

عنوان مقاله:

Investigation of the Scaling Formula Accuracy for Poly-energetic Kernel Calculation in 6 MV Photon Beam

محل انتشار:

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خلاصه مقاله:

Background: Dose distribution can be obtained from total energy released per unit mass (TERMA) and inhomogeneous energy deposition kernel (EDK) convolution. Since inhomogeneous EDK data is location-dependent, it is calculated by employing the density scaling method rather than Monte Carlo based user code EDKnrc. Objective: The present study aimed at investigating EDK scaling formula accuracy in the presence of lung and bone inhomogeneities. Material and Methods: In this theoretical-practical study, six EDKs datasets with lung and bone inhomogeneity in different radii were generated using EDKnrc user code and density scaling formula. Then the scaling method data and corresponding EDKnrc-generated ones were compared to enhance the calculations, and some correction factors for error reduction were also derived to create more consistency between these data. Results: The study has shown that the errors in the theoretical method for calculating inhomogeneous EDKs were significantly reduced based on the attenuation coefficient and ρ_{rel} parameter, with α equal to ۱.۲ and ۰.۸ for bone and lung voxels, respectively. Conclusion: Although the density scaling method has acceptable accuracy, the error values are significant at the location of lung or bone voxels. By using the mentioned correction factors, the calculation inaccuracy of heterogeneous EDKs can be reduced down to ۵%. However, the lung heterogeneity results corrected by the method are not as good as the bone cases.

کلمات کلیدی:

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