

## Effects of Geometric Magnification on Image MTF(f) and DQE(f) in Digital Mammography.

Geometric magnification is often used to improve the visualization of details in mammography. This is especially considered helpful in digital mammography as the spatial resolution of a digital mammography unit is often limited and inferior to those of screen/film combinations. In this paper, the MTF and DQE were measured and studied as a function of the spatial frequency in the object planes corresponding to various magnification factors. When the MTF and DQE of the detector are plotted as a function of the spatial frequency in the object plane, there is an automatic improvement due to the re-scaling of the frequency. However, both the MTF and DQE are also degraded by the focal spot blurring effect, thus limiting and eventually reversing the improvement as the magnification factor increases. It was found that degradation of the DQE presents a more serious problem than degradation of the MTF itself. In this paper, a theoretical model is presented to describe the combined effects of the improvement from geometric magnification and the degradation due to focal spot blurring. Measurements with a small field digital mammography unit (SenoVision by General Electric Medical Systems, Inc.) are presented to study the effects of geometric magnification on the MTF and DQE in the object plane. The frequency dependent DQEs were then used to determine the optimal magnification factor. Implications on exposure requirement and detection of low contrast objects are discussed using contrast detail phantom images as examples.