AbstractID: 13266 Title: Dosimetric Correction for Lung Aperature used in Mouse Irradiation Experiments for a 250 kVp Orthovoltage Unit

Purpose: Mouse lung irradiation experiments are being carried out to investigate radiation induced pulmonary fibrosis. The irradiation setup involves a mouse pie cage device to irradiate 10 mice simultaneously with concentric radiation shields to protect critical organs and a plastic bag containing anesthetic isoflurane gas. The objective is to provide accurate dosimetric evaluation for irradiating mouse lungs with the above setup.

Method and Materials: The irradiator is a Philips RT-250 orthovoltage unit. A 12.5 cm diameter cone and 250 kVp X-rays were used for irradiation. The procedure for evaluating dose rate consists of: dose calibration for the open cone as per standard protocol, output factor measurement of the shielded field, and percentage depth dose (PDD) comparison of the concentric aperture versus the open cone. The actual mouse irradiation setup also involves a ~1.0 cm airgap, off-axis prescription point, and the plastic bag. These dosimetric effects were accounted for as correction factors in the formulism for irradiation time calculation. Dose enhancement at the surface caused by photoelectrons and Compton electrons from the shielding material was also studied.

Results: Results showed a cumulative 21.3% drop of dose rate due to attenuation from the bag (1.2%), inverse square law fall-off (6.3%), and output ratio of the narrow aperture contributing the remaining 13.8% drop. The off-axis effect found was minimal. Also there was a drop in PDD due to the reduced field size. An increased surface dose from electrons scattered off the shield was noticed from the surface dose profile. This extra surface dose was reduced by the airgap and plastic bag, thereby providing skin sparing for small animal irradiation.

Conclusion: More accurate dose delivery will be achieved when the correction factors are applied. By adding a thin attenuating material and airgap, surface dose due to Compton electrons and photoelectrons can be reduced.