Abstract ID: 17053 Title: Absorbed dose rate measurements around a single 192Ir intravascular brachytherapy seed using a high-spatial resolution gel dosimetry system

Purpose: Investigate the absorbed dose rate distribution at sub-millimeter distances close to a192Ir intravascular brachytherapy seed using a high-spatial-resolution gel dosimetry system.

Method: One BANG3-Pro-1 gel phantom was used for the seed irradiation and one for calibration. A small format laser computer tomography scanner has been used to acquire the data. The measurements were performed with a spatial-resolution of 100 μm in all dimensions. Since this gel is energy independent for photons between 20 keV and 1250 keV, it was calibrated using a small (1cm2) 60Co gamma beam. The air kerma strength was measured using the NIST well-ion chamber. The dose-rate constant was measured and the absorbed-dose-rate was obtained at distances between 0.6 and 12 mm from the seed.

Results: A dose rate constant of (1.140 0.052) cGyh-1U-1 was obtained which agrees with published data. At distances between 2.5 and 6 mm, an enhancement on the absorbed dose-rate is observed. This observation agrees quantitatively with data for the same seed reported previously using Gafchromic film MD-55-2. On the other hand, published Monte Carlo data that take into account the emitted beta particles from the seed describe qualitatively this feature, but quantitatively, difference up to 20 % is observed in the enhancement region.

Conclusion: This study and the reported data using MD-55-2 suggest that the argument from the AAPM TG-149 protocol where the absorbed dose to the tissues from beta particles is considered to be insignificant is not quite correct and the AAPM TG-149 protocol should be revised. Finally, experimental method that provide high spatial resolution and water-equivalent tissue may be the best option to determinate absorbed dose at close distances to brachytherapy seeds since for Monte Carlo calculation, precise knowledge of the seed core is of great importance, which is generally very difficult to accomplish.