

AbstractID: 9342 Title: A high precision, high throughput fixture for routine spatial characterization of the Xoft Axxent™ miniature x-ray source

Purpose:

Xoft has developed a sophisticated fixture for testing X-ray sources intended for use in the Axxent™ electronic brachytherapy system. This manufacturing test fixture (MTF) simultaneously measures azimuthal and polar angular distributions as well as depth-dose. Total measurement time for each source is approximately ten minutes in the standard configuration. The measurement hardware and accompanying data acquisition and computer software form a complete system that has passed a formal Validation consisting of Installation, Operation and Performance Qualifications.

Method and Materials:

Measurement hardware consists of a single PTW ionization chamber and nine solid state detectors which are cross-calibrated to the ionization chamber in a regular maintenance procedure. Components underwent precision spatial measurements at the time of assembly, and custom gauges are used periodically to determine positions to 200 µm precision. The system was designed to be very accurate in positioning measurement devices with respect to the source. Furthermore the measurement techniques minimize the effect of residual misalignment through reliance on relative readings where possible and through correction coefficients determined via consistency checks.

Results:

Repeatability, Reproducibility and operator variability of measurements was determined to be 0.1%, 0.4% and 0.5% (1 sigma) respectively in Performance Qualification. Absolute accuracy is estimated through a detailed error budget analysis to be 1.5% for azimuthal and depth-dose measurements and 4.3% for polar measurements.

Conclusion:

The MTF provides accurate measurements of critical source parameters with high throughput and negligible operator-based variation. Although it has been designed for the Xoft x-ray source, with the use of adapters it could be used to characterize radioactive seeds as well.