

Purpose: To develop a scatter removal method for digital breast tomosynthesis based on physical measurements..

Method and Materials: A Hologic prototype digital breast tomosynthesis system was used to generate projection images. A CIRS anthropomorphic breast phantom was first imaged at a low mAs with an array of beam stops between the x-ray source and the breast. For each projection image, local minima, which were near the centers of the beam-stop shadows, were located using a Matlab program. The pixel values at these local minima were then interpolated and a scatter image was generated. The breast phantom was then imaged again at a higher mAs without the beam-stop array. The total mAs of two exposures was kept the same as the mAs recommended by Hologic for a breast with the same thickness. The scatter-free projections were obtained by subtracting the scaled scatter images from the corresponding projections acquired in the second exposure. 3D breast was reconstructed from the scatter-free projections.

Results: For a 6 cm breast, the scatter-to-primary ratio could be as high as 0.4 even though there was an air gap between the breast and the detector. The scatter-free projection images shown higher image contrast.

Conclusion: Contrast-to-noise ratio may be increased and artifacts due to scatter may be reduced when 3D breast is reconstructed from scatter-free projections. The overall effect of scatter subtraction on the image quality needs further investigation.