

AbstractID: 4910 Title: TG21 in-air measurements of Elekta Gamma Knife dose volumes

Purpose: To implement TG21 dosimetry protocols and in-air measurements to determine the dose rate of fields resulting from the 18mm and 14mm helmets of an Elekta Gamma Knife (GK) unit.

Methods and Materials: An air ionization chamber with a collecting volume of 0.007cm^3 was used to make in-air measurements at the physical isocenter of a GK unit. The isocenter was determined and the chamber was positioned in air using a chamber holder and laser positioning system. The dose rate to water was determined using the TG21 formalism designed for use with Co-60 teletherapy machines. Only a measurement taken at the isocenter of the machine is required. Certain chamber-specific correction factors and a chamber calibration factor are also used. The clinical dose rate is determined by Elekta from measurements taken in an 8cm radius spherical phantom. For comparison this clinical dose rate can be corrected out of phantom using tissue-air ratios. The experimentally determined dose rate is then compared with to the corrected clinical dose rate.

Results: The dose rate for the 18mm and 14mm helmets determined using TG21 is within 1% of the Elekta-provided clinical dose rate after correction out of phantom. The dose rate was also experimentally determined for the 8mm and 4mm helmets. The experimental dose rate is low for these helmets due to the field fall off within the chamber volume.

Conclusion: TG21 in-air measurements may be performed with the GK unit providing the field size is large enough to appear as a uniform field to the ionization chamber. These measurements allow GK dosimetry to be performed with an established dosimetry protocol and without complications arising from phantom material. This will allow further developments of in-air calibration methods appropriate for the 8mm and 4mm fields of GK units to be compared to a well established standard.