AbstractID: 13523 Title: Monte Carlo Study of Absorbed Dose to Solid Water for External Auditing

Purpose: An external audit for radiotherapy has been performed by the third parties to maintain a uniform quality of patient care among different facilities. Among a lot of auditing items, we developed a method to determine absorbed dose to water from Farmer-type ion-chamber measurements in solid water within the context of AAPM TG-51 protocol. The AAPM T-51 protocol has liquid water as a phantom material for clinical reference dosimetry. Instead of liquid water, the use of a solid phantom is convenient for an external auditing of busy clinics**. Method and Materials:**Due to different compositions and densities of solid water, correction factor for irradiation geometry and chamber responses are needed to convert measurements in solid water into absorbed dose to water. To avoid the complexity of measurement we kept the reference condition of solid water identical to that of water. The compositions and homogeneity of commercial solid water are varied among different manufactures and not consistent with the compositions provided by manufacturers. Therefore, the compositions of solid water used in this study were experimentally determined by using an electron probe micro-analyzer (EPMA). The absorbed dose conversion factors for the solid water phantom were measured and, calculated by using the EGSnrc Monte Carlo code system. **Results:**Measured and calculated conversion factors under the reference condition were in a range of 1.00 – 1.005 for 6-15 MV photon beams, and 1.001 – 1.021 for 6-20 MeV electron beams. The total uncertainty of TG-51 protocol measurement using solid water was determined to be ±1.5%. **Conclusion:**The measurement time (including setup time of a solid water phantom and a chamber for several photon and electron beams) was typically less than 30 minutes for external auditing.
Conflict of Interest (only if applicable): Research sponsored by Korea Institution of Nuclear Safety corporation