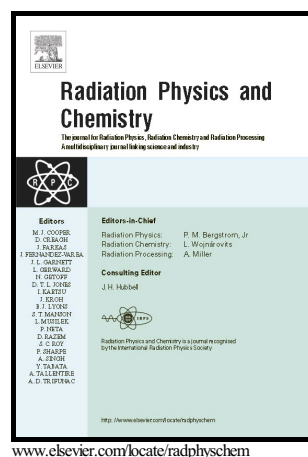


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Physics Elements of an Algorithm for Brachytherapy Dose Calculation in Homogeneous Media for ^{192}Ir Source

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Abstract

Unlike for external beam treatment, Model Based Dose Calculation Algorithms for Brachytherapy are still under development, and have been recently encouraged by the American Association of Physicists in Medicine. This delay is at least partially caused by the extreme complications associated with the multidimensional considerations underlying Brachytherapy dose calculations. These algorithms require detailed mathematical description, based on extensive radiation physics considerations, of the spatial and angular distribution of the points where the decay photon first interacts in matter, called TERMA points, along with the functions describing the radial and angular dose spread around each TERMA point, called Kernel. This work contributes to this global effort by providing these functions for the individual photon lines in the decay of the exactly modeled Nucletron microSelectron v_3 ^{192}Ir source. The underlying physics of all photon and electron interaction mechanisms has been extensively considered. Furthermore, the effect of the absorbing media has been also investigated. Ultimately, three-dimensional integration of dose Kernel contribution at a specified position, running all over TERMA points in the irradiated volume, has been conducted to generate the dose at that specific location. This methodology is much less time, data storage, and CPU consuming compared to repeating

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