Purpose:
Ion chamber is one of the fewer detectors that can be used to measure absolute dose for proton beam at present. However, ion chamber is not proper for in vivo dose measurement as the large volume. Although a great number of studies reported on the in vivo dosimetry. But there is no study carried out on the topic for feasibility of the absolute dose measurement by radiophotoluminescence glass dosimeter (RGD) with the stopping power correction. The purpose of the study is to investigate the performance of RGD in the therapeutic proton beam by means of Monte Carlo simulation and experiments, and evaluate the feasibility of RGD for therapeutic proton beam.

Methods:
In this work, Monte Carlo simulation toolkit Geant4 was used to obtain the detailed information of dosimetric performance of the RGD. Firstly, the proton stopping power ratio of water to RGD (GD301, Asahi Techno Glass Co.) was calculated. Secondly, the beam modeling of proton beam in Southern Tohoku Proton center was held and then absorbed dose and proton energy fluence in the RGD at different depth was calculated for acquiring the stopping power correction factors. Finally, the stopping power correction factor calculated by Geant4 will be applied to the measured data for confirming the usefulness of stopping power correction and the usability of RGD for dose measurement in therapeutic proton beam.

Results:
The simulation results showed that the stopping power ratio of RGD to water increased with the decreasing energy. The measured data showed good agreement between ion chamber and RGD with stopping power correction except the region behind of Bragg peak.

Conclusions:
The experiment results revealed that the usefulness of stopping power correction for correct proton dose measurement using RGD. More research is needed for correct dose measurement around the deeper region of Bragg peak.