AbstractID: 10369 Title: A comprehensive neutron survey for the first clinically operated ELEKTA Infinity LINAC in North America and comparison with other 15 MV LINACs

Purpose: To conduct a comprehensive neutron survey for the first clinically operated ELEKTA Infinity LINAC (equipped with MLCi2 collimator) in North America and to compare the results with other 15 MV LINACs

Method and Materials: Currently, an ELEKTA Infinity LINAC (equipped with the latest MLCi2 collimator) is in clinical operation at our institution. A comprehensive in-room and outside the room neutron survey was conducted for the unit. Moderated gold activation foils were used for in-room (out of the primary beam) neutron measurement around the treatment head at 13 different locations covering both the patient plane and the target plane. All in-room measurements were made with a 20 x 20 cm field size at an energy of 15 MV (the highest clinical commissioned energy) and the beam pointed down unless otherwise noted. A Victoreen Model 488 neutron survey meter was used for outside room survey at various locations as suggested by the corresponding shielding report. The maximum field size of 40 x 40 cm was used for all outside survey measurements.

Results: For the in-room survey, the measured fast neutron equivalent doses are (in mrem per photon rad delivered at the isocenter) within the range of 3.63E-1 to 4.38E-1 mrem/rad in the target plane, and within the range of 1.52E-1 to 3.80E-1 mrem/rad in the patient plane. In addition to fast neutrons, there is a nearly constant thermal neutron field of 2.9×10^{-3} mrem/rad. Compared to previously conducted neutron surveys of various 15 MV LINACs from different manufactures and models, the new Infinity model reports significantly lower neutron readings. For the outside room survey, when a typical 50,000 rem/week workload is assumed, and use factors/occupancy factors are taken into consideration, the combined photon and (equivalent) neutron doses are found to be below regulatory limits for all survey locations.