

AbstractID: 5308 Title: Determining the Air-Kerma Strength of 1cm Coiled Brachytherapy Sources

Purpose: To show the ability of a large-volume free-air chamber to experimentally determine the air-kerma strength of a new 1cm ^{103}Pd coiled brachytherapy sources and show its potential for determining the air-kerma strength of longer (2-6cm) coiled sources.

Method and Materials: A Variable Aperture Free-Air Chamber (VAFAC) has been constructed for making air-kerma rate measurements of low-energy photon-emitting brachytherapy sources with photon energies up to 70 keV. The VAFAC has been used to determine the air-kerma strength of 1cm coiled brachytherapy sources. The present US air-kerma strength standard for low dose rate (LDR) brachytherapy sources is the National Institute of Standards and Technology Wide-Angle Free-Air Chamber (NIST WAFAC). The results obtained with the VAFAC were compared to air-kerma strengths determined with an Accredited Dosimetry Calibration Laboratory (ADCL) well ionization chamber (traceable to the NIST WAFAC) and direct measurement in the NIST WAFAC. At present, the WAFAC is unable to measure the air-kerma rate of the coiled sources longer than 1cm due to its geometric limitations. The VAFAC does not have the same geometric limitations as the NIST WAFAC, which extends its capabilities to measure sources up to 6cm in length.

Results: It has been shown that air-kerma strengths determined for three 1cm length coils with the VAFAC are within 1% agreement with both an ADCL well ionization chamber and NIST WAFAC values.

Conclusion: This work shows that the VAFAC can accurately determine the air-kerma strength of 1cm ^{103}Pd coiled brachytherapy sources. It also shows the ability of the VAFAC to measure sources up to 6cm in length, a feat which was previously impossible due to the limitations of the NIST WAFAC.

Conflict of Interest: Research sponsored by RadioMed Corporation.