

**Purpose:** To investigate the dual-energy cone-beam CT (CBCT) imaging using a recently developed dual CBCT system and explore the feasibility of a novel interventional imaging technique for IGRT.

**Method and Materials:** A dual-detector CBCT system with two large flat panels has been developed in our laboratory. Two imaging chains were arranged orthogonally to each other on one optical bench. The designed source-to-detector distances and source-to-isocenter distances are 150 cm and 100 cm, respectively. The detectors are 40cm x 30cm in size with 194 $\mu$ m-pixels (Varian Paxscan 4030CB). Prereconstruction basis material decomposition is implemented using conic-surface equations and calibrated using aluminum and acrylic step-wedges. The scan data are processed into basis material density images and monochromatic projections, and then submitted for FDK reconstruction. Phantom studies have been carried out for qualitative evaluation and validation. Quantitative analysis is still in progress for the dual-energy imaging.

**Results:** Preliminary results have demonstrated the validity of dual-energy CBCT technique in large flat-panel detectors. Basis material decomposition, monochromatic image and linearly mixed images are possible ways to utilize the information from a dual-energy scan.

**Conclusion:** Single polychromatic CBCT reconstruction suffers in beam hardening and poor soft tissue contrast. The dual-energy system offers potential advantages to solve these inherent problems for IGRT and provides the potential for functional imaging. Future work will quantitatively investigate the technique, scatter effect, cross-scatter effect and combinations of imaging parameters in a dual cone-beam CT system.

**Conflict of Interest:** This work is partially supported by a research grant from Varian Medical Systems.