AbstractID: 9275 Title: Non-Primary to Primary Ratio Measurements in a Digital Breast Tomosynthesis System

Purpose: For a breast tomosynthesis system using a stationary detector, a standard mammographic anti-scatter grid cannot be used. As a result, scatter and off-focal radiation are expected to be high and will negatively impact reconstructed image quality. In addition, phosphor-based systems can suffer from glare which will further degrade the image. The goal of this project is to quantify the "non-primary" sources of signal as a function of projection angle to provide information for potential image correction in the tomosynthesis reconstruction.

Method and Materials: The scatter, off-focal and glare components will be evaluated in terms of a non-primary to primary ratio (NPR). Using a series of tantalum apertures of increasing size, we measured the primary and off-focal components, and scatter/glare in an open beam. The NPR was then evaluated over typical tomosynthesis projection angles (0° to 25°) for a range of thicknesses of plastic phantoms.

Results: The off-focal to primary ratio is measured to be 0.091. The NPR at 0° was calculated as 0.44, 0.82, and 1.2 for 2, 4 and 6 cm phantoms. A small angular dependence is seen in the NPR, increasing at higher angles. The NPR can be reasonably predicted by an empirical model of NPR versus effective thickness with a maximum error in NPR of 0.022 (4.9% error) over a range of 0° to 20°. At 25° the NPR appeared to increase sharply (5%-9.5% greater than the empirical model).

Conclusion: The NPR appears to be weakly dependent on projection angle up to about 20°. Further investigation will involve extending the measurements to a range of kV and filter combinations, and to elucidate the mechanism for increased NPR at highly oblique angles (>20°).

Conflict of Interest (only if applicable): Our lab has a research agreement with GE Healthcare regarding several topics in breast imaging.