ACR Required QC Tests

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ACR Required Tests

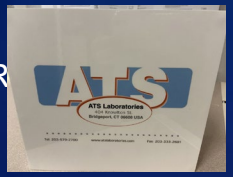
- Annual survey
  - Physical and mechanical inspection
  - Image uniformity and artifact survey
  - System sensitivity
  - Ultrasound scanner electronic image display performance

  - Geometric accuracy (optional)
  - Contrast resolution (optional)
  - Spatial resolution (optional)
  - Primary interpretation display performance (optional)
  - Evaluation of QC program (if applicable)

Before getting started with testing…

- ACR recommends QC performed under supervision of a qualified medical physicist
  - Properly trained designee
- Inventory establishment and verification
- Phantoms and testing methods
  - Material acoustic properties

CIRS ATS 539



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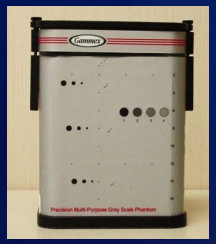

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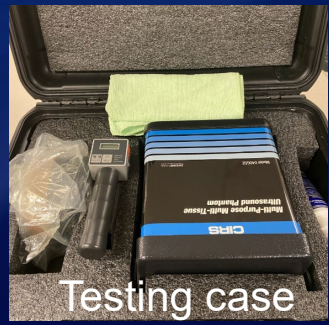

Testing case

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Physical and Mechanical Inspection

- Scanner and monitor: console cracks, damaged buttons/transducer holders, dysfunctional lights/switches/locks, dirty air filter, damaged power cords, contamination, etc.

- Transducer/cable: delamination, holes, air bubbles, separation, cable roll-over damage, exposed wiring, connector damage/bent pins, excessive dust, etc.

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Physical and Mechanical Inspection

Promised dirty air filter

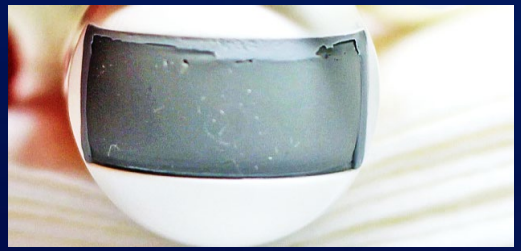

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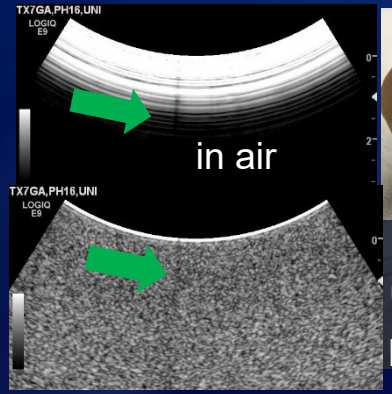
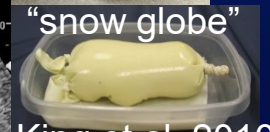
Image Uniformity and Artifact Survey

- Multi-purpose or uniformity phantom
  - Shallower imaging depth, lower dynamic range, turn off spatial compounding, max frame averaging
- Factors to consider when artifact(s) identified
  - Location, number, and severity (could use computerized tool)
  - Check impact of cable and port
  - Clinical practice reality





King et al. 2010

System Sensitivity (Depth of Penetration, DOP)

- Subjective assessment
  - Consistent imaging mode and transmit frequency, 100% power output, higher dynamic range, one focal zone (if relevant) deeper than expected DOP, turn off speckle reduction/smoothing
  - Visually define the deepest depth with consistent presentation of speckles during live scan and measure this depth
  - Compare with acceptable range or previous data
- Objective measurement (optional)
  - A pair of uniform-gel image and in-air image w/ same acquisition parameters (IEC 61391-2)

