# When the glove doesn’t quite fit: surveying breast biopsy attachments and tomo-guided biopsy units

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# Outline

- Stereotactic versus tomo-guided biopsies
  - Clinical workflow
  - Commercially available units
  - Technical and clinical considerations
- Accreditation and testing
  - What's required?
  - Evaluating add-ons for breast biopsy
  - Adapting the 1999 stereo QC manual for DBT
- Future Directions
  - 2020 ACR-AAPM Technical Standard
  - ACR SBB QC Manual Update

# Stereo vs. Tomo-guided Breast Biopsies

## Clinical Workflows

# Nomenclature

- Stereotactic-guided breast biopsy
- Tomosynthesis-guided breast biopsy

*What method is used to localize the target?*

## Stereo-Guided Biopsy

Scout Image

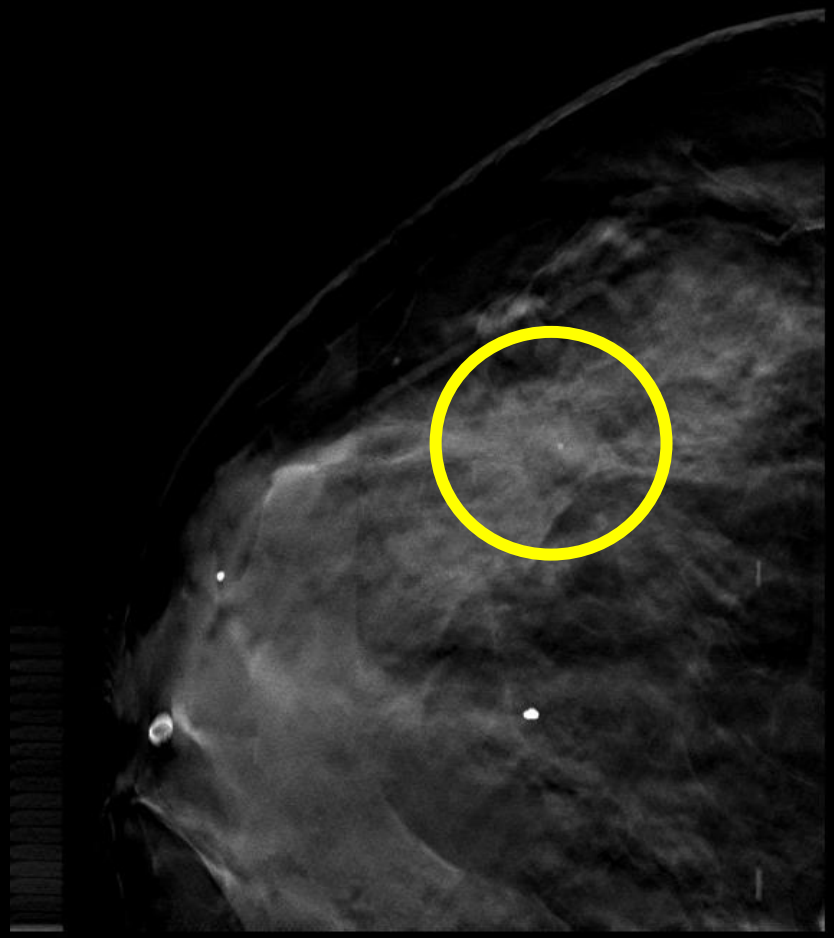
Stereo Pair

## Tomo-Guided Biopsy

DBT Scout
(localize off DBT slice)

*What method is used to localize the target?*

Scout (DBT)



- 54 yo female
- Area of architectural distortion in right breast
  - upper outer aspect, middle depth
- RIS Comments – “with TOMO guidance”

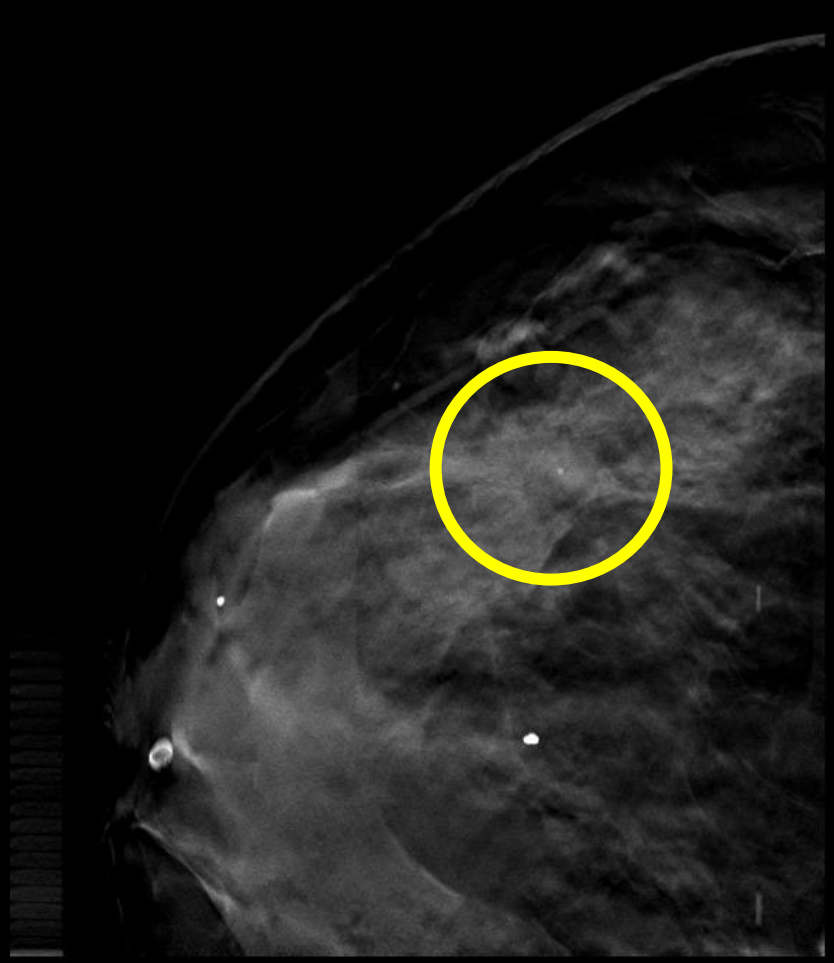
## Stereo-Guided Biopsy

- Scout Image
- Stereo Pair
- Advance Needle
- Pre-fire Stereo Pair
- Fire Needle
- Post-fire Stereo Pair

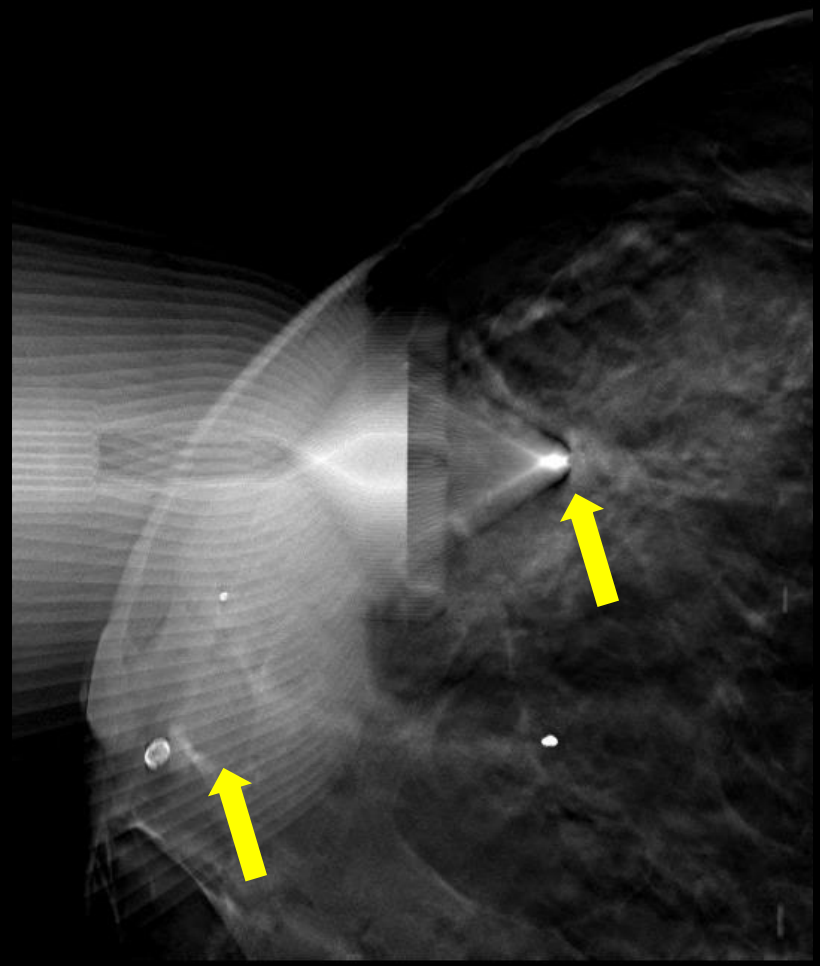
## Tomo-Guided Biopsy

- DBT Scout
  (localize off DBT slice)
- Advance Needle
- Pre-fire Stereo Pair or DBT
- Fire Needle
- Post-fire Stereo Pair or DBT

