

**American College of Radiology
Recommendations for Full-Field Digital Mammography Quality Control**

Table I-1a. Full-Field Digital Mammography Quality Control Tests – Technologist Tests

Test #	Test	Applicability	Minimum Frequency	Performance Criteria	Corrective Action Timeframe for Routine QC
1.	Daily Checklist	All	Daily	Must pass image receptor manufacturer's criteria.	Immediately, before checked component is used for patients
2.	Laser Printer Density Consistency	All	Daily (wet); Monthly (dry)	D_{max} may not fall below -0.15 operating level (OL) DD and MD must be within ± 0.15 OL D_{min} must be within ± 0.03 OL	Immediately, before patient images printed
3.	Phantom Image Quality	All	Weekly	Must pass image receptor manufacturer's criteria.	Immediately
4.	Display Monitor QC	All	Weekly	Must pass workstation manufacturer's criteria.	Immediately: final interpretation workstation - before patient images interpreted; acquisition station - before patients imaged
5.	Viewboxes and Viewing Conditions	If screen-film comparison films viewed or printed digital images are interpreted	Weekly	Any marks that are not easily removed with window cleaner should be removed with a safe and appropriate cleaner. If viewboxes appear non-uniform, all of the fluorescent lamps should be replaced as soon as possible. If viewbox masks are difficult to use, appropriate service or modifications should be requested. <i>(from 1999 ACR Mammography QC Manual)</i>	Immediately, before patient images interpreted or comparison films reviewed
6.	Full Field Artifacts	All	Monthly	Shall not be present at a level that obstructs or mimics clinical information.	Immediately
7.	Monthly Checklist	All	Monthly	Must pass image receptor manufacturer's criteria.	As specified by the manufacturer for each check

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8.	Laser Printer Artifacts	All	Monthly	Must pass laser printer manufacturer's criteria.	Immediately, before patient images printed
9.	Resolution/ Modulation Transfer Function (MTF)	All with scanning x-ray beams or laser readouts	Quarterly	Must pass image receptor manufacturer's criteria.	Immediately
10.	Repeat Analysis	All	Quarterly	If the total repeat or reject rate changes from the previously determined rate by more than 2.0 percent of the total films included in the analysis, the reason(s) for the change shall be determined. Any corrective actions shall be recorded and the results of these corrective actions shall be assessed. <i>[900.10(e)(3)(ii)]</i>	Within 30 days of the test date
11.	Printed Image Quality	All	Quarterly	Must pass laser printer manufacturer's criteria.	Immediately, before patient images printed
12.	Analysis of Fixer Retention	All laser printers with wet processors	Quarterly	The residual fixer shall be no more than 5 micrograms per square cm. <i>[900.10(e)(3)(i)]</i>	Within 30 days of the test date
13.	Compression Force	All	Semi-Annually	A compression force of at least 111 newtons (25 pounds) shall be provided. The maximum compression force for the initial power drive shall be between 111 newtons (25 pounds) and 200 newtons (45 pounds). <i>[900.10(e)(4)(iii)]</i>	Immediately

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Table I-1b. Full-Field Digital Mammography Quality Control Tests – Medical Physicist Tests

Test #	Test	Applicability	Minimum Frequency	Performance Criteria	Corrective Action Timeframe for Routine QC
Medical Physicist Tests					
1.	Mammographic Unit Assembly Evaluation	All	Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria.	Immediately or within 30 days of the test date, depending on the problem
2.	Phantom Image Quality	All	Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria.	Immediately
3.	Missed Tissue	All	Mammography Equipment Evaluation & Annually	Must not exceed 7 mm. <i>(note: criteria based on ACRIN experience)</i>	Immediately
4.	Technique Chart/AEC Evaluation (SDNR)	All	Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria.	Within 30 days of the test date
5.	Artifact Evaluation	All	Mammography Equipment Evaluation & Annually	Shall not be present at a level that obstructs or mimics clinical information.	Within 30 days of the test date
6.	kVp Accuracy	All	Mammography Equipment Evaluation <i>(note: ACRIN data shows that annual accuracy testing is not necessary due to the stability of modern generators used with digital systems; for the same reason, reproducibility testing is not needed for either Mammography Equipment Evaluations or Annual Surveys)</i>	Shall be accurate within $\pm 5\%$ of the indicated or selected kVp at the lowest clinical kVp that can be measured by a kVp test device; the most commonly used clinical kVp; and the highest available clinical kVp. [900.10(e)(5)(ii)(A)]	Immediately

