

Case Studies in Mammography and Displays



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Disclosures and Disclaimers

- I am President & Chief Medical Physicist of JF Medical Physics Inc.
- JF Medical Physics Inc. provides Diagnostic and Nuclear Medicine Physics services
- No disclaimers

Case Study #1 - Mammography

- **Initial identification**
 - Full-field artifact evaluation performed using 4 cm PMMA and typical paddle/AEC mode
 - Planned Nuance Excel
 - Dust speck identified
 - Processed image
 - Narrow window

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Case Study #1 - Mammography

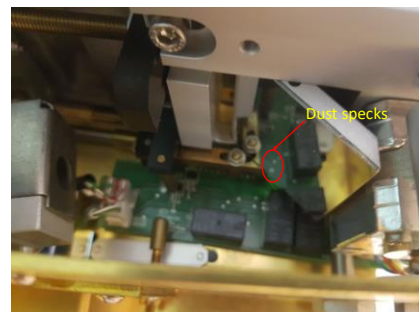
- **Troubleshooting**
 - Discussion with MRT
 - "Look at this artifact. Have you seen this before?" Yes
 - "When did this start?" A couple of days ago
 - "Does this artifact show up on patient images?" No
 - "Any recent servicing?" No
 - "Is Planned's QC passing all tests?" Yes
 - "Does the artifact show up all the time or intermittent?" Intermittent
- N.B. A great example of why it may be preferable that the appropriate (mammography) Medical Physicist be the one to perform the evaluation and NOT delegate this task!**
- Verification of Manufacturer's (Applicable) QC
 - Planned has a fullfield artifact evaluation as well using a different phantom
 - Not applicable since it was apparent on phantom brought on-site
 - Planned has an "Uncorrected DEL" test
 - Verifies for pixel variations (differences in gain and dead pixels)
 - Passed

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Case Study #1 - Mammography

- **Advise to contact appropriate FSE**
 - FSE provided me with picture of dust particles on mirror
 - Likely cause
 - I recommended a cleaning and full gain/offset calibration followed by a fullfield artifact evaluation
 - Fullfield artifact image showed no artifact
- **Site informed me 2-3 weeks later that artifact is back**
 - Requested desire to proceed with clinical imaging
 - FSE informed them and myself that it was an intermittent artifact with the detector
 - Plans made by site to replace unit (and hence detector — issue)
 - Protocol stated but overall left to Chief Radiologist

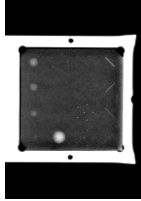
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Case Study #2 - Mammography

- Facility received the following comments upon RMI phantom review from CAR (Canadian Association of Radiologists)
 - textured background
 - image processing (blotches)
 - fibre-like artifact by first speck group
- RMI phantom image sent to me from facility
 - For processing/presentation images sent
 - I had agreed with textured background
 - Image acquired with AEC and spoke with vendor to increase AEC target dose (so long as 3 mGy limit in-place)
 - No blotches seen nor was there a fibre-like artifact



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Case Study #2 - Mammography

- Support letter written to facility
 - Indicated RMI phantom review with
 - Total counts (fibres, speck groups, masses)
 - Uniformity of wax appearance
 - Slight crack in phantom corner but not overlying any inserts
 - Indicated fullfield artifact phantom review with
 - No artifacts present
 - Very mild banding present (with narrow WW)
 - Stated that banding is not seen on RMI and not expected to be seen on a breast due to the heterogeneous nature
 - Uniformity of detector
 - SNR values per ROI (centre, corners) determined to be => 40 as per ACR Digital Mammography QC Manual (a standard)

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Case Study #3 - Mammography

- Initial Identification
 - Accredited facility
 - Upon imaging flatfield phantom, significant detector non-uniformities were observed (and measured)
 - Very blotchy
 - Including along CW

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Case Study #3 - Mammography

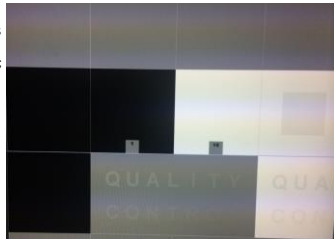
- Troubleshooting
 - When was the last detector calibration?
 - Gain, offset, dead pixel mapping – not sure (but checked system configuration)
 - How is the artifact analysis being performed? – vendor QC
 - Which phantom?
 - Methodology of analysis?
- Corrective Action
 - Advised to halt imaging and perform full gain/offset calibration
 - Asked to return to facility to perform evaluation
 - Detector still slightly non-uniform, but better
 - Second calibration performed and looked great!
 - Education provided to facility w.r.t artifact analysis
 - Tighter WW to increase contrast

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Case Study #4 - Displays

- Initial identification
 - Poor observation of alphanumerics of AAPM TG18-QC test pattern in black box on both displays (9 – left; 11 – right)
 - Mid-grey and white boxes showed sharp and legible alphanumerics (all 14)
 - 5% contrast box barely visible
 - 95% contrast box easily visible



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Case Study #4 - Displays

- Troubleshooting
 - Set of Barco displays
 - "MediCal QAWeb calibration software supplied?" No
 - If MediCal QAWeb used, the last Conformance Test report would have been reviewed
 - GSDF validation
 - LR, Lamb, Lmin('), Lmax(') can also be determined
- Road Map for Facility
 - Recommended that displays be immediately discontinued for diagnostic use and have appropriate calibration software installed
 - Configured to required Federal/Provincial/State standards -- none
 - Configured to ACR-AAPM-SIIM Electronic Practice Standard for Medical Imaging -- appropriate

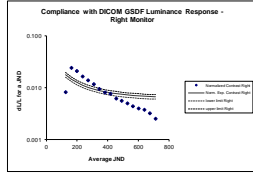
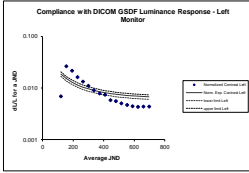
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Case Study #4 - Displays

Prevention

- Configure calibration software (as per NYS Primary Display Standards)
 - Annual calibration of black and white levels
 - Quarterly validation of GSDf compliance



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Thank you!



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