Purpose: To investigate the effects of exposure equalization on the noise property and visibility of micro-calcifications using simulated SEDM imaging experiments.

Method: An anthropomorphic breast phantom was imaged at various exposure levels using a full-field digital mammography system. A lead plate with two-dimensional array of aperture holes was used to measure primary signals which were then subtracted from those obtained without the lead plate to separate scatter components from total image signals. Exposure equalization factors were determined from a standard FFDM image and these factors were then multiplied with images acquired at various exposure levels to simulate SEDM image. Two sets of image were acquired and subtracted from each other to estimate the noise properties for different imaging techniques. Images of simulated micro-calcifications with different sizes were composed with primary signals and then added with scatter components to form FFDM and simulated SEDM images for visualization studies.

Results: SEDM resulted in reduced noise level in dense area while increased noises level in less attenuating area (fatty area or at the board of the breast where the thicknesses are reduced) compared with the standard FFDM method. The visualization of simulated micro-calcification is seen slightly improved in dense area of the breast phantom due to improved signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR).

Conclusion: SEDM technique can improve image SNRs and CNRs in dense area of the breast, hence to improve the visibility of micro-calcification in breast images.