# AbstractID: 10706 Title: Characterization of In-Air Anisotropy of Brachytherapy Sources Using Clinical Ionization Chambers

**Purpose:** To determine the feasibility of using well, spherical cavity, and cylindrical cavity ionization chambers to characterize the in-air anisotropy of low-energy photon-emitting brachytherapy sources. **Method and Materials:** Anisotropy in the plane of the long axis of I-125 and Pd-103 brachytherapy sources was characterized by calculating air-kerma rate as a function of rotation angle from emergent spectra measured with a high-purity germanium spectrometer. This measurement is a critical component of the seed calibration program at the National Institute of Standards and Technology (NIST), used to identify anomalous sources and explain variations in well-chamber response relative to the U.S. air-kerma strength standard due to anisotropy variations. To investigate whether such a measurement was possible using instrumentation commonly found in therapy clinics, the responses of three different types of ionization chambers were measured as the source was rotated by 360 degrees in small increments. Initially, ionization chamber current was measured as a function of distance from the source to determine the optimum position for the anisotropy measurements, a compromise between signal strength and angular resolution. The well-ionization chamber was placed on its side with the centering jig removed. **Results:** All three ionization chambers were able to reproduce the characteristic shape and features of the in-air anisotropy for a given model source as measured by the spectrometer, albeit with slightly lower angular resolution. Using an ionization chamber results in significant time savings, as a detailed source anisotropy characterization can be completed in 1.5 days as opposed to 2.5 days with the spectrometer. **Conclusion:** Measurement of the in-air anisotropy of brachytherapy sources can be accomplished using ionization chambers of the types used in clinics, including well-ionization chambers. This technique could serve as an additional quality assurance check on seeds prior to their being used for dosimetry measurements critical for accurate treatment planning.