Scout (DBT)



Post-Fire (DBT)



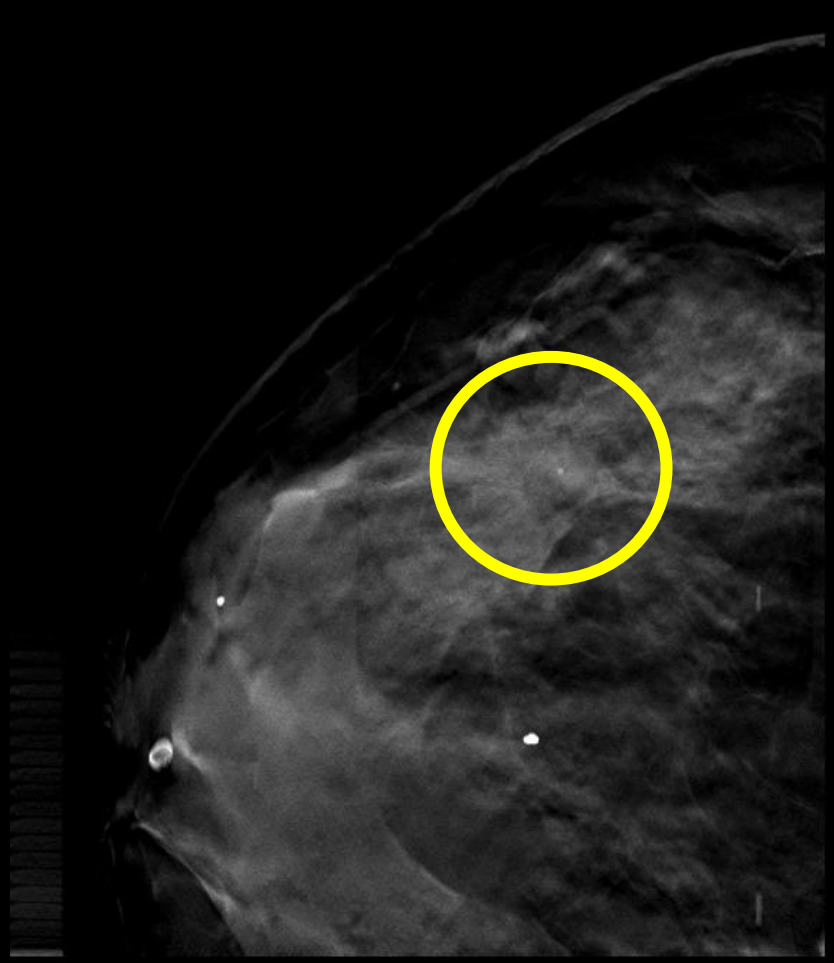
## Stereo-Guided Biopsy

- Scout Image
- Stereo Pair
- Advance Needle
- Pre-fire Stereo Pair
- Fire Needle
- Post-fire Stereo Pair
- Image Specimen

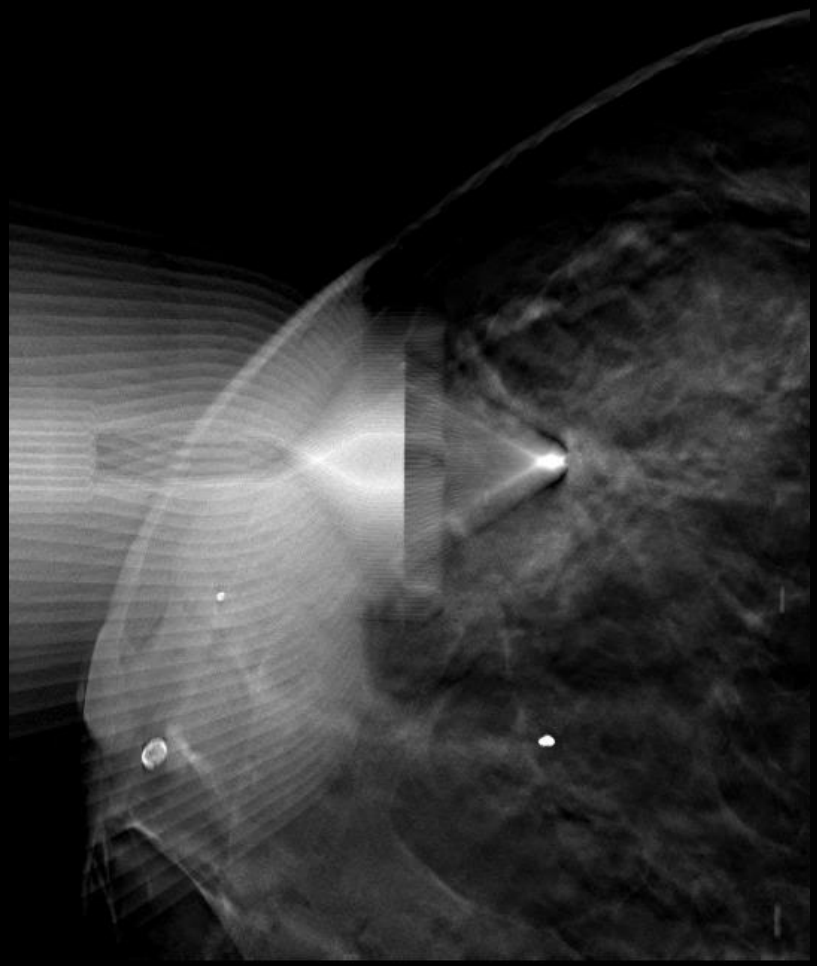
## Tomo-Guided Biopsy

- DBT Scout
  (localize off DBT slice)
- Advance Needle
- Pre-fire Stereo Pair or DBT
- Fire Needle
- Post-fire Stereo Pair or DBT
- Image Specimen

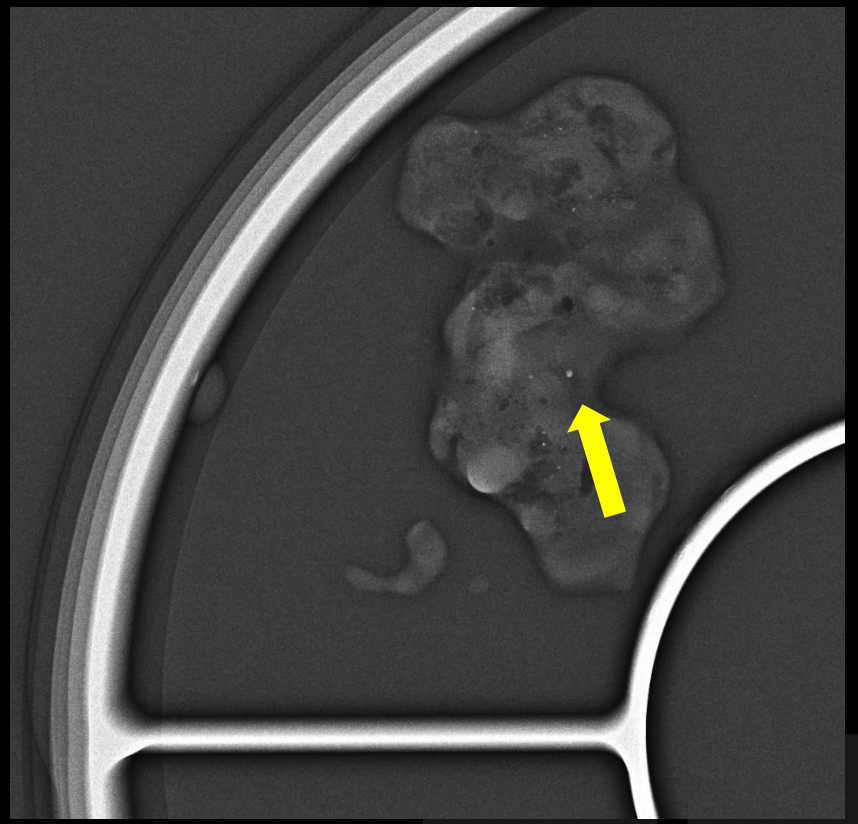
Scout (DBT)



Post-Fire (DBT)



