Case Studies in Mammography and Displays

JF Medical Physics Inc.™
Image Quality & Radiation Safety Management

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• 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

Troubleshooting

• Discussion with MRT
  • “Look at this artifact. Have you seen this before?”
  • “When did this start?”
  • “Has this ever shown on patient images?”
  • “Was there a recent service?”
  • “Is Planmed’s QC passing all tests?”
  • “Does the artifact show up all the time or 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
  • Planmed has a fullfield artifact evaluation as well using a different phantom
  • Not applicable since it was apparent on phantom brought on-site
  • Planmed has an “Uncorrected DEL” test
  • Passed

Advise to contact appropriate FSE

• FSE provided me with picture of dust particles on mirror
  • Likely cause
  • Recommended 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
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
  - 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

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

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

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 (variety, corners) determined to be => 40 as per ACR Digital Mammography QC Manual (a standard)

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
  - Second calibration performed and looked great!
  - Education provided to facility w.r.t artifact analysis
    - Tighter WW to increase contrast

Case Study #4 - Displays

- Troubleshooting
  - Set of Barco displays
    - "Medical Grade calibration software supplied?" No
    - If Medical Grade used, the last Conformance Test report would have been reviewed
    - GSDF validation
    - LR, Lambda, Lambda[1], Lambda[2] 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
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

Thank you!

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