

Purpose: To verify small field dosimetry techniques based on the proposed new formalism for reference dosimetry of nonstandard fields [Alfonso et al., Med. Phys. 35, 5179-5186 (2008)] in volumetric modulated arc therapy field.

Methods: For this study, we constructed a cylindrical PMMA phantom including a hole to measure a reference absorbed dose at the center of phantom. We investigated a candidate plan-class specific reference (pcsr) field using Eclipse 8.6 and the CT images of home-made phantom. Four detectors were used for the absorbed dose to water in the pcsr field: Thermoluminescent dosimeter, Glass dosimeter, a diamond detector and a liquid filled ionization chamber. For determining correction factor between the condition of conventional reference field and pcsr field, three cylindrical ionization chambers of varying volumes were used (a farmer type chamber, a Semiflex chamber and a PinPoint chamber) in pcsr fields by means of one arc and two arc gantry with continuously varying beam aperture, gantry speed and dose rate.

Results: We found the correction factors were not different between one fully arc pcsr field and two fully arc pcsr field. For one fully arc pcsr field, the correction factors of each chamber were found in a range of 0.988-0.999, while for two arc pcsr field, they were found in a range of 0.984-0.996. The measurement in each pcsr field found the different within 1.2 %.

Conclusions: We investigated two pcsr fields and measured the correction factors using chambers with various volumes. We found that the correction factors were changed according to chambers and pcsr fields. Therefore, in small field and nonstandard field such as VMAT, the correction factor have to be measure using proper pcsr fields and chambers.