AbstractID: 3294 Title: Microdosimetry Using Special Type PAG Dosimeter Eith 4.7 Tesla Small MRI Scanner

Purpose:

To demonstrate the capability of gel dosimeters to determine the dose in the microdosimetry range and to produce special type gels.

With high signal to noise ratio and less susceptible to oxygen from the air and hence reducing the impact of one of the most hindering parameters in gels preparations.

Method and Materials:

Acrylamide-gels were prepared in argon-degassed water and gelatin. The irradiation polymerization induced provides a 3D map of energy deposited, which can be determined by using MRI-scanner. A Bruker type small animal MRI-scanner of 4.7 Tesla magnetic field and 10 cm core is used. An image of the inverse of T2 map was then made by use of a fitting algorithm. A formulation for clear gel was made by changing the monomer concentration to about 20 %T (Total monomer concentrations) and 5 %C (cross linker concentrations).

Results:

Pixel size of 59 μm x 59 μm x 1 mm was obtained using a 4.7 T MRI-scanner. Scanning time averaged approximately an hour for a 512x512 image.

Compared to a standard 1.5 T scanner, the improvement in pixel size represents a 15-fold improvement. A small pixel size means improved spatial dose resolution of the gels. High T and low C concentrations improves signal to noise ratio. Dose beam profiles and depth dose curves for 6 MV beams are found to be in agreement with ionization chamber measurements. Results also indicate that oxygen diffusion through the gel container decreases with depth. In using gel dosimeters for more accurate dose resolutions this differential oxygen diffusion through the gels should be considered.

Conclusion:

Gel dosimeters can be used as microdosimeters. Applications for microdosimetry include radiobiology and future radiotherapy such as micro-beam type radiotherapy. The further implications of clear gel formulations and increased magnetic field usage for high pixel resolution warrant additional investigation.