

AbstractID: 13210 Title: Traceability to National Measurement Standards for Electronic Brachytherapy Calibrations

Purpose: To establish a primary air-kerma standard for the Xofig miniature x-ray brachytherapy source. **Method and Materials:** A new calibration facility has been designed at the National Institute of Standards and Technology (NIST) to directly realize air kerma from electronic brachytherapy sources operated up to 50 kV. The previously established primary x-ray standard, the Lamperti free-air ionization chamber, has been dedicated for this measurement capability. The spectrum emergent from the source is measured with a high-purity germanium spectrometer. To account for possible anisotropy of emissions from the source, both the free-air chamber and the spectrometer are rotated about the long axis of the source. Well-chamber measurements are also performed to study the variability in the ratio of well-chamber current to air-kerma rate in anticipation of developing a method for transferring the NIST standard to secondary calibration laboratories and/or therapy clinics. **Results:** Comparisons of the air-kerma rate realized by two NIST x-ray primary standards, the Lamperti free-air chamber (10 kV to 60 kV) and the Ritz free-air chamber (20 kV to 100 kV), were in agreement to better than 1% as is typical for well-established primary x-ray standards. This comparison validated the use of the Lamperti chamber in establishing the measurement techniques required for the determination of air kerma. **Conclusion:** NIST has designed, constructed, and validated the experimental apparatus necessary for the measurement of air-kerma from an x-ray brachytherapy source using a primary standard. NIST acknowledges the support of Xofig, Inc., in this project.