AbstractID: 7460 Title: Evaluation of the Geometric and Dosimetric Inaccuracies of the LGK Stereotactic Irradiation of Experimental Animal

Purpose: The purpose of this study was to evaluate geometric and dosimetric inaccuracies during the irradiation of the experimental animal (rat) brain on the Leksell gamma knife.

Materials and Methods: Three types of dosimeters were employed for these measurements: a) thermoluminescent dosimeter (TLD) (Harshow LiF chips 3x3x1 mm^3), b) semiconductor detector (Scanditronix EDD-2, 0.5 mm thickness, 1.5 mm diameter), c) polymer-gel dosimeter. Semiconductor detector and TLD were calibrated and then implanted in the brain of the rat cadaver and used for absolute dose measurements. Special glass phantom mimicking exactly the shape of the rat body and filled by the polymer-gel (evaluated on Siemens EXPERT 1T MRI scanner) was used for measurements of relative dose distribution and evaluation of geometric inaccuracies. A typical treatment plan consisted of four 4 mm isocenters arranged to create horse shoe shape dose distribution with the total volume of 70 % isodose about 200 mm^3 creating hipocampal lesion in the rat brain.

Results and Conclusions: Observed results demonstrated that Leksell GammaPlan treatment planning system can be employed for the calculation of absorbed doses for experimental animals. However, in our concrete case, it was necessary to apply correction factor of 1.078 for the absolute absorbed dose to obtain reliable results. Comparison of dose profiles in all three axis calculated by the treatment planning system and measured ones by polymer-gel dosimeter showed good agreement. Comparison of calculated and measured dose profiles demonstrated very good geometric agreement with mean deviation in profile position of 0.5 mm.