AbstractID: 7497 Title: Preliminary study of the effect of prolonged radiation delivery times in IMRT on retention of gammaH2AX

Purpose: To investigate repair of DNA double-strand breaks (DSB) following acute and prolonged (typical of IMRT) dose delivery using retention of γH2AX as an indicator of residual DSB.

Method and Materials: Human fibroblasts were exposed to 2Gy of 300kVp X-rays (HVL 3.54 mm Cu) in 1 minute, 10 minutes, or 22 minutes. Dose rate was contolled by adjusting SSD over the range of 32.1 cm to 153.5 cm. Dosimetry was verified using an ionization chamber following the AAPM TG 61 protocol, and by TLD. The protracted treatment times were chosen to bracket IMRT delivery times typically found in the clinic. Twenty four hours post irradiation, cells were fixed and examined by flow cytometry for the fraction of γH2AX that was still retained by these cells. Six cell cultures were irradiated at each SSD and two cell cultures served as unirradiated controls.

Results: A persistent, although not statistically significant difference in γH2AX retention was observed when levels observed following 1 min irradiation were compared to those seen for the protracted irradiation times. Differences in γH2AX retention were compatible with measured or theoretically projected differences in cell survival.

Conclusions: Our preliminary results indicate the feasibility of this approach as a rapid method to assess small differences in repair rates. Direct measure of DSB repair provides insightful data which complements survival assay studies and can lead to a better understanding of impact of repair on effectiveness of IMRT. Further studies are currently underway on cells irradiated with clinical IMRT dose delivery techniques.