Specimen



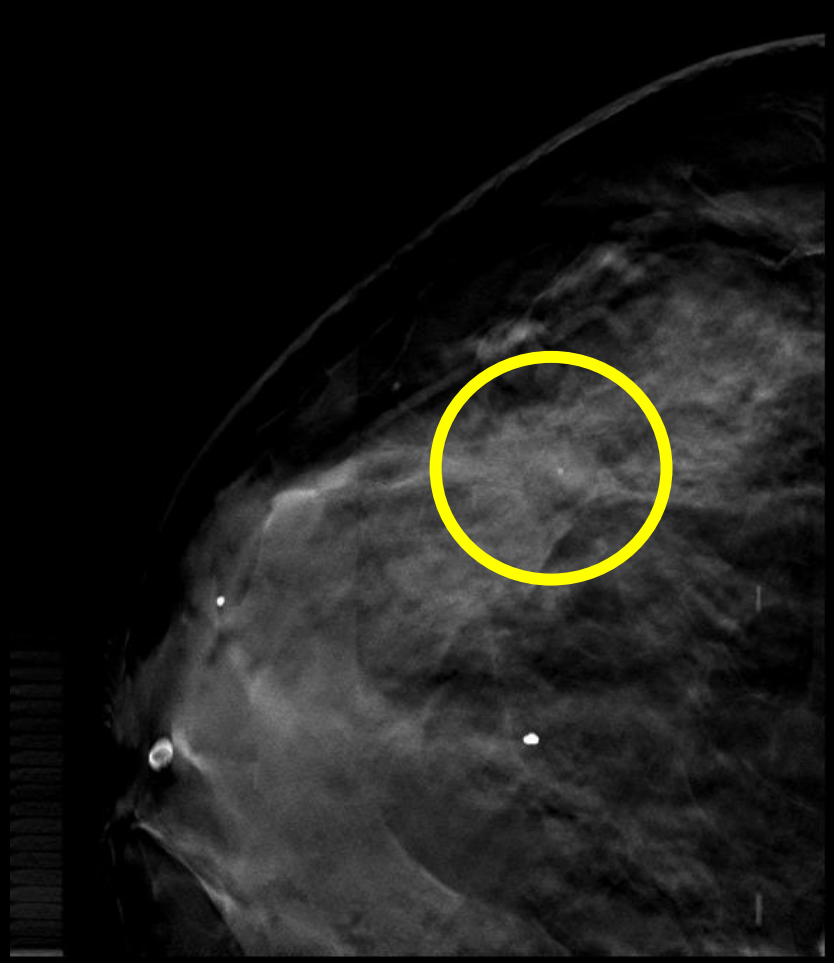
## Stereo-Guided Biopsy

- Scout Image
- Stereo Pair
- Advance Needle
- Pre-fire Stereo Pair
- Fire Needle
- Post-fire Stereo Pair
- Image Specimen
- Biopsy Clip Confirmation (Stereo)

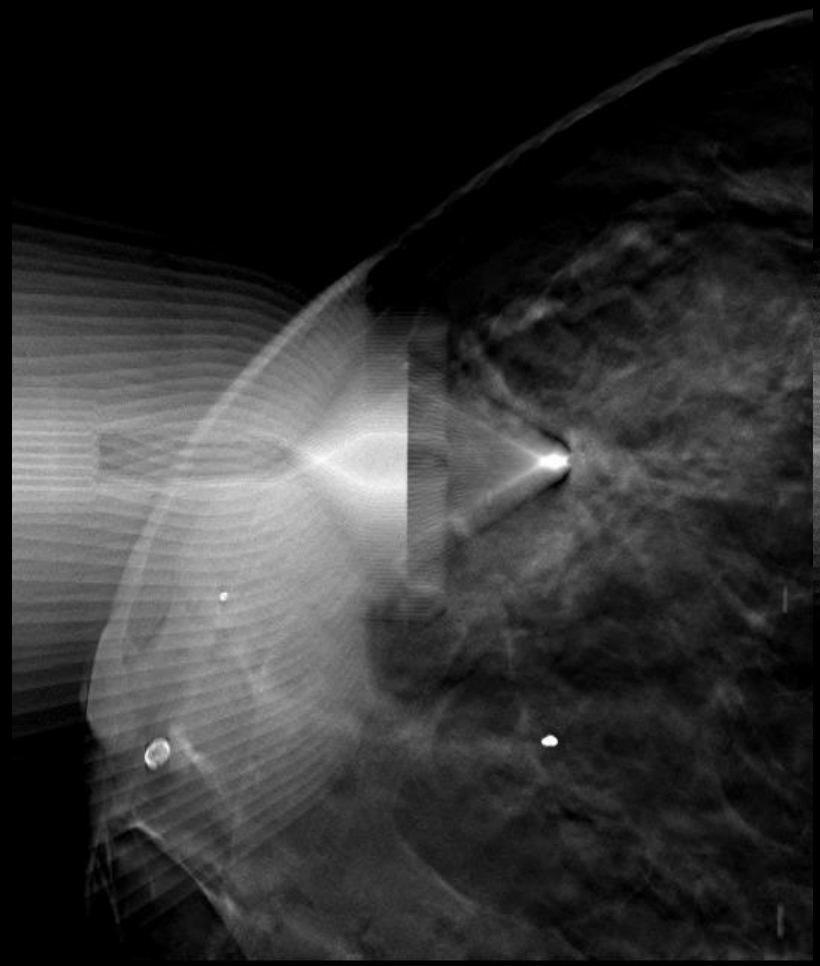
## Tomo-Guided Biopsy

- DBT Scout
  (localize off DBT slice)
- Advance Needle
- Pre-fire Stereo Pair or DBT
- Fire Needle
- Post-fire Stereo Pair or DBT
- Image Specimen
- Biopsy Clip Confirmation (DBT)

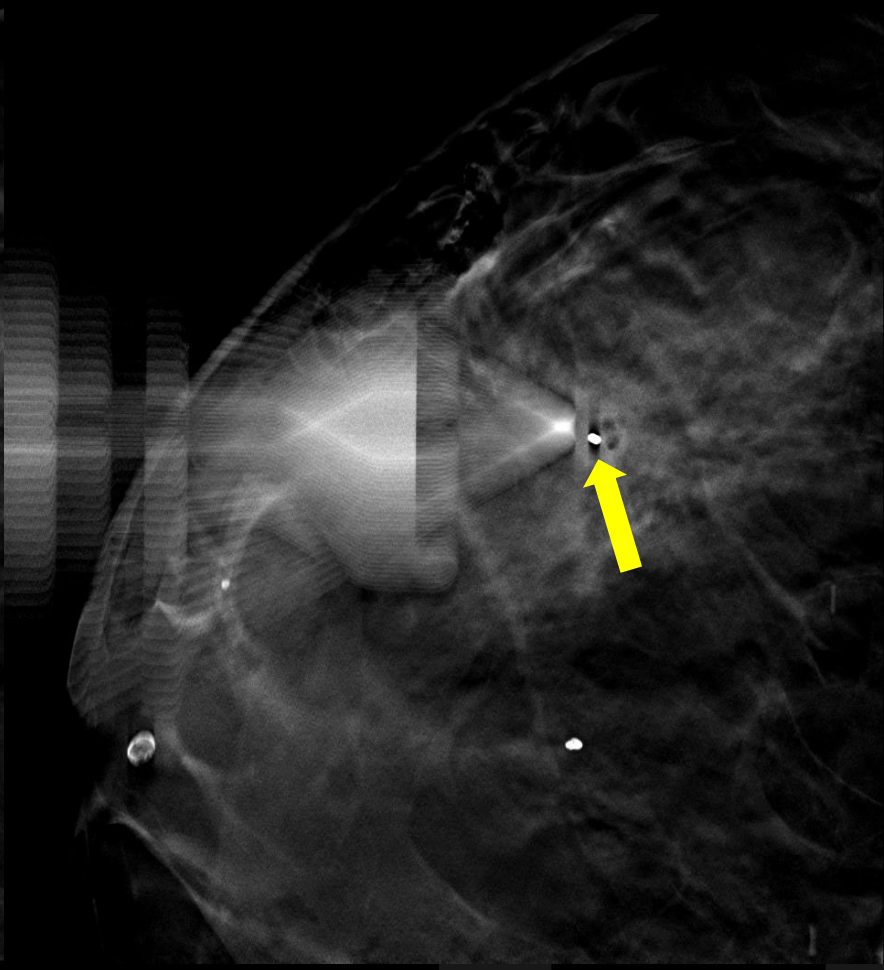
Scout (DBT)



Post-Fire (DBT)



