別紙様式３

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学位論文題名（注：学位論文題名が欧文の場合は和訳をつけること）

Feasibility study of absorbed dose estimation using radiophotoluminescence glass dosimeter for proton therapeutic beam

ガラス線量計を用いた陽子線の水吸収線量計測に関する研究

学位の種類：　修士（放射線学）
人間健康科学研究科　博士前期課程 人間健康科学専攻　放射線科学域
学修番号：09897614
氏　　名：張　維珊
（指導教員名：齋藤　秀敏）

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Radiophotoluminescence glass dosimeter (RGD) is widely used in radiotherapy nowadays. While there are few evaluation studies of the response for RGD in the proton beam. Some studies indicated that the response of RGD decreases in the Bragg Peak region, but the relation between absorbed dose and response is not understood very well. The purpose of this study is to confirm the feasibility of RGD for dose assessment in proton beam.

In this work, the relations between absorbed dose and response of RGD in the proton beam based on dosimetric characteristics learned from Monte Carlo simulation and experiments will be disclosed. In the part of experiment, we have some basic characteristic investigation experiments for RGD such as reproducibility and dose response linearity and dose measurement experiment. Obtaining detailed information of dosimetric performance of the RGD by experiments is difficult, so that the Monte Carlo simulation toolkit Geant4 was used. Firstly, the proton stopping power ratio of water to RGD (GD301, Asahi Techno Glass Co.) was calculated to evaluate whether the RGD is proper to be used in proton dosimeter measurement. Secondly, absorbed dose and proton energy fluence in the RGD at different depth was calculated to make sure that the absorbed dose of RGD (D_{RGD}) can be converted to the absorbed dose of water (D_{WATER}) correctly. The simulation results showed that the stopping power ratio of RGD to water increased with the decreasing energy. It means that the correction upon energy can help RGD to measure the absorbed dose in the proton beam. Finally the stopping power correction factor obtained by Geant4 will be applied to the measured data for confirming the usability.

The experiment results revealed that the correction by means of stopping power ratio is useful for absolute dose measurement in the reference condition recommended by TRS-398