Purpose:To evaluate the efficacy of MTF measurement on digital mammography systems in the Ontario Breast Screening Program (OBSP).

Methods:An MTF tool, composed of a copper square on a flexible printed circuit film is supported on top of a 40 mm PMMA slab and imaged with an x-ray technique appropriate for this thickness. In-house software, QuickQC, is used to review the image, define regions of interest (ROIs) over each copper edge and calculate the presampled MTF from the line spread function (LSF), by differentiating the edge spread functions (ESF). The noise in the LSF is zero at zero frequency, making the normalization of MTF(0) possible. Since implementing this test in the OBSP 5 years ago, over 180 digital mammography systems have been surveyed semi-annually (~ 800 reports). The physicist collects and analyzes the MTF images for all targets and focal spot sizes. MTF results for each digital mammography vendor were summarized to develop pass-fail criteria.

Results:Using appropriate x-ray techniques, the MTF obtained in this way is similar to values published elsewhere. The noise in the MTF linearly increases to the cutoff spatial frequency, but doesn't seriously impair the ability to evaluate compliance. The effects of phosphor glare and extra focal radiation are evident in the low frequency region. Focal spot deterioration is observed as a decrease in MTF compared to the performance for other units of the same model. Underexposure of the phantom causes excessive noise in the MTF. The frequency at which the MTF drops to 50% is typically between 2.5 to 3.5 mm-1 for phosphor based systems with both 50 and 100 um pitch, and 4.0 to 5.0 mm-1 for Se systems with 74-85 um dels.

Conclusions:This objective QC test is effective in identifying MTF degradation in a range of different digital mammography systems in the field.