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Test #	Test	Applicability	Minimum Frequency	Performance Criteria	Corrective Action Timeframe for Routine QC
7.	Beam Quality Assessment (Half-Value Layer)	All	Mammography Equipment Evaluation & Annually	Must meet upper and lower criteria in the 1999 ACR Mammography QC Manual. <i>(note: both upper and lower criteria are important to maintain a check on beam quality in the recommended absence of routine kVp tests; if necessary, the MP may conduct kVp testing to investigate outliers)</i>	Within 30 days of the test date
8.	Breast Entrance Exposure and Average Glandular Dose	All	Mammography Equipment Evaluation & Annually	Average glandular dose delivered during a single cranio-caudal view of an <i>attenuator</i> simulating the <i>attenuation</i> of a standard breast (e.g., 4 cm of PMMA) shall not exceed 3.0 milligray (mGy) (0.3 rad) per exposure. <i>[based on 900.10(e)(5)(vi)]</i>	Immediately
9.	Ghost Image Evaluation	All	Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria if applicable.	Within 30 days of the test date

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Test #	Test	Applicability	Minimum Frequency	Performance Criteria	Corrective Action Timeframe for Routine QC
10.	Collimation Assessment	All	Mammography Equipment Evaluation & Annually	All systems shall have beam-limiting devices that allow the entire chest wall edge of the x-ray field to extend to the chest wall edge of the image receptor and provide means to assure that the x-ray field does not extend beyond any edge of the image receptor by more than 2 percent of the SID. If a light field that passes through the X-ray beam limitation device is provided, it shall be aligned with the X-ray field so that the total of any misalignment of the edges of the light field and the X-ray field along either the length or the width of the visually defined field at the plane of the breast support surface shall not exceed 2 percent of the SID. The chest wall edge of the compression paddle shall not extend beyond the chest wall edge of the image receptor by more than one percent of the SID when tested with the compression paddle placed above the breast support surface at a distance equivalent to standard breast thickness. The shadow of the vertical edge of the compression paddle shall not be visible on the image. [900.10(e)(5)(vii)]	Within 30 days of the test date
11.	Resolution/Modulation Transfer Function (MTF)	All	Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria.	Immediately
12.	Noise	All	Mammography Equipment Evaluation & Annually	To be developed.	Within 30 days of the test date
13.	Spatial Linearity and Geometric Distortion of the Detector	All All w/moving parts (slot-scan & CR)	Mammography Equipment Evaluation Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria.	Immediately

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Test #	Test	Applicability	Minimum Frequency	Performance Criteria	Corrective Action Timeframe for Routine QC
14.	Monitor Display Quality and Baseline Values	All softcopy	Mammography Equipment Evaluation & Annually	Must pass workstation manufacturer's criteria.	Immediately
15.	Monitor Luminance Response and Viewing Conditions	All softcopy	Mammography Equipment Evaluation & Annually	Must pass image receptor manufacturer's criteria.	Immediately
16.	Viewbox Luminance and Room Illuminance	If screen-film comparison films viewed or printed digital images are interpreted	Mammography Equipment Evaluation & Annually	Viewboxes should be capable of producing a luminance of at least 3,000 candela per square meter (cd/m ²). The illumination levels should be 10 lux, or preferably less. <i>(based on 1999 ACR Mammography QC Manual)</i>	Immediately
17.	Laser Printer Evaluation and Baseline Values	All	Mammography Equipment Evaluation & Annually	Must pass laser printer manufacturer's criteria.	Immediately
	Evaluation of Site's Tech. QC	All	Annually	Tests carried out properly and at appropriate intervals; identifying areas where quality and QC testing can be improved.	

- * Any failures found during a Mammography Equipment Evaluation must be corrected *immediately*.
- * The stipulation of passing manufacturer's performance criteria is applicable only if the test is part of that manufacturer's QC protocol and specific passing criteria are given.
- * The medical physicist's survey report must be sent to the facility within 30 days of the date of the survey. [900.10(e)(8)(iv)]
- * The medical physicist should perform additional, more selective diagnostic tests to further characterize sources of problems if any of the above tests fail. For example, if the HVL test fails, the medical physicist may want to perform a kVp test.
- * Revised regulations should require that routine preventative maintenance be performed on all mammography units following the procedures outlined by the original equipment manufacturer.