AbstractID: 12985 Title: Improving the HU accuracy of Varian's OBI CBCT

**Purpose:** Varian's OBI CBCT has been widely used for IGRT and adaptive radiotherapy. But studies showed that the Hounsfield unit (HU) accuracy in CBCT was still poor due to the residual scatter after the 1D anti-scatter grid. This work was trying to improve the HU accuracy by correcting the residual scatter.

**Method and Materials:** CBCT projections of both a Quasar and a Catphan phantom were acquired in half fan mode using a half-bowtie filter. However, the bowtie filter causes non-uniform fluence and uneven beam hardening before irradiating the phantom. Our recently published scatter correction algorithm was based on uniform photon fluence with a single x-ray spectrum across the beam. In order to do scatter correction in this scenario, the non-uniform fluence was corrected by using a single open projection in air with the bowtie. Also, Monte Carlo generated energy spectra after the bowtie filter was used to compensate for the effect of non-even beam hardening. Finally, image reconstruction was made using the FDK algorithm from the scatter corrected projections.

**Results:** For the Quasar phantom, the HU of CBCT for the acrylic and bone inserts were 180, 265 HU from our approach, 27 and 59 HU from the CBCT reconstructor, while from planning CT, they were 127 and 270 HU respectively. For the CatPhan phantom, the HU of CBCT for the acrylic bone and air inserts were 139, 806 and -667 HU from our approach, -242, 322 and -756 HU from the CBCT reconstructor, while from planning CT, they were 81, 856 and -934 HU respectively.

**Conclusion:** In this preliminary study, the HU accuracy of CBCT was substantially improved from our study compared to those from Varian's online reconstruction for most of the materials. However, there is still difference for air cavity from the planning CT, which needs further investigation.