# AbstractID: 7037 Title: Evaluation of MVCT images containing lead alloy masks for electron beam treatment planning

**Purpose:** To evaluate the accuracy of electron beam dose calculations in MVCT images containing lead alloy masks.

**Method and Materials:** A phantom consisting of two 30x30x5-$cm^3$ slabs of CIRS plastic water® was imaged using kVCT (GE Lightspeed-RT) and MVCT (TomoTherapy Hi·Art). The MVCT scans were taken with nine square masks of Cerrobend® (density = 9.4$gcm^{-3}$) on top of the phantom. The masks contained square openings of 3x3$cm^2$, 6x6$cm^2$ and 10x10$cm^2$ and had thicknesses of 6mm, 8mm and 10mm. The same collimation was simulated in the kVCT images by creating regions-of-interest (ROI) duplicating the sizes, shapes, and density of the masks. Using the Philips Pinnacle$^3$ treatment planning system, twelve treatment plans were created using electron energies of 6, 9, 12, and 16 MeV for each opening size. For each plan, the mask thickness appropriate for the electron energy was used and the dose distributions calculated using the kVCT and MVCT images were compared. In uniform dose regions (doses above 90% of maximum) dose differences were calculated; in high-dose gradient regions (doses below 90% of maximum) distances-to-agreement (DTA) were determined.

**Results:** In the uniform dose region, the maximum difference between the doses in the MVCT images and the doses in the kVCT image was greater than or equal to ±5% for all opening and energy combinations. In the high-dose gradient region, almost half of the maximum DTA values exceeded 2mm. Analysis of the MVCT images showed that DTA differences were largely due to distortions in the phantom CT numbers caused by the masks.

**Conclusion:** Although Cerrobend® produces dramatically less distortion in MVCT images compared to kVCT images, image distortion is still too great for accurate electron beam dose calculations.

Supported in part by a research agreement with TomoTherapy, Inc.