AbstractID: 4821 Title: A TG43 methodology to describe Iridium-wires with variable length.

The use of Iridium wire has a long history in the application of radiation therapy. A number of legacy systems still support the planning of this treatment. Newer brachytherapy planning systems currently rely on a methodology based on the recommendations of the AAPM task group no. 43 (TG43). The aim of this task group was to provide a framework for the application of point like (or near point like) brachytherapy sources. However, in clinical practice, the Iridium wires are cut to the needed length necessitating an description of sources with variable length. It is clear that the TG43 methodology implies a fixed source length.

In this work we aim to provide an extension of the TG43 framework by allowing the length of a given source to vary. To this end monte carlo simulation (MCNPX2.6.0A) of Iridium sources of lengths between 1 and 14cm were performed. Dose distributions around the source in water and in vacuum (activity determination) were calculated. From this data we derived the activity, the dose rate constant and the radial function.

The activity (Air Kerma measured at 1m distance) showed no variation as a function of the source length(L). The dose rate constant followed a relatively simple pattern which could be fit with a function of the form: $\frac{a}{(L+c)^c}$. The radial dose rate could be fit with a function of the form $\frac{A(L)r^{B(L)}}{1+C(L)r^{D(L)}}$. The radial function was subsequently obtained by taking the geometrical function into account. The variables A,B, C, and D showed smooth variation as a function of L. Allowing interpolation to predict radial functions of lengths for which no monte carlo simulations were available.

We hope to extend this work to include the anisotropy terms in the near future.
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