Clip Placement



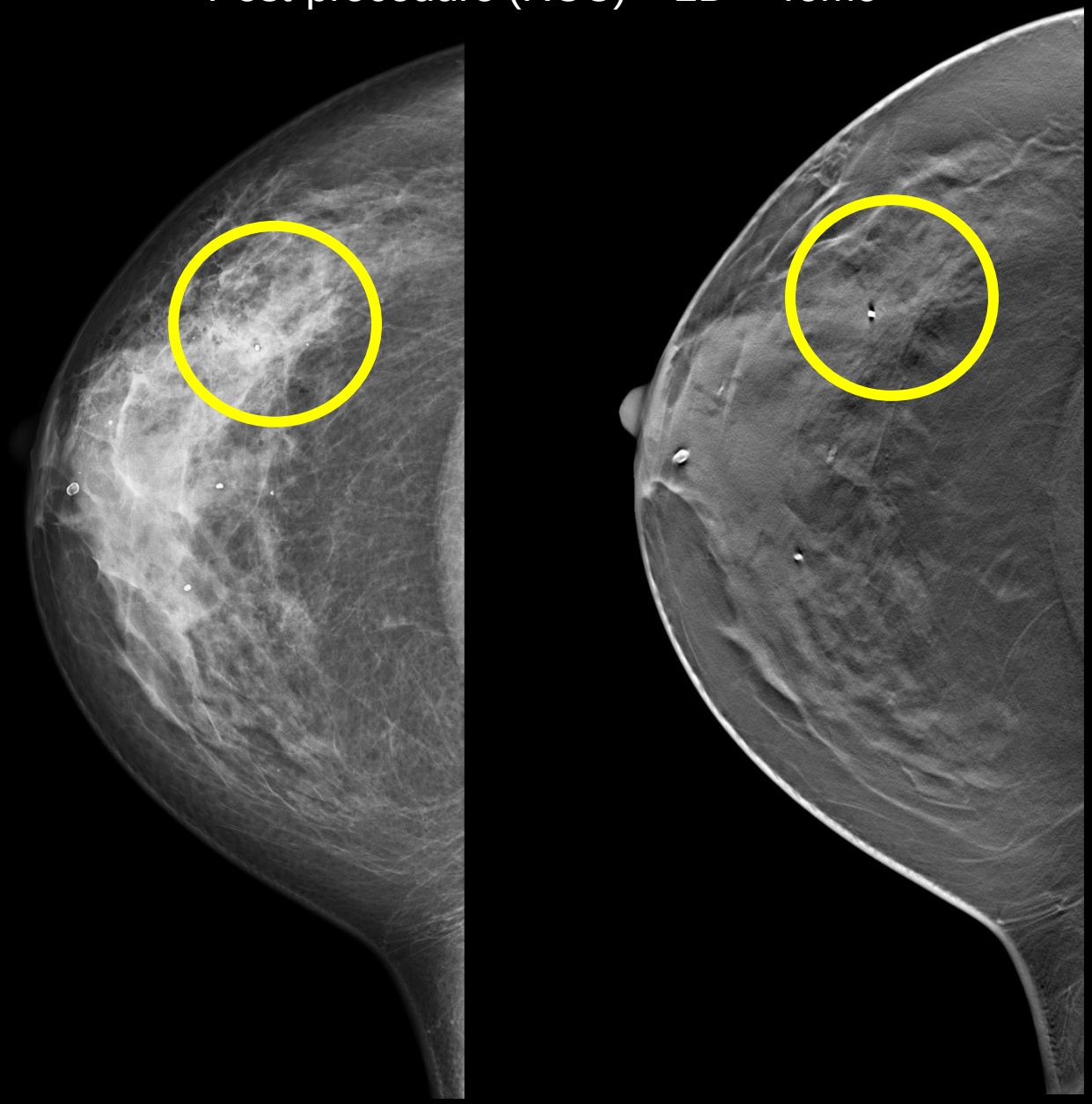
## Stereo-Guided Biopsy

- Scout Image
- Stereo Pair
- Advance Needle
- Pre-fire Stereo Pair
- Fire Needle
- Post-fire Stereo Pair
- Biopsy Clip Confirmation (Stereo)
- Image Specimen
- Post-procedure Mammogram

## Tomo-Guided Biopsy

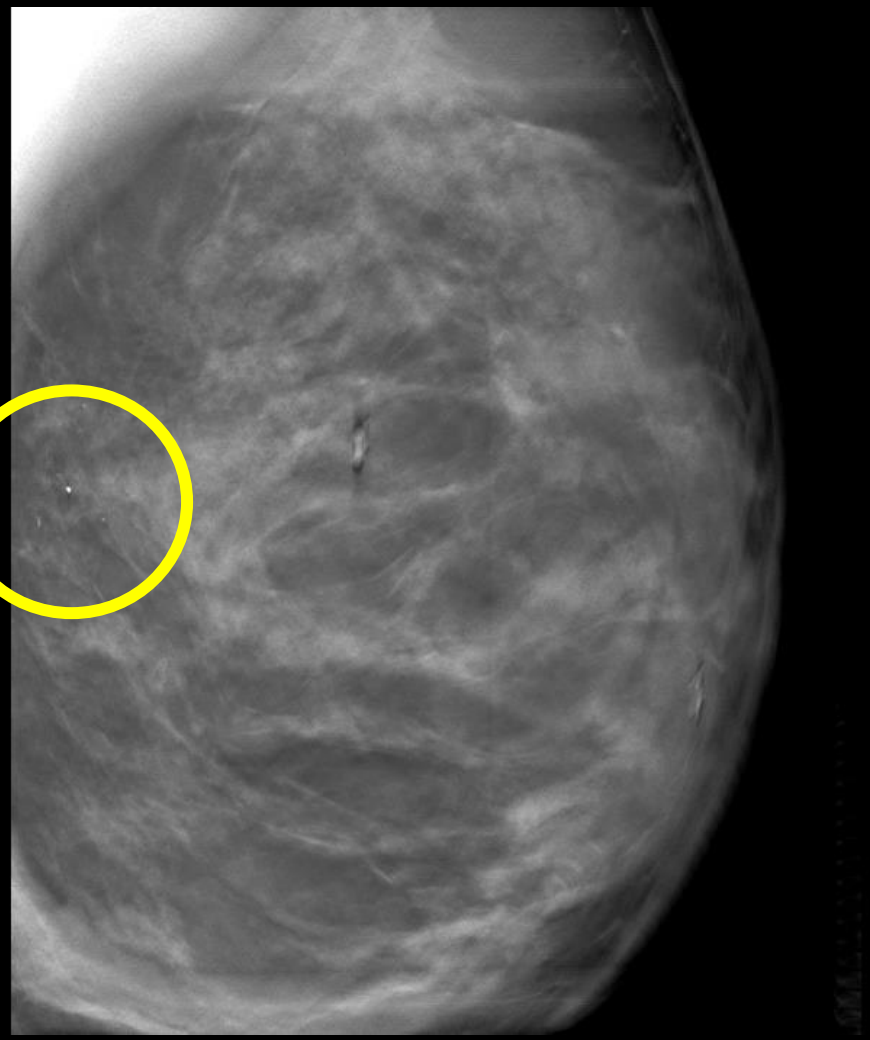
- DBT Scout
  (localize off DBT slice)
- Advance Needle
- Pre-fire Stereo Pair or DBT
- Fire Needle
- Post-fire Stereo Pair or DBT
- Biopsy Clip Confirmation (DBT)
- Image Specimen
- Post-procedure Mammogram &/or DBT

Post-procedure (RCC) – 2D + Tomo



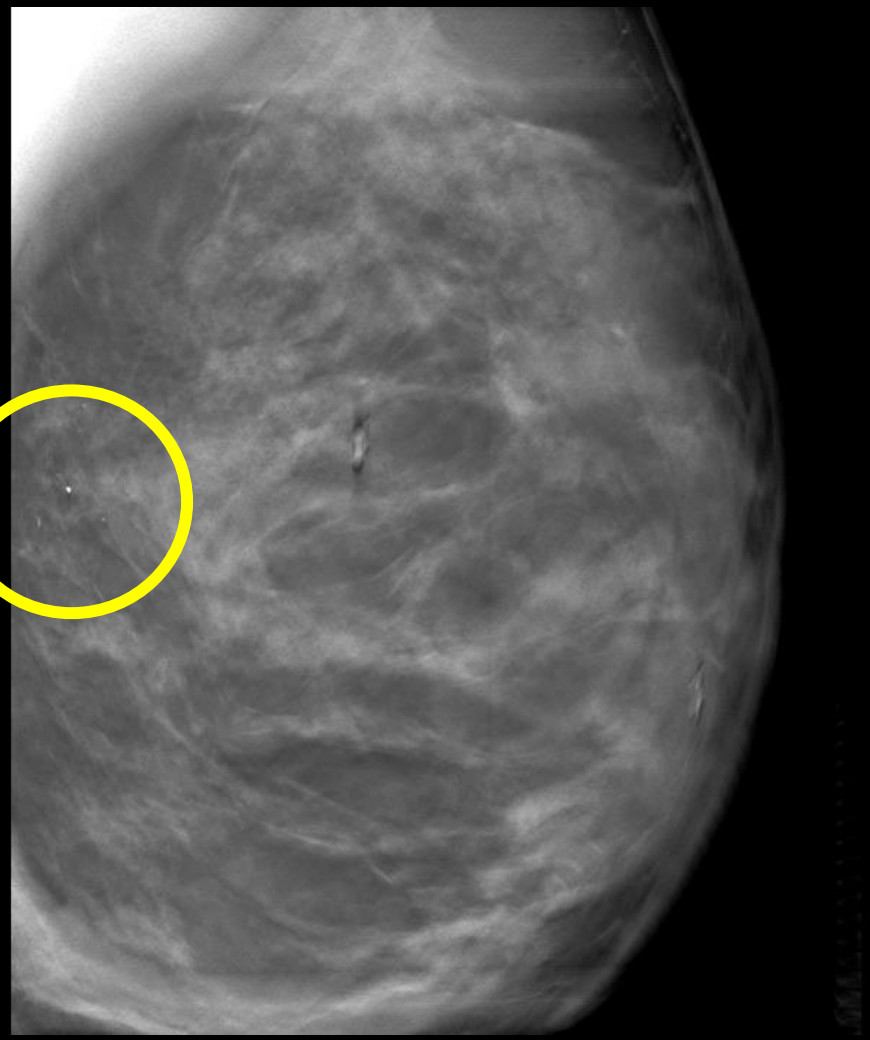
- Pathology Result
  - Benign
  - Focal chronic inflammation and fibrosis suggestive of a ruptured cyst

Scout (DBT)

