AbstractID: 11702 Title: Monte-Carlo Evaluation of the backscattering shielding of Two EPIDs

Purpose:
To evaluate two possible designs to shield the imaging panel from radiation backscattered from objects downstream of the imager.

Method and Materials:
Two EPID panel variants, panel 1 and panel 2, are prototyped with an in-house EGSnrc Monte Carlo code module. These panels differ from commercial panels via the addition of composite materials within the detector panel, designed to shield the detection screen from radiation backscattered. No, medium, and strong backscattering materials are simulated via the addition of 10 cm vacuum, water and lead respectively beneath the imager geometry. Poly-energetic energy deposition kernels for 6 and 18 MV photon beams are calculated using Monte Carlo simulation. The integrated energy is used to evaluate the signal enhancement due to the backscattering. Each kernel is convolved with 5×5, 10×10, 15×15, and 25×25 cm^2 fluence profiles to determine the maximum backscatter signal deviation attributable to the added materials as a function of field size.

Results:
The largest signal enhancements for poly-energetic irradiations are 2.87% and 3.07% for panel 1 and panel 2 respectively, which occur with the 18 MV incident energy and the lead backscatter. For water, the maximum enhancement is 0.74% and 1.08%. The back-scatter signal induced deviation decreases with field size.

Conclusions:
Both prototype imaging panels will reduce the maximum backscatter signal enhancement to <3.1%. For typical clinical field sizes and backscattering materials, the signal enhancement should be <1%. Use of these panels could reduce the backscattering induced uncertainties and improve the reliability of measurements.

Conflict of Interest:
This work was funded in part by Varian Medical Systems.