AbstractID: 6559 Title: Helmet Factor and Timer Error Measurements for the Leksell Gamma Knife

The helmet output factors (HF) and timer errors (TE, added to set time when computing delivered dose) for all collimator helmets (4, 8, 14 and 18 mm) of a Leksell model-B Gamma Knife were measured using five LiF TLD-100 microcubes (~1 mm x 1 mm x 1 mm). The microcubes were centered in a 16 cm diameter polystyrene phantom, and positioned at the helmet focus. Exposure times of 0.3 min and 0.1 min were used, corresponding to doses of about 90 cGy and 39 cGy, respectively, with the 18 mm helmet. Doses above 100 cGy, in the supralinear response region of LiF, were avoided as they were found to alter the radiation sensitivities of the microcubes. Standard deviation uncertainties were estimated, based on variations in the TLD response for identical exposures. The response factor of each microcube was followed individually, to reduce uncertainties. Measurements were performed with the 18 mm helmet both immediately before and after measurements with any other helmet, to account for any drifts in the response of the TLD reader. The measured HF for the 4 mm helmet is 0.88±0.02, in good agreement with other measurements and Monte Carlo computations reported recently. Timer errors ranged from 0.039±0.004 min for the 4 mm helmet, to 0.052±0.005 min for the 18 mm helmet. In comparison, TE for the 18 mm helmet measured using a Capintec Model PR05-P Intracavitary Mini-Chamber is 0.045±0.005 min. The Leksell treatment planning software does not currently incorporate corrections for timer error.