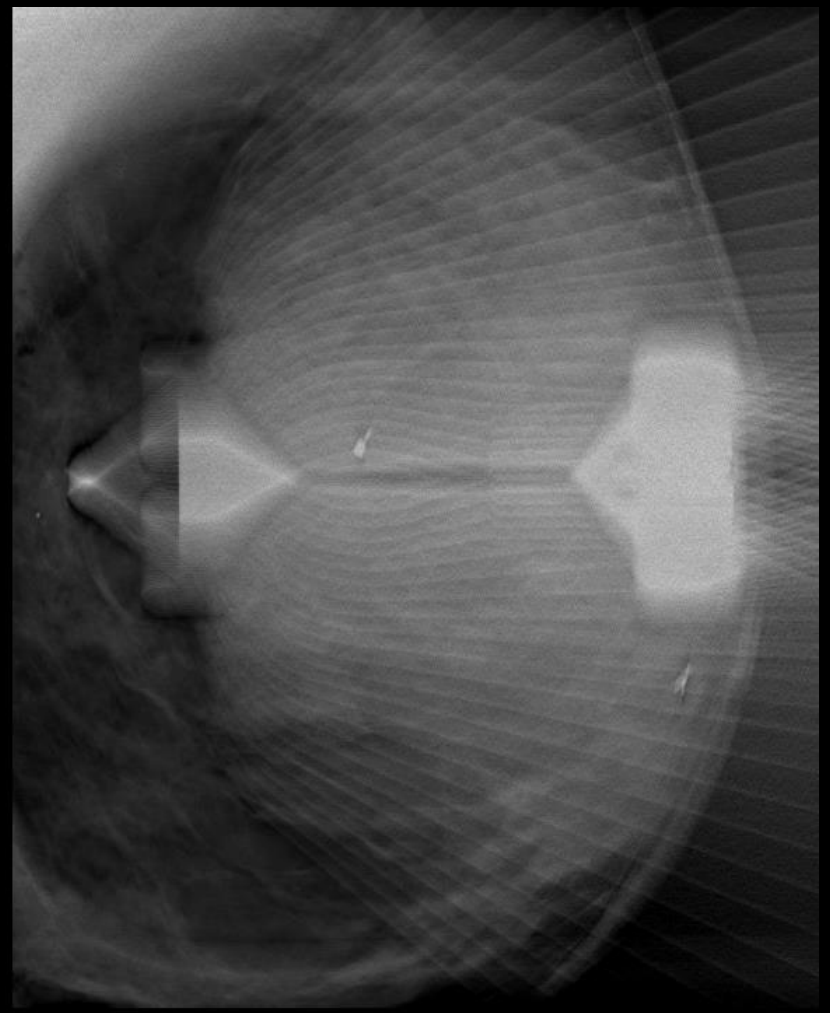


- 49 yo female
- Biopsy of calcifications
  - Upper outer left breast at far posterior depth
- RIS Comments – none

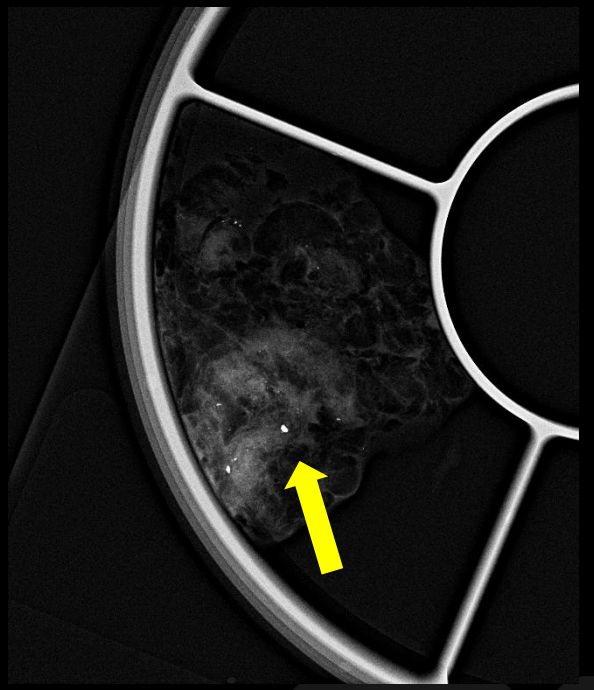
Scout (DBT)



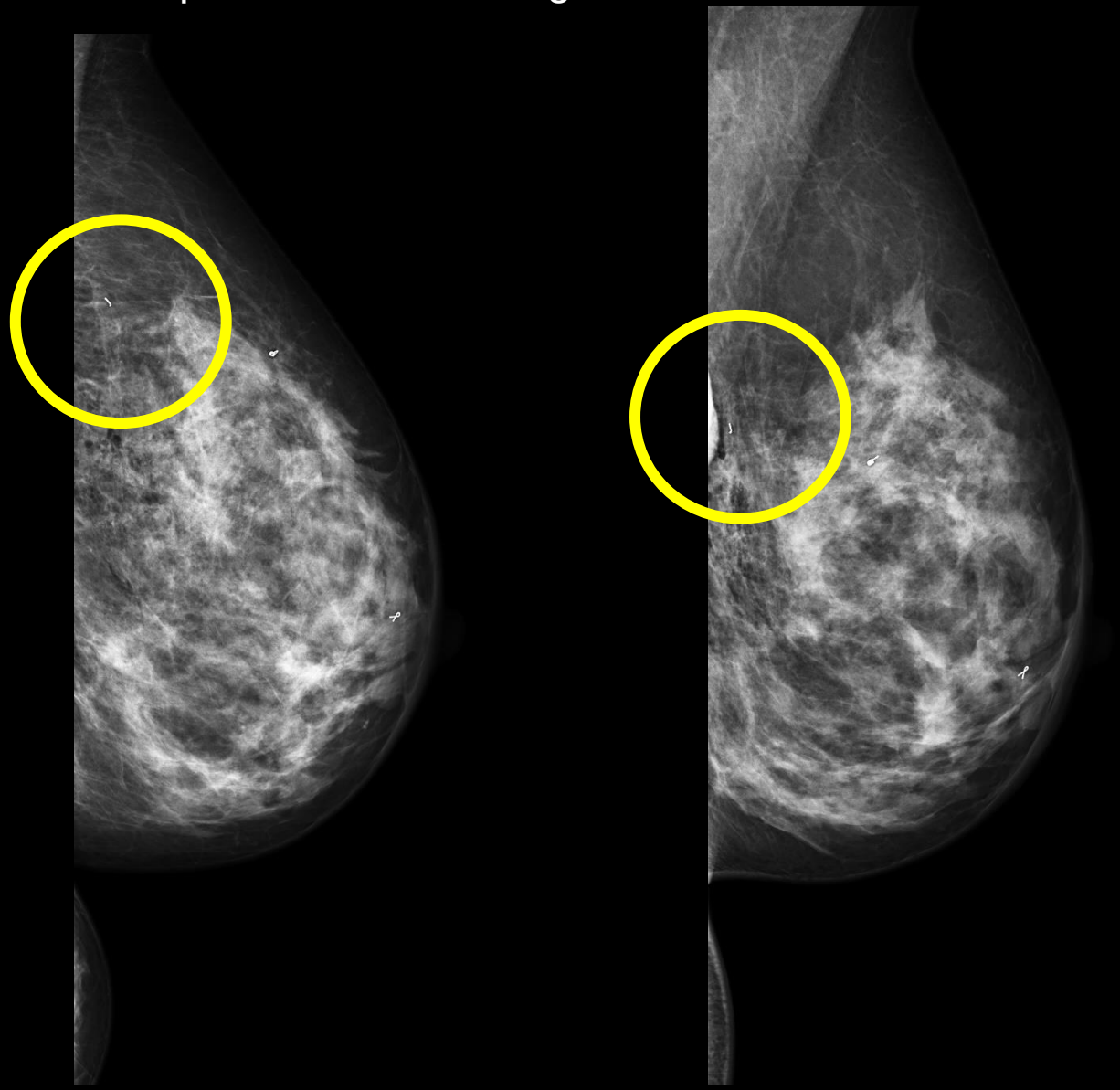
Post-Fire (DBT)



Specimen



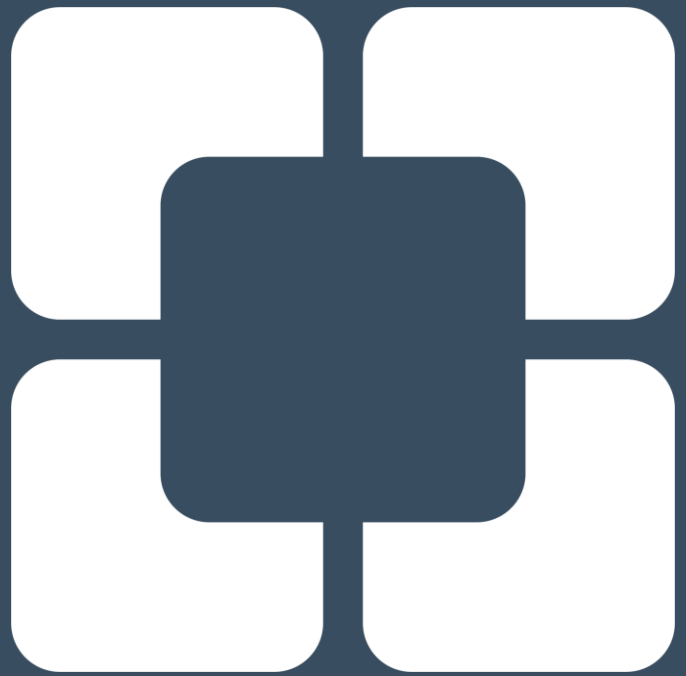
Post-procedure mammograms



- Pathology Result
  - Benign sclerosing adenosis (SA) with calcifications present

