

AbstractID: 8417 Title: Measurement of relative output factors for the Leksell Gamma Knife PERFEXION by film dosimetry

Purpose:

To measure relative output factors (ROFs) for 4 and 8 mm collimators for the Leksell Gamma Knife PERFEXION unit. Effective ROFs calculated by Monte Carlo (MC) by ELEKTA and used in the Gamma Plan 8.0 treatment planning system are 0.805, 0.924 for 4 and 8 mm collimators, respectively.

Method and Materials:

Three types of films, Kodak EDR2, gafchromic EBT and MD-V2-55, were used within the spherical polystyrene phantom of diameter of 160 mm. To obtain calibration curve 10 films were exposed to doses of 0-400, 0-800, 0-8000 cGy for EDR2, EBT, MD-V2-55 films, respectively. Three samples of each film type were then exposed in identical setup for 4, 8 and 16 mm collimators. Films were scanned by EPSON EXPRESSION 10000 XL scanner with 200 dpi resolution in 16-bit grayscale for radiographic and 48-bit color for gafchromic film and imported in red channel. Films were evaluated by FilmQA version 2.0.1215 software. Fifth degree polynomial fit for calibration curve was used and background corrections applied for all films. Doses delivered to the center of each of studied films by 4, 8, 16 mm collimators were obtained and ROFs calculated and corrected for transit dose.

Results:

Measured ROFs and deviations compared to MC calculated value for 8 mm collimator were 0.899 (-2.7%), 0.917 (-0.8%), and 0.920 (-0.4%) for EDR2, EBT, and MD-V2-55 films, respectively. Measured ROFs and deviations compared to MC calculated value for 4 mm collimator were 0.778 (-3.4%), 0.818 (1.6%), and 0.804 (-0.1%) for EDR2, EBT, and MD-V2-55 films, respectively.

Conclusion:

MD-V2-55 film seems to be an ideal dosimeter for small stereotactic field ROFs measurements. All results obtained in this study were in close agreement with MC values. Largest deviations noted from the MC were for EDR 2 films. The closest agreement with MC values was observed for MD-V2-55 films.