AbstractID: 12942 Title: Current Practice in Small Radiosurgery Field Dosimetry – Preliminary Results from 21 Centers Participating in the International Leksell Gamma Knife Calibration Survey

Purpose: To investigate current practice in calibration of small Leksell Gamma Knife (LGK) radiosurgery fields and measure output of the surveyed LGK units using alanine dosimeter.

Methods and Materials: Each participant of the project received a LGK calibration questionnaire addressing following information: LGK model, calibration protocol used, phantom used, ion chamber used, LGK calibration personnel, independent verification of calibration and collimator relative output factor values. Alanine dosimeters evaluated with a Bruker ECS106 Electron Paramagnetic Resonance spectrometer using the protocol described in the NIST Ionizing Radiation Division Quality System Manual were used to measure the dose rate of the surveyed LGK units.

Results: To date, 21 LGK units have participated in this project (North America 9, Europe 5 and Asia 7).The calibration protocols used for surveyed sites were: AAPM TG21 9 sites, IAEA TRS277 1 site and IAEA TRS398 11 sites. ELEKTA ABS spherical phantom was used in 18 cases and ELEKTA solid water phantom in 3 cases. Following ion chambers were used for LGK calibration: PTW 31010 (0.125 cm^3) 9 times, Exradin A16 (0.007 cm^3) 4 times, PTW 31006 (0.015 cm^3) 3 times, Capintec PR-05P (0.070 cm^3) 2 times, Wellhoffer IC-10 (0.125 cm^3) 1 time, Exradin A1SL 1 time and Exradin A14SL 1 time. Calibration of LGK units was performed by an on-site physicist in 15 cases and by ELEKTA physicist in 6 cases. Independent verification was done in 8 cases out of total 21 surveyed units. All LGK units surveyed are currently using the ELEKTA default values for collimator relative output factors.

Conclusions: The range of dose planned to measured ratio was 0.972 – 1.030 demonstrating reasonably good LGK calibration consistency. Mean absolute value percentage deviation between planned and measured dose was 1.34 ± 0.84 %. This project is ongoing and more information will be provided at its conclusion.