AbstractID: 5709 Title: Effect of mini-phantom material on in-air dosimetry quantities

Purpose: Recent studies suggest that miniphantom material and thickness affect the measured values of in-air output ratio. These results prompt us to investigate the effect of mini-phantom depth and material on several in-air quantities.

Method and Materials: Beam data for two photon beams (6x and 15x) were compared for several in-air quantities: off-axis ratio (OAR); central axis wedge factor (CAX WF); distance factor (DF) dependence and off-axis wedge factor (OAX WF). Several miniphantom materials (Lucite, copper, lead and graphite) were used with a radiological depth ranging from 2 to 25g/cm^2.

Results: OAR decreases with increasing mini-phantom thickness and off- axis distance x, for the same mini-phantom material. For open field, the maximum difference is 5% and 8% for 6x and 15x, respectively. CAX for WF were measured for 15^0, 45^0 and 60^0 wedge angles, for both virtual and solid wedges. WF increases up to 11% with mini-phantom thickness, when solid wedges are used. Virtual wedges have an effect of less than 1% on WF. Maximum errors were found for 45^0 solid wedge. DF dependence was measured for several SAD's for 6 and 15x, open and 60^0 virtual and solid wedges. DF agreed within 3% regardless of beam energy, material and SAD. OAX WF were measured at a few off-axis points along both wedge and non-wedge gradient directions for 6x. WF varies by up to 2.6% in the toe direction, by up to 1.1% in the heel direction and by up to 3.3% in the non-wedge direction.

Conclusion: Mini-phantom material has an effect on measured in-air dosimetric quantities. Ideally, a water-equivalent miniphantom should be used. When the miniphantom thickness increases (even for water equivalent material), the value of WF, OAR, DF increase by 11%, 8%, 3%, respectively. The error also increases with Z value of mini-phantom and photon energy.