

2019 年度 博士前期課程学位論文要旨

学位論文題名 (注：学位論文題名が英語の場合は和訳をつけること)

A study on estimation of photon energy spectrum emitted from electron linear accelerators
電子線形加速器が発生する光子のエネルギー-スペクトルに関する研究

学位の種類： 修士 (放射線学)

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注：1 ページあたり 1,000 字程度 (英語の場合 300 ワード程度) で、本様式 1~2 ページ (A4 版) 程度とする。

The Monte Carlo simulation by modeling the treatment head is considered as the most common method to estimate the photon energy spectrum. However, it consumes a lot of computing time and the treatment head specification is not always available. Therefore, a simplified method is proposed in this study to estimate the photon energy spectrum which can reproduce the depth dose agreed with the measured (reference) data.

The photon energy spectrum was estimated by using a depth dose library, which includes monoenergetic depth dose from 0.1 MeV to 7.0 MeV with an interval of 0.1 MeV. The monoenergetic depth dose was calculated using the DOSRZnrc code. To obtain better statistical accuracy in the calculated monoenergetic depth dose, the number of history of 1×10^9 was chosen. A GRG (Generalized reduced gradient) nonlinear function was performed repeatedly until getting a good agreement between the reconstructed and reference *PDD*. Thus, by minimizing the variance of the relative difference between the reconstructed and reference *PDD*, parameters for the photon energy spectrum were determined.

To verify the method a comparison of *PDD* calculated by reference and estimated photon energy spectrum was involved. The resultant relative difference of *PDD* was $< 0.5\%$ which proved sufficient accuracy of the method. As a result, the method is expected to be used effectively as a fast photon energy spectrum estimation tool for clinical purpose.