# Stereo vs. Tomo-guided Breast Biopsies

## Commercially Available Units



# Prone Systems


Hologic Multicare Platinum

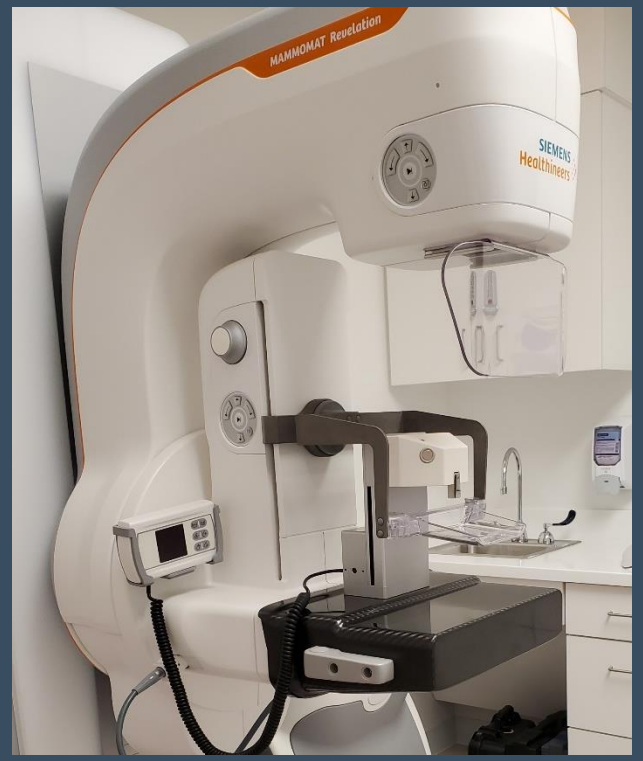
END OF LIFE AS OF 2017


Hologic Affirm

# Add-ons


Hologic
Affirm

GE
Pristina Serena



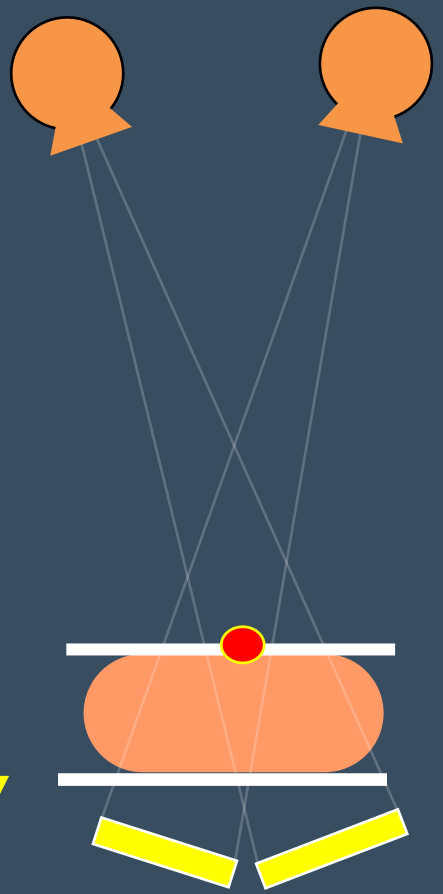

Siemens
Revelation

Not pictured:

- Fuji ASPIRE Cristalle
- GE Serena Bright
- Siemens Inspiration
- Giotto Biopsy Digit (can be used prone or upright)

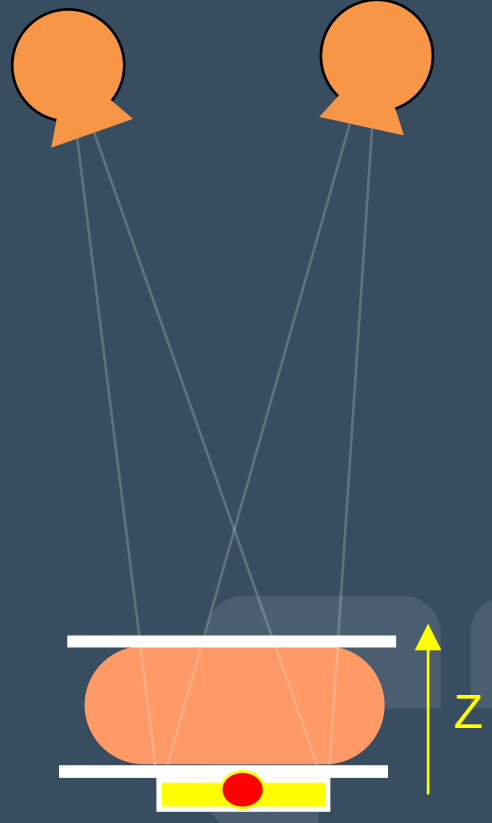
*Photograph of GE Pristina courtesy of Jonathon Meuller*

# Geometries




Center of Rotation at Breast Surface

Center of Rotation at Detector



# Design Considerations

- Clear paddles
  - Better visualization of abnormalities outside the biopsy window

# Design Considerations

- Lateral needle approach
  - Thin breasts
  - Deep lesions
  - Fewer artifacts from needle (for DBT)

| Prone Units | DBT-Guided Biopsies? | Lateral Needle Approach? | CESM Guided Biopsies? |
|---|---|---|---|
| Hologic Multicare Platinum (EOL) | ✗ | ✗ | ✗ |
| Hologic Affirm (Prone) | ✓ | ✓ | ✗ |

| Add-on Biopsy Units | DBT-Guided Biopsies? | Lateral Needle Approach? | CESM Guided Biopsies? |
|---|---|---|---|
| Fuji ASPIRE Cristalle | ✓ | ✓ | ✗ |
| Hologic Affirm | ✓ | ✓ | ✗ |
| GE Pristina Serena | ✓ | ✓ | ✗ |
| GE Serena Bright | ✓ | ✓ | ✓ |
| Giotto Biopsy Digit | ✓ | ? | ✗ |
| Siemens Inspiration | ✗ | ✗ | ✗ |
| Siemens Revelation | ✓ | ✗ | ✗ |

# Stereo vs. Tomo-guided Breast Biopsies

## Technical and Clinical Considerations

# Dose

## Stereo-Guided Biopsy

Scout Image

Stereo Pair

| | 2D Biopsy Procedure (mGy) | 3D™ Biopsy Procedure (mGy) | Full 3D™ Biopsy Procedure (mGy) |
|---|---|---|---|
| Scout | 1.6 | 1.8 | 1.8 |
| Targeting | 3.2 | — | — |
| Pre-fire* | 3.2 | 3.2 | 1.8 |
| Post-fire* | 3.2 | 3.2 | 1.8 |
| Post-procedure | 3.2 | 1.8 | 1.8 |
| **TOTAL** | **14.4** | **10** | **7.2** |
| % Reduction (compared to 2D) | — | 31% | 50% |

Table 2. Radiation dose (mGy) for 2D, hybrid, and tomosynthesis only guided stereotactic biopsies. Radiation dose estimates are based on a 4.2 cm, 50% fatty 50% glandular tissue, assuming 1.6 mGy per 2D image and 1.8 mGy per tomosynthesis image set.

*(Grimm, 2020)*

≥

## Tomo-Guided Biopsy

DBT Scout
(localize off DBT slice)

(Hologic Affirm Prone)

