

AbstractID: 5665 Title: Application of a rotatable isocentric phantom for determining geometric errors in gantry rotation of a complete LINAC system including EPID and OBI

**Purpose:** With the onset of on-board-imaging (OBI) and 2D-2D matching programs to determine table shifts in IGRT, QA tests are needed to assess the accuracy of these shifts. Hence, the purpose of this study was to investigate geometric inaccuracies in that could occur within a LINAC with EPID and OBI due to gravity effects when the gantry is rotated.

**Method and Materials:**

A rotatable isocentric phantom (Modus Medical Devices) was aligned to the lasers in our CT simulator. CT scans with 1mm slice thicknesses were transferred to the Eclipse TPS. DRR's were generated and exported into our IMPAC R&V system. The phantom was then aligned to the lasers in the Linac room. A Varian iX LINAC with EPID and OBI was used to obtain orthogonal pairs of images with the gantry set to 0°, 90°, 180°, and 270°. For each image the phantom was rotated such that its top surface was parallel to the imaging detector. The Varian 2D-2D image matching program on the OBI computer was used to determine the geometric inaccuracies.

**Results:**

The initial set up of the phantom immediately revealed a misalignment of 2.5mm in the external lasers in the CT simulator. In addition, the CT scanner table sagged as much as 3.9 cm as it entered and passed the bore with an 68kg on the table. Imaging on the Linac with the MV or kV source at 0° (top) showed images that were perfectly aligned. However, when the kV source and detector was used at 270° or 90°, the images were up to 2mm off due to gravity effects.

**Conclusions:** A technique was developed to determine the geometric inaccuracies found in a LINAC with EPID and OBI. Equipment sag showed that table shifts of less than 2mm may not be real or needed.