

## A Fourier Analysis Method for MTFs Measurement with Bar Patterns in Digital X-ray Imaging.

Tilted x-ray slit method has often been used to measure the line spread function (LSF) and the modulation transfer function (MTF) in digital x-ray imaging. However, this method generally requires substantially higher x-ray technique to obtain reasonable signal size for analysis. The bar patterns are generally available as a quality control tool and can be used to provide square wave response function (SQWRF) at regular exposure levels. However, the MTF is more commonly used to characterize the spatial resolution of the imaging system and is required to compute the frequency dependent detective quantum efficiency (DQE). In this paper, a Fourier analysis method is described and used to analyze the bar pattern signals and measure the MTF. With this method, signal profiles over multiple image lines are combined an array which is then transformed to Fourier components. The ratio of the height of the first peak to the zero frequency component is then computed and corrected to obtain the MTF value at the frequency of the specific bar pattern used. Higher order harmonics can be either ignored or used to compute the MTF at multiples of the base frequency. The theoretical basis for the method is described and used to derive the correction factors. The method is demonstrated with MTF measurements for a small field digital mammography system. The results have been found to agree well with those obtained with the tilted slit method.