**8.5.9 Dose Calibration**

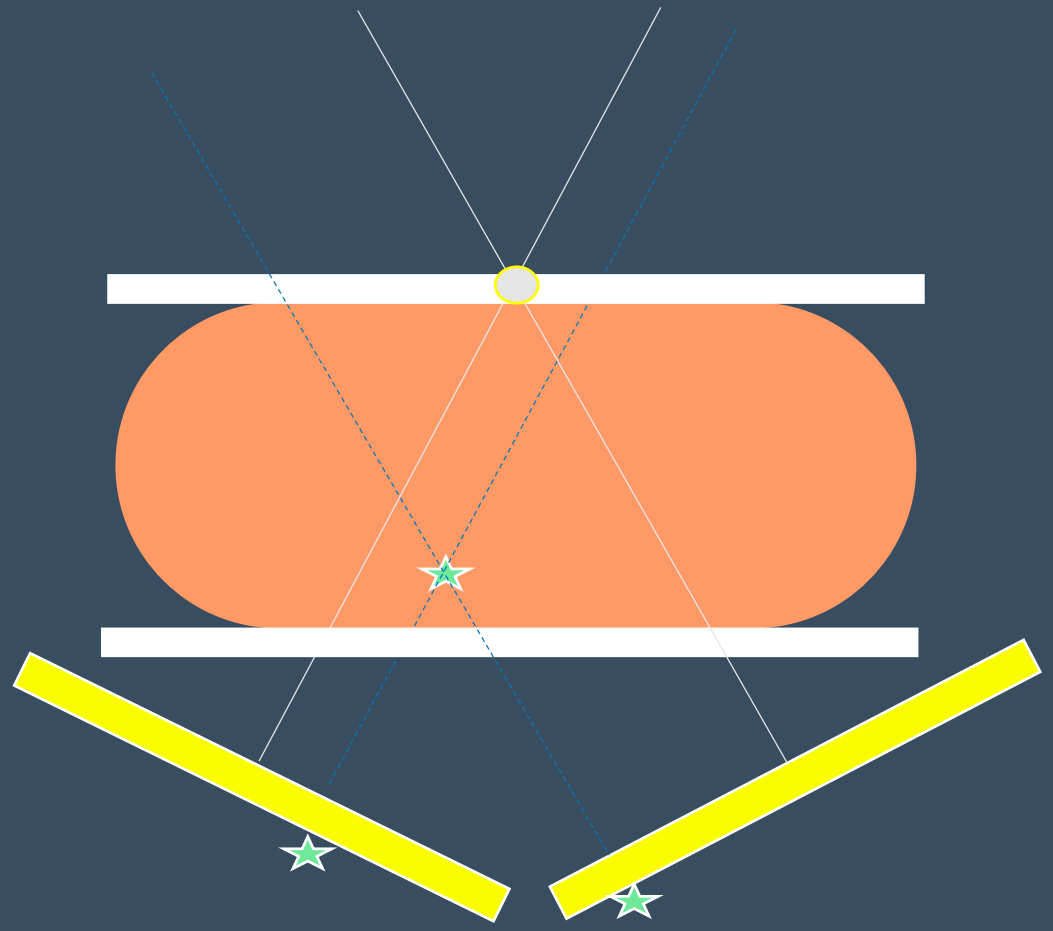
For locations following ACR standards, verify that the dose is set for:

- Stereotactic Biopsy Dose - 1.60 mGy
- Tomosynthesis Dose, 30 projections - 1.80 mGy

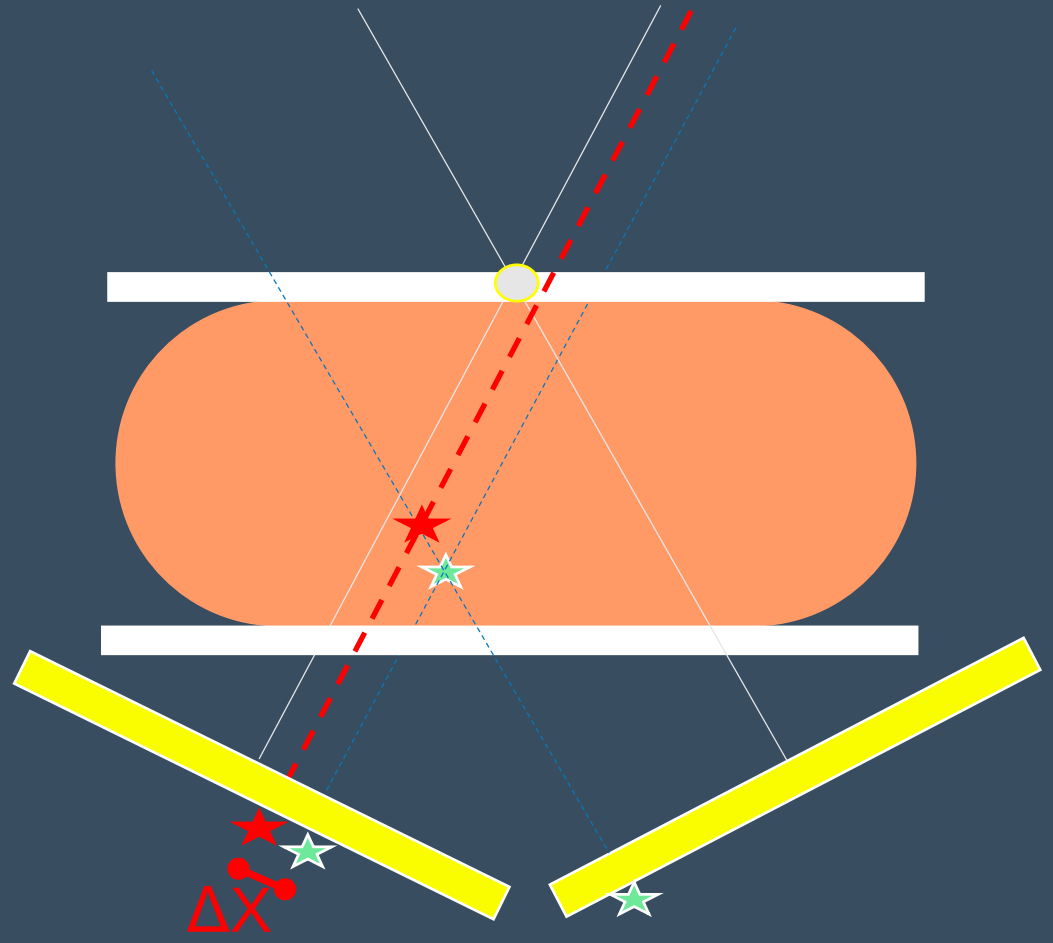
For dose calibration, refer to the procedures in the Detector section of CalTool.

