

AbstractID: 7285 Title: Initial phantom evaluation of a surface imaging system (GateCT®) for 4-D CT

**Purpose:** Many external surrogates exist for 4-D CT, but all require some device attached to the patient. We evaluated a markerless optical surface imaging system for use with 4-D CT.

**Method and Materials:** A prototype of the GateCT optical surface imaging system (VisionRT, London, UK) was installed with a Philips Brilliance 64 CT simulator (Philips Medical, Cleveland, OH). The system is similar to the AlignRT product, but only contains one camera pod which is focused on the bore of the CT scanner. It also monitors the x-ray on signal and sends regular pulses to the scanner similar to other external respiratory surrogates. First, a static plate was imaged to detect any drift in the measured motion. Next, the 4D phantom was used to create sinusoidal motion with simultaneous longitudinal motion to model breathing whilst the patient was scanned, and the motion measured by GateCT was compared with the phantom motion. Next, the 4-D phantom moved a 2 cm marble in a sinusoidal pattern, and the scanner was operated in retrospective helical mode. The respiratory waveform was exported from the GateCT program to the scanner, and the inspiration and exhalation image sets were reconstructed and compared.

**Results:** When the phantom was still, the GateCT point track gave a stable reading with a noise level of 0.5 mm. When the phantom was moving in one or two dimensions, the GateCT point track accurately recorded the amplitude, phase and frequency of the motion. For the 4-D CT scans, the reconstructed CT images indicated that the amplitude, phase, and frequency of the marble motion were recorded accurately by GateCT.

**Conclusion:** GateCT hold potential as a markerless respiratory surrogate. More work is necessary to determine the optimal patient selection for this technique.