AbstractID: 13313 Title: Improving skin-surface delineation in truncated cone-beam CT using laser profilometry

PURPOSE: Laser profilometry is a technique where three-dimensional topographic surface profiles of an object are reconstructed using data acquired with a laser range-finding system. Axial rotation of a laser range-finding system around an object can provide enough surface data to allow for this reconstruction. In cone-beam computed tomography (CBCT), a patient's imaging dose can be reduced by collimating the incident kilovoltage (kV) field; however this comes at the cost of reducing an imaging system's ability to accurately resolve a patient's skin surface. The study described herein is of the implementation of a laser-profilometry-based CBCT system which can enhance skin surface delineation while requiring narrower kV imaging beams. **MATERIALS AND METHODS:** The head-and-neck region of an anthropomorphic phantom was imaged using the CBCT feature of the Elekta XVI kV imaging system. During this imaging session, a three-dimensional skin-surface was reconstructed using an in-house laser profilometry system attached to the collimator of the Elekta Axesse's MV treatment beam. This profilometry system is capable of measuring the distance to the surface of an object with an uncertainty of +/- 1.5mm. Skin-surface reconstructions are then compared with CBCT reconstructions with emphasis placed on delineation of skin boundaries. **RESULTS:** Coregistration of the reconstructed laser-defined skin surface with XVI-generated CBCT reconstruction show strong spatial correlation. **CONCLUSION:** The detail provided by laser data allows for the narrowing of collimators in kV imaging beams without losing the ability to resolve boundary edges in the imaging subject. **Research supported by NIH T32-CA113267.**