarily due to the reduced number of images. This threshold is correlated with the number of phase bins and the motion period. Furthermore, image integrity was observed to improve with decreasing gantry rotation periods.

Conclusions: Image integrity as evaluated in this study demonstrates relative gains with respect to changes in the temporal resolution parameters of 4DCT acquisition. Due to observed differences, we report that suboptimal settings could result in dramatic target delineation inaccuracies. Optimization of acquisition parameters needs to be performed, assessing the period of motion and limiting factors such as the availability of acquisition settings, image storage and processing power.

Conflict of Interest: Sponsored in part by GE Healthcare.