**Experimental determination of the average energy and dose rate constant of the OncoSeed 6711 I-125 seed through the use of a measured spectrum**

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**1. Introduction**

I-125 seeds are regularly used in low dose-rate brachytherapy implants. For many years the seed of choice was the OncoSeed 6711 I-125 seed. The dose calculation protocol recommended by the American Association of Physicists in Medicine (TG-43) is based on measurable quantities. One of these quantities is the dose rate constant, which is defined as the ratio of the dose rate at the reference position and the air kerma strength.

**2. Method and Materials**

I-125 seed spectra were measured with a silicon drift detector and the spectra corrected for detector efficiency. The dose rate constant was calculated by taking into account the number of photons emitted with a particular energy per nuclear disintegration, the mass energy absorption coefficient in air and the dose rate constant for each individual energy peak. The individual energy dose rate constant contains the ratio of the mass energy absorption coefficients in of water and air, a term that includes the effect of photon attenuation and the buildup of scattered photons in water. An 8th order polynomial is fitted to the data. Additionally, the measured spectrum can also be used to obtain the average energy of the I-125 seed by taking into account the energy of each resolved peak, as well as the photon fluence of the same peak.

**3. Results**

The dose rate constant determined through the spectrum was Ʌ = 0.978 cGy h-1 U-1, in good agreement with Ʌ determined through measurements with thermoluminescent dosimeters (TLDs), which was Ʌ = 0.96 cGy h-1 U-1, as well as the consensus dose rate constant given in TG-43U1 as Ʌ = 0.965 cGy h-1 U-1.

The average energy of the OncoSeed 6711 I-125 seed was determined to be 27.24 keV when the Titanium characteristic X-rays are included, and 27.44 keV when they are excluded in the calculation.

**4. Conclusion**

The obtained dose rate constant was in good agreement with the one measured in solid water using TLDs, as well as with published data. The average energy was within 0.4% of published data.