AbstractID: 13418 Title: Beam quality correction of radiophotoluminescence glass dosimeter in accordance with Burlin cavity theory

Purpose: The radiophotoluminescence (RPL) glass dosimeter is suitable detector for postal dose audit program because it doesn't have fading effect and luminescence can be read repeatedly. However energy dependence cause of high-Z is significant. Burlin cavity theory can be applied to dosimetry with RPL glass (ρ=2.4 g cm^{-3}) because it extended the Bragg–Gray and Spencer–Attix cavity theories to cavities of intermediate dimensions. Therefore, by using Burlin cavity theory, the methods to correct beam quality dependence is proposed and it was evaluated for several beam quality and field size in this report.

Materials and methods: The energy spectrum of photons and electrons in water were simulated for several photon energy, depth and field size using the EGSnrc MonteCarlo code. The $(\mu_{en}/\rho)_{w,glass}$ and $(L/\rho)_{w,glass}$ were determined with the spectrum. The physical quantity d is a weighting factor which gives the contribution to the total dose from electrons generated by surrounding water, and (1 d) is the contribution to the total dose from electrons generated by photon interaction in the RPL glass. The d was determined using original user code of the EGSnrc. In addition, measurement using the RPL glass was performed in the same condition as simulation.

Results: Beam quality correction factor by Burlin's, when RPL glass dosimeter was calibrated in 6 MV X-ray, 10 cm depth in water and 10 cm by 10 cm field, was 0.994 for 4 MV and 1.010 for 10 MV. This correction factors were in good agreement with that of measurement within 0.5%.

Conclusion: In this study, the correction methods of beam quality dependence of RPL glass dosimeter were investigated. As a result, good agreement between Burlin's and measurement was obtained, and it was shown that beam quality dependence of RPL glass dosimeter can be corrected by suggested method.