AbstractID: 5112 Title: Commissioning of multi-leaf collimator for fast neutron therapy

Purpose: To collect and analyze data required for modeling of d(48.5)+Be fast neutron beam and shaped by newly installed multi-leaf collimator (MLC) replacing previously used multi-rod collimator (MRC).

Method and Materials: The MLC is of semi-focused design and consists of 60 leaf pairs operated under vision control. The leaf ends are straight, while the sides of the leaves are tapered to match the beam divergence and project 5 mm at isocenter plane. The leaf thickness is 300 mm of steel, and the MLC is the primary beam shaping device. The measurements along the central axis as well as lateral profiles were done in a water phantom. In the build-up region the central axis depth dose curves were combined with data obtained from the measurements using thin window extrapolation ionization chamber. The output factors were defined at 0.9 cm depth in phantom and in free air by means of small volume Tissue Equivalent (TE) ionization chamber and miniature pin diode. In addition TE/Mg(Ag) paired ionization chambers were used to separate the neutron and gamma components in phantom as well as in free air.

Results: No significant variations of the central axis depth doses were observed compared to MRC. Penumbra measured between tapered leaf sides was smaller than penumbra measured between straight leaf ends. The differences were largest at shallow depths and for large field sizes: 7 mm for 25×25 cm^2 field decreasing to less than1 mm for fields smaller than 15×15 cm^2. Linear relationship between the actual leaf end position and field size was observed. The gamma component at 0.9 cm depth in phantom increased with the field size from 1.5% to 3% and from 0.4% to 0.74% in air.

Conclusion: A set of beam data measured for neutron MLC was used in beam modeling.