AbstractID: 13589 Title: The CBCT Performance of a New Treatment Platform

**Purpose:** To characterize the CBCT performance of a new radiation therapy platform (Trilogy MX).
**Methods:** An entirely new CBCT system has been developed for Trilogy MX. The new CBCT system differs from that of the On-Board Imager® (OBI) in the use of a beam hardening filter, which reduces patient dose, and an improved reconstructor, which uses scatter correction algorithms to account for the x-ray scatter caused by the cone-beam geometry. Scans of Catphan® and electron density (Model 062A, CIRS) phantoms have been compared with OBI scans. Hounsfield unit (HU) accuracy was checked by changing the z scan length and the phantom diameters for pelvis (125kVp, 680mAs, 45cm dia.) acquisitions. The Catphan was imaged using doses ranging between 5-20mGy ($CTDI_w$). Projections acquired using clinical OBI units were also reconstructed for comparison using the new reconstructor.
**Results:** The new CBCT system has higher dose efficiency and higher HU accuracy. When the volume length is reduced from 160mm to 90mm or when the phantom diameter is reduced from 330mm to 180mm, the HU values measured for the same inserts differ by -190 to +80HU for OBI scans and by -60 to +50HU for Trilogy MX scans (for electron densities between 0.2 and 1.2). The contrast detectability of the 1% contrast objects in the Catphan phantom improves from 9mm to 4mm diameter when using the same $CTDI_w$ dose as OBI. Clinical images exhibit much better uniformity, elimination of streaks and better definition of the skin surface.
**Conclusions:** The new reconstruction algorithm makes substantial improvements in CBCT image quality, reduces patient dose and increases HU accuracy. The new system produces CBCT images, which are much better suited to image guidance and which may be suitable for other tasks such as adaptive RT planning.