

# Abstract ID: 9605 Title: Comprehensive evaluation of the new bow-tie filter in the Elekta XVI CBCT system

**Purpose:** To evaluate the dosimetric and image quality performances of a newly released commercial bow-tie filter (BTF) for use with the Elekta XVI<sup>®</sup> CBCT system.

**Method and Materials:** Multiple phantoms, including the C-Atphan<sup>®</sup> and two uniform acrylic phantoms, were used for all measurements. Two commonly used clinical scanning protocols, head-and-neck and pelvis, were used to measure dose (central and peripheral) and image quality under two conditions: with and without the BTF. The total mAs parameters were varied to evaluate the influence on image quality in the presence of BTF during data collection.

**Results:** Half value layers for 100 kV and 120 kV increased from 6.1 to 6.8 mm -Al and 6.7 to 7.7 mm-Al, respectively, when measured in the absence and presence of BTF. Dose by head-and-neck protocol and pelvis protocol, without BTF, were 0.13 and 2.35 cGy, whereas with BTF, 0.09 and 1.51 cGy. The dose decreased by 31% for head-and-neck and 36% for pelvis in the presence of BTF. The presence of BTF did not improve the quality of image with default protocols. In fact, the uniformity values decreased more than 20% from the original values. However, by increasing the total mAs, improved the uniformity with BTF. BTF did not improve the spatial resolution even with increasing of mAs setting.

**Conclusion:** A comprehensive evaluation of the newly released BTF for XVI CBCT system has been carried out. It was observed that the presence of BTF increases x-ray beam filtration by 0.7 to 1 mm-Al and the resultant dose decreased by 30 to 40%. BTF does not show any improvement of image quality with current default clinical protocols. Further optimization of scanning and reconstruction parameters is required to appreciate the benefits of BTF.