# AbstractID: 9556 Title: Measurement errors associated with linear accelerator commissioning data.

**Purpose**: Linear accelerator (LINAC) commissioning employs 3-D water phantoms (WP) to accurately assess LINAC dosimetric characteristics. The accuracy of the treatment planning system (TPS) modeling is based on the collected data. This investigation aims to assess the errors associated with the collection of commissioning data.

**Method and Materials**: Possible sources of error within 3-D WP measurements that were assessed are water tank mechanics, data acquisition, and chamber aspects. WP scanning software, mechanical measurements, and infra-red motion tracking cameras were used to evaluate the mechanical performance of the WP. Continuous motion and point by point measurements were compared for a variety of standard detectors. Minor field size variations were scaled to the nominal field size for TPS import purposes using two methods, 1) geometric scaling of the whole profile or 2) geometric scaling of 80% of the field width. The detector orientation effects were evaluated for profiles and percentage depth dose.

**Results:** WP positional accuracy and reproducibility was within 0.4mm and mechanical hysteresis within 0.46mm. The collection method impacted the results obtained for small detectors (<0.01cc) with the point measurement technique resulting in reduced noise level. However, the time scale increased considerably with the point by point technique. For field width scaling the 80% scaling method showed improved results compared to scaling the whole profile. The detector orientation showed variations in the build up region for small detectors and small variations were observed for penumbral widths of profile measurements.

**Conclusion:** Error sources in data collection have been identified and quantified in this work. Detailed error analysis of experimental set up is presented.

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