AbstractID: 9605 Title: Comprehensive evaluation of the 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 CBCT system.

**Method and Materials:** Multiple phantoms, including the Catphan\textsuperscript{®} 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 the conditions of 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.