

Currently ^{192}Ir Brachytherapy sources are calibrated in terms of air kerma at 1 m distance free in air, which must then be converted to dose to water. In the present work a direct dose to water calibration is presented.

A water phantom was constructed in which an NE2571 ionisation chamber can be positioned at 1, 2.5, and 5 cm distance from an ^{192}Ir -source. The measured air kerma in water is converted to dose to water by applying the medium-energy x-ray dosimetry protocol with two extra correction factors. The obtained conversion factors $\text{CF}(r)$ were verified in a second method by applying detailed EGS4 (PRESTAI) Monte Carlo calculations in which. The sources were also calibrated in terms of air-kerma free in air, to verify the specific dose rate constant Λ_0 . A combination of in air and in water measurements yielded a third method to calculate CF. This procedure is performed on several PDR and HDR sources. Extensive TLD measurements confirmed the obtained results.

The obtained conversion factors (e.g. for a Gammamed PDR source) : $\text{CF}(1\text{cm})=1.458$; $\text{CF}(2.5\text{cm})=1.162$; $\text{CF}(5.0\text{cm})=1.112$. For the specific dose rate constant we obtained : $\Lambda_0 = 1.128 \text{ cGy h}^{-1} \text{ U}^{-1}$.

This new system enables us to compare in air calibrations of brachytherapy sources with dose measurements in water. It is also a more direct way to calibrate the source in terms of dose to water, and the conversion factor can be split up in separate contributions which have an underlying physical meaning.