

技术及应用

利用深度剂量数据重建放射治疗X射线能谱

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摘要 利用深度剂量测量数据重建放射治疗X射线能谱, 并对重建方法进行评价。先用Monte-Carlo模拟计算60个单能光子束的深度剂量分布作为基函数, 然后使用Cimmino迭代法对测量的深度剂量进行线性拟合, 得到相应射野每个单能光子束对测量深度剂量的贡献权重, 即放射治疗所用的韧致辐射X射线的相对能谱。考虑机头组件散射对能谱的影响, 计算中采用双源模型, 在等中心平面分3个区域 (5 cm×5 cm、10 cm×10 cm~5 cm×5 cm、20 cm×20 cm~10 cm×10 cm) 重建能谱。最后将分区重建能谱与10 cm×10 cm射野重建能谱进行比较, 对重建方法进行评价。结果表明: 利用双源模型重建能谱更符合临床实际情况, 分区能谱较不分区能谱计算的深度剂量更符合实际测量深度剂量。

关键词 [深度剂量分布](#) [Monte-Carlo模拟](#) [双源模型](#) [Cimmino迭代](#) [X射线能谱](#)

分类号

Reconstruction of X-ray Spectra for Radiation Therapy

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Abstract This study describes a method to reconstruct energy spectra of clinical bremsstrahlung X-rays from measured depth dose data. The measured depth dose can be expressed as a linear combination of basis functions, namely the depth doses of monoenergetic photon beams derived from Monte-Carlo simulations. The weights of the basis functions, which were obtained with the Cimmino iteration, represent the relative energy spectra. The real energy spectra are changed gradually with the off-axis distance because of the photons scattered from components of treatment head. The energy spectra of X-rays in the isocenter plane were reconstructed using a dual-source model in three regions: 5 cm×5 cm, 10 cm×10 cm-5 cm×5 cm, 20 cm×20 cm-10 cm×10 cm. Depth doses produced from the uniform spectrum (10 cm×10 cm) and from regional spectrum were compared with measured depth doses respectively. The results show that using the dual-source model in reconstructing spectrum is more appropriate in clinical, and depth doses produced from regional spectrum are more identical to measured depth doses.

Key words [depth dose distribution](#) [Monte-Carlo simulation](#) [dual-source model](#) [Cimmino iteration](#) [X-ray spectra](#)

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