

AbstractID: 8419 Title: Dosimetric analysis of attenuation in the Leksell Gamma Knife
PERFEXION calibration phantom adaptor

Purpose:

The purpose of this study was to evaluate the attenuation of 16 mm beams caused by the ELEKTA calibration phantom adaptor used for the new Leksell Gamma knife PERFEXION (PFX).

Method and Materials:

For the calibration of PFX, Elekta AB provides a 160 mm diameter polystyrene phantom with an aluminum adaptor of C-shape which has stainless steel fixation screws for holding the phantom in the irradiation position in PFX. An Exradin A16 ion chamber (collecting volume 0.007 cm³) and a Standard Imaging MAX 4000 electrometer were used to measure radiation output at the center of the 160 mm diameter polystyrene phantom for each of eight identical sectors and 16 mm collimator.

Results:

While studying the uniformity of output from each of the 8 sectors it was noticed that for sector No. 3 (270 degree) and sector No. 7 (90 degree), the outputs measured were lower by about 2% as compared to other sectors. On detailed investigation with Kodak EDR2 film, we found that for these two sectors, there were 2 beams of 16 mm diameter passing through the aluminum adaptor and the stainless steel fixation screws which caused attenuation of these two beams and hence a reduction in output .

Conclusion:

The attenuation by phantom adaptor introduces a systematic error in output calibration of PFX. The overall reduction in output measured for all 8 sectors combined is about 0.5%. We suggest that until Elekta AB redesigns a new phantom adaptor for PFX calibration, physicists should be aware of the attenuation of 16 mm beams by the adaptor and incorporate this effect in the output calibration of the PERFEXION .