Noise properties of two CCD-based systems for full breast digital mammography have been measured. One system is an early commercial system, currently undergoing initial clinical evaluation. The other is a system being developed under an NIH-sponsored collaboration between two universities. Noise properties of interest include x-ray signal dependence, spatial frequency dependence, and temporal fluctuations.

Noise was evaluated in images processed using existing system algorithms for defect mapping, dewarping, and nonuniformity correction. Both average (rms) and spatial frequency dependent (NPS) evaluations were made. Characterizations of dark frame noise and that of uniform x-ray flood images were made. Both one- and two-dimensional noise power spectra were evaluated.

Although the two systems share many common noise characteristics, there are significant differences, including markedly different dark noise magnitudes, differences in NPS shape as a function of both spatial frequency and exposure, and differences in the natures of the residual fixed pattern noise following flat fielding corrections. Nonstationary behavior in both time and space in the rms magnitudes and frequency distributions of the noise power were observed. Spectra are nonisoplantic, and are complicated functions of exposure, spatial frequency, and time.

The 2-d power spectra of both systems exhibit strong peaks indicative of periodic noise components. Depending on the method of obtaining the 1-d NPS (i.e. synthetic slit scanning or slice extraction from the 2-d NPS), these on-axis periodic structures can be misleadingly smoothed or missed entirely. For low x-ray exposures, quantum noise limited operation may be possible only at low spatial frequency.