Temporal Stability of a Prototype Full-Field Digital Mammography Imaging System

Purpose: To measure the temporal stability of physical characteristics for a prototype full-field digital mammography unit.

Methods: The prototype digital mammography unit tested was a full-field, flat-panel x-ray detector based on a CsI phosphor screen and an amorphous silicon detector array. The temporal stability of both the image quality and the physical characteristics of the digital system were measured. Image quality tests included ACR phantoms, uniformity measurements, and pixel values under a stepwedge ("speed points.") Physical measurements included electronic noise, sensitometric response, modulation transfer function (MTF,) noise power spectrum (NPS,) and detective quantum efficiency (DQE.) Data were collected over a 4-month period from the time of acceptance-testing.

Results: The temporal stability of the physical characteristics of the digital mammography unit was good. Coefficients of variation for the MTF were between 1-3% and 6-8% for the NPS. The electronic noise coefficient of variation was 0.25%. The temporal stability of the image quality measures was also good, especially as measured by the 0% variation in daily ACR phantom scores. The stability of the sensitometric response had a variance coefficient of 0.8-3% for various stepwedge speed-points, including the image background.

Conclusions: The prototype digital full-field digital mammography unit system is temporally stable in terms of its physical characteristics and the quality of images it produces.

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