

AbstractID: 6830 Title: A Method for determining the water kerma in a graphite phantom for x-rays with up to 50 kV tube voltages

Purpose: The Physikalisch-Technische Bundesanstalt (PTB) is developing a primary standard for the realization unit of the absorbed dose to water for low-energy photon-emitting brachytherapy seeds. As a first step towards this aim, an extrapolation chamber is used for the determination of the water kerma inside the phantom.

Method and Materials: The water kerma in a graphite phantom has been measured by means of an extrapolation chamber and using a novel Monte Carlo based evaluation method. In essence it consists of a measurement of the air kerma in the phantom under secondary electron equilibrium, i.e. for large plate separations. The air kerma is converted to the water kerma for the case of zero plate separation. In order to verify this method a measurement of the air kerma free in air was made which was converted to the water kerma in the graphite phantom again by Monte Carlo calculations.

Results: The comparison of the water kerma values in a graphite phantom, which are obtained by in phantom and free in air measurements shows an agreement of both methods within their combined uncertainty. The uncertainty of the presented method is approximately 1% ($k=1$).

Conclusion: The good agreement found in the comparison supports the new evaluation method. In future work it is planned to calibrate a suitable secondary standard in terms of water kerma by means of the extrapolation chamber and using this device in the radiation field of I-125 seeds.