# AbstractID: 10556 Title: Motion estimation using cone-beam CT projection images.

**Purpose:** To investigate the motion information that can be extracted from the raw cone-beam CT(CBCT) projection data of a fiducial marker in a respiratory motion phantom. **Methods and Materials:** A CBCT was acquired of a programmable respiratory phantom embedded with a gold seed fiducial marker. During acquisition, 650 raw projection images were sequentially captured as the imager rotated in a 360 degree arc. With a 60 second CBCT, and a 4 second respiratory period, the raw dataset contained motion information from 15 complete motion cycles. The images were binned based on respiratory phase, and the location of the gold seed in each image was determined. The back-projections of the fiducial at the same phase but from different cycles (and therefore different gantry angles) produced a set of points representing fiducial positions at that phase. By using the average position, and by reconstructing positions for all phases, a trajectory was built. **Results:** When the fiducial's motion was identical from cycle to cycle, the difference between the actual and reconstructed average motion was less than 1mm. When the motion changes between cycles, an 'average trajectory' can be constructed, whose fidelity to the true average depends on the degree of variability of the true motion cycle to cycle. **Conclusions:** There is motion information present in the raw CBCT dataset that can be exploited with the use of an implanted fiducial marker. This particular example might provide a useful characterization of the internal motion at the treatment unit from the same dataset as is used for patient and target setup.