

AbstractID: 7270 Title: The Influence of Bowtie Filtration on Cone-Beam CT Image Quality

**Purpose:** The large variation of x-ray fluence at the detector across the imaged field-of-view in cone-beam CT causes the loss of skin-line and reduces CT number accuracy and image uniformity. We report the performance of a bowtie filter (BTF) as a compensator for improved uniformity, skin-line and CT number accuracy.

**Method:** Image enhancement is performed using a BT filter with a 20cm collimator. The BTF was inserted 30cm from the x-ray source on an Elekta Synergy XVI. This filter modulates the 2D x-ray fluence making it non-uniform across the field-of-view. This compensates for the limited attenuation near the skin, resulting in enhancement of skin-line and uniformity. Two phantoms (1) CatPhan and 2) CatPhan with irregular acrylic annulus (Cat-Irreg) were scanned on an Elekta CBCT system. The reconstructed images with and without a BTF were analyzed. The images were transformed into polar coordinates to allow quantification of radial lag artifacts (radar artifact) for the Cat-Irreg phantom.

**Results:** The use of the bowtie filter demonstrated a considerable improvement in CT accuracy in the skin-line region. The uniformity increases 30% for Cat-Irreg phantom, and skin-line edges for both phantoms are visible. CT number accuracy with the BT filter improved by 2% for the CatPhan phantom while no improvement was evident for the Cat-Irreg phantom. The CT# linearity for the catphan phantom with the BT filter improved by 8%. In addition, a 45% reduction in the “radar artifact” was observed in the Cat-Irreg phantom images acquired with the BT filter.

**Conclusion:** The implemented BTF shows improvement in image quality including uniformity and skin-line reconstruction. This compensator is static and makes many compromises for anatomical imaging site, patient size, and imaged field-of-view. The ideal compensator would optimize the fluence profile to account for numerous properties of the patient and imaging system.

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