Variation of the energy spectrum of a high dose rate (HDR) ^{192}Ir source along the transverse and longitudinal source axes

Due to the dependence of TLD response on photon energy, accurate information about energy spectra is essential to determine absolute dose from TLD readings. It is especially important for isotopes with many low energy spectral lines such as ^{192}Ir. In general, the energy spectrum exiting the source is shifted toward lower energies with increasing distance from the source in water. Some change in energy spectrum with angle may also occur for ^{192}Ir sources, depending on the degree of source self-absorption and filtration. Currently, there is no consensus about the energy-dependent correction factor for TLD measurements with ^{192}Ir sources. This is mainly due to lack of information, particularly in terms of directional (angular) dependence of ^{192}Ir spectra. In this study, the variation of the energy spectrum of an HDR ^{192}Ir source (Nucletron Corporation, Columbia, Maryland) with distances (i.e., 1-10 cm from the source center) and angles (i.e., the transverse and longitudinal source axes) was investigated by performing Monte Carlo calculations using the MCNP 4A code. The Monte Carlo results confirm the change in energy spectrum with distance and angle, and can be used to derive the energy-dependent TLD correction factor.

This work is supported in part by PHS grant CA10953 awarded by the NCI, DHHS.