*(MAN-04482 Rev 004)*

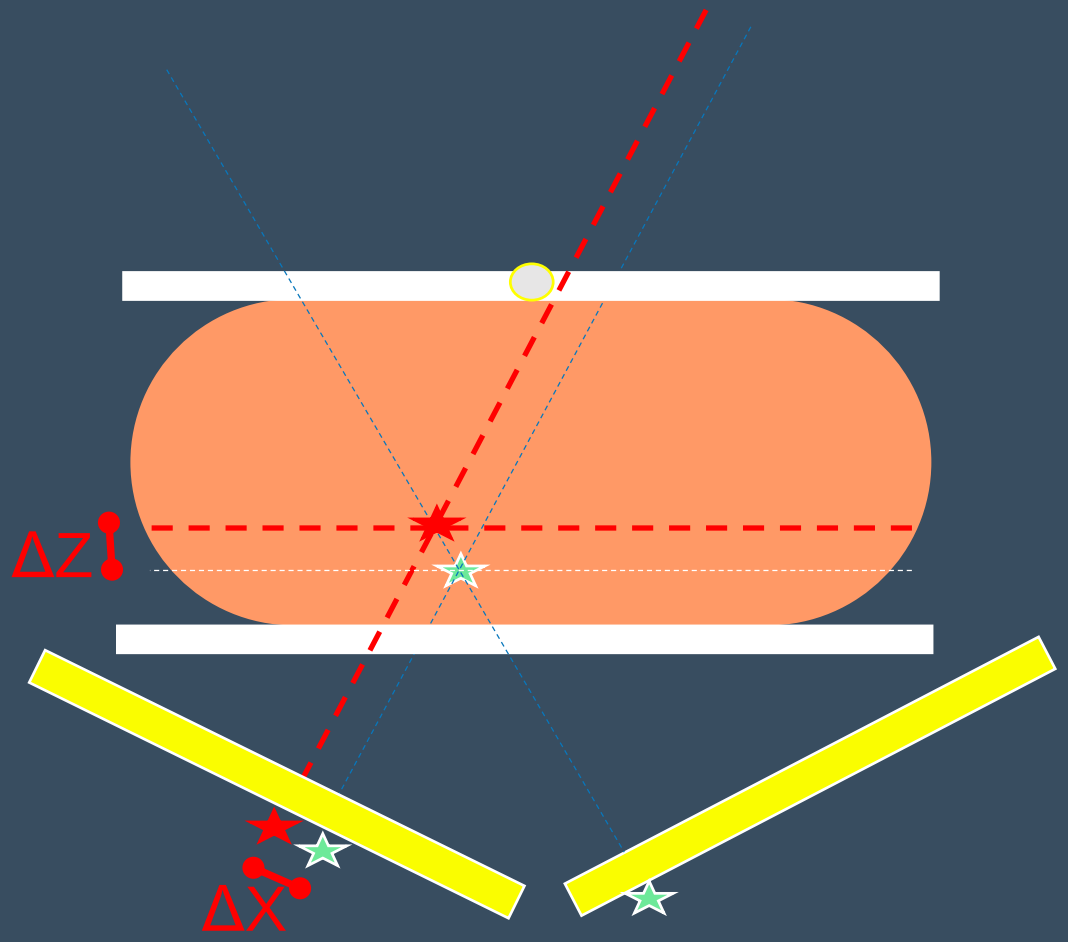
# Targeting Errors - Stereo

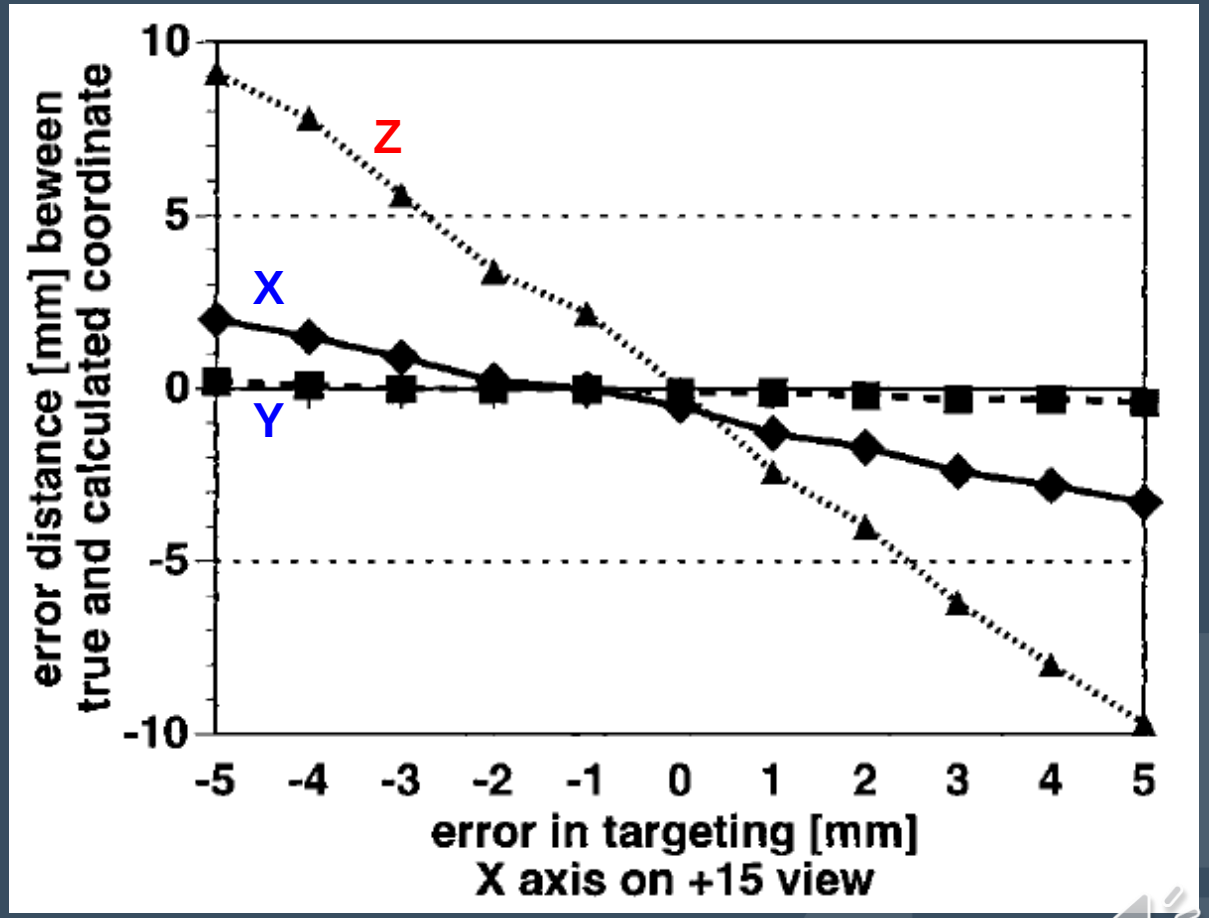


# Targeting Errors - Stereo



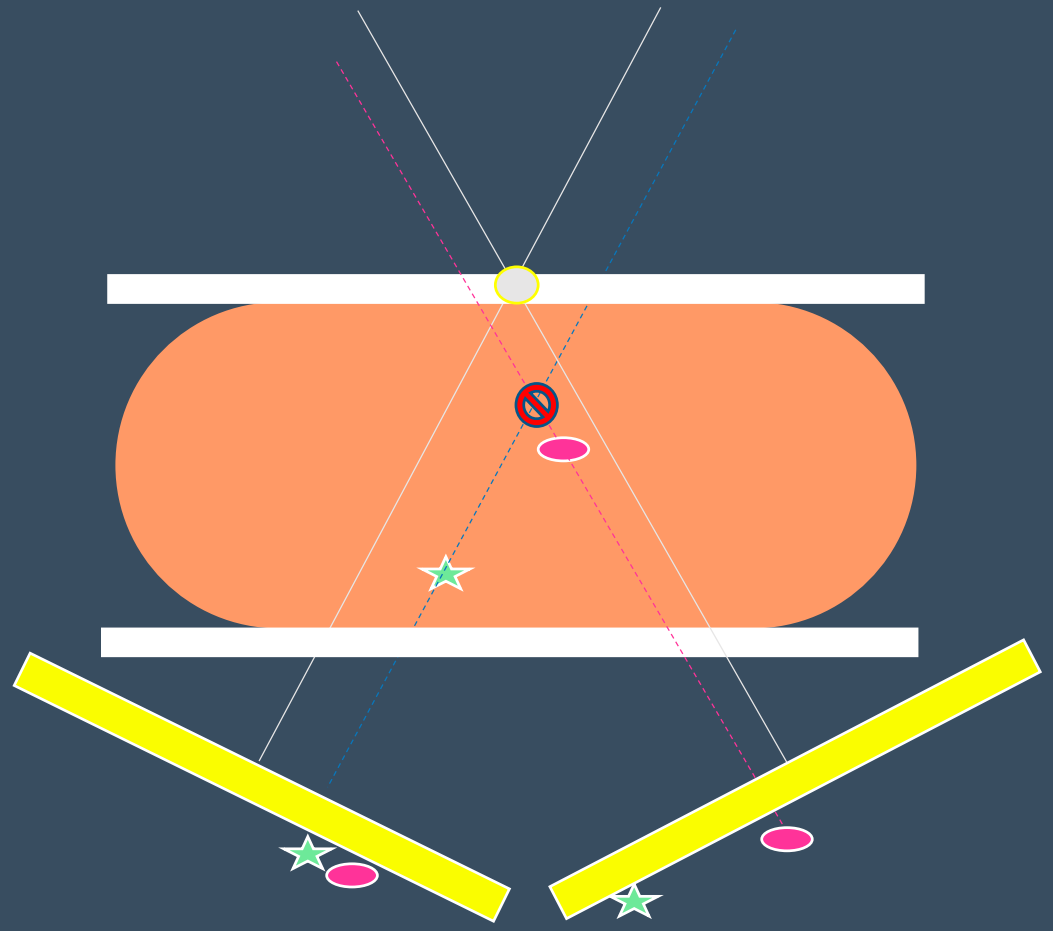
# Targeting Errors - Stereo



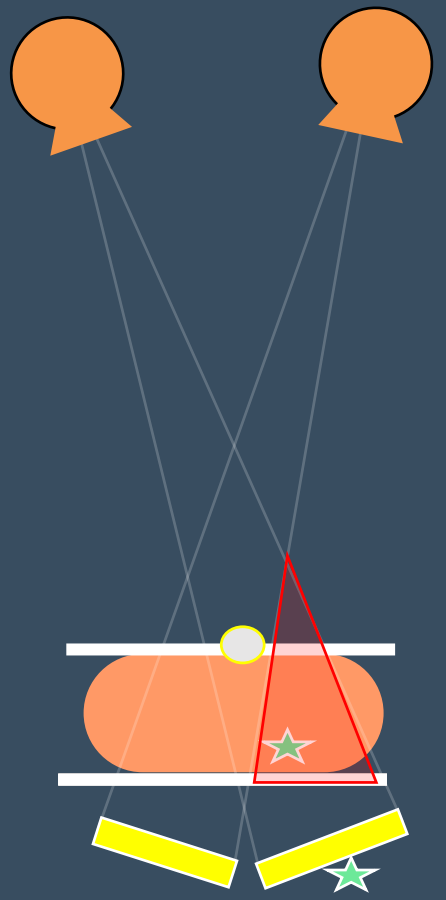




JJ Carret al, Stereotactic localization of breast lesions: How it works and methods to improve accuracy. RadioGraphics2001; 21:463–473

# Targeting Errors - Stereo



# Field of View (FOV) Limitations - Stereo

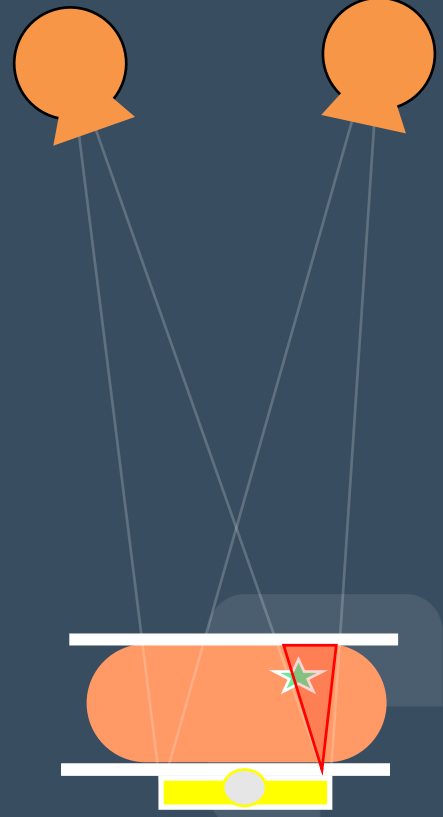