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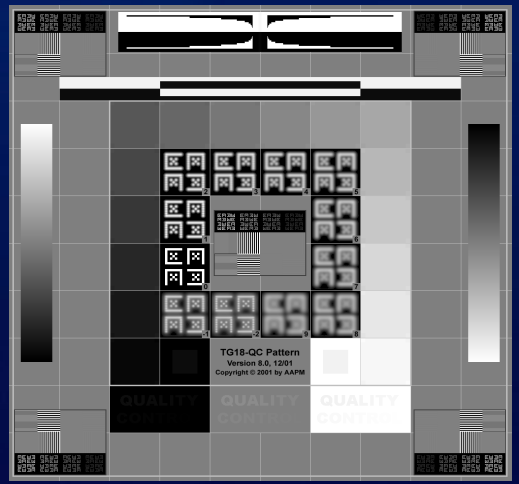
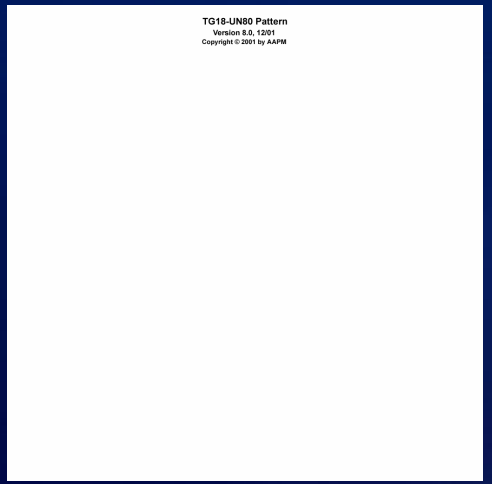
Scanner Display Performance - Qualitative

- Clean display
- Use test patterns to visually check luminance, contrast, resolution, pixel defect and other non-uniformities, etc.

TG18-QC



TG18-UN80



TG18-UN10

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Scanner Display Performance - Quantitative (optional)

- Measure luminance response
  - Maximum and minimum luminance
- If necessary and available, adjust monitor output and re-measure

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Summary Form

Ultrasound/Breast Ultrasound Equipment Annual Survey Summary

Facility Name:		
UAP/BUAP #:	Unit #:	Report Date:
Serial Number:		Survey Date:
System Manufacturer:		Model:
Medical Physicist or designee (Print name):		
Medical Physicist or designee (Signature):		

Equipment Evaluation Tests

Required	Pass/Fail *	Comments
1. Physical and Mechanical Inspection		
2. Image Uniformity and Artifact Survey		
3. System Sensitivity		
4. Scanner Electronic Image Display Performance		

Were all clinically used transducers tested? ☐ YES ☐ NO

Optional		
1. Primary Interpretation Display Performance		
2. Contrast Resolution		
3. Spatial Resolution		
4. Geometric Accuracy		

Overall comments:

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Documentation of corrective action

*If any Fail result is indicated above, documentation of corrective action is required.

Revised 10/27/2020

Medical Physics Annual Equipment Performance Summary

(v2.3)

Services for:
Modality: Ultrasound **TMS Asset #:**
Manufacturer: **Model:**
Equipment ID: **Serial Number:**
UAP ID #:
WARS Location: **Room ID:**
Survey Date: **Report Date:**
Service Provider: **Service Provider Number:**
Service Provider: **Service Provider Number:**

Test Description	P = Pass F=Fail NA=Not Applicable
1. US System Inventory Transducer Inventory Verification	
2. US Scanner Evaluation Basic connectivity Physical & Mechanical Inspection -- Safety Evaluation Image Uniformity and Artifact Survey, for each port	
3. Electronic Image Display Performance Ultrasound Scanner Displays for primary interpretation of ultrasound exams	
4. US Transducer Evaluation (Summary For All Assigned Transducers) Physical & Mechanical Inspection -- Safety Evaluation Image Uniformity and Artifact Survey System Sensitivity (Depth of Penetration)	
5. Evaluation of QC Program Review of routine US QC program	

Comments and Recommendations (Additional information may be found on the Notes Page)

A

Mayo Clinic Rochester/Midwest

Signature **Date**

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Acknowledgements

- Donald Tradup, Scott Stekel, Dr. Nicholas Hangiandreou

Thank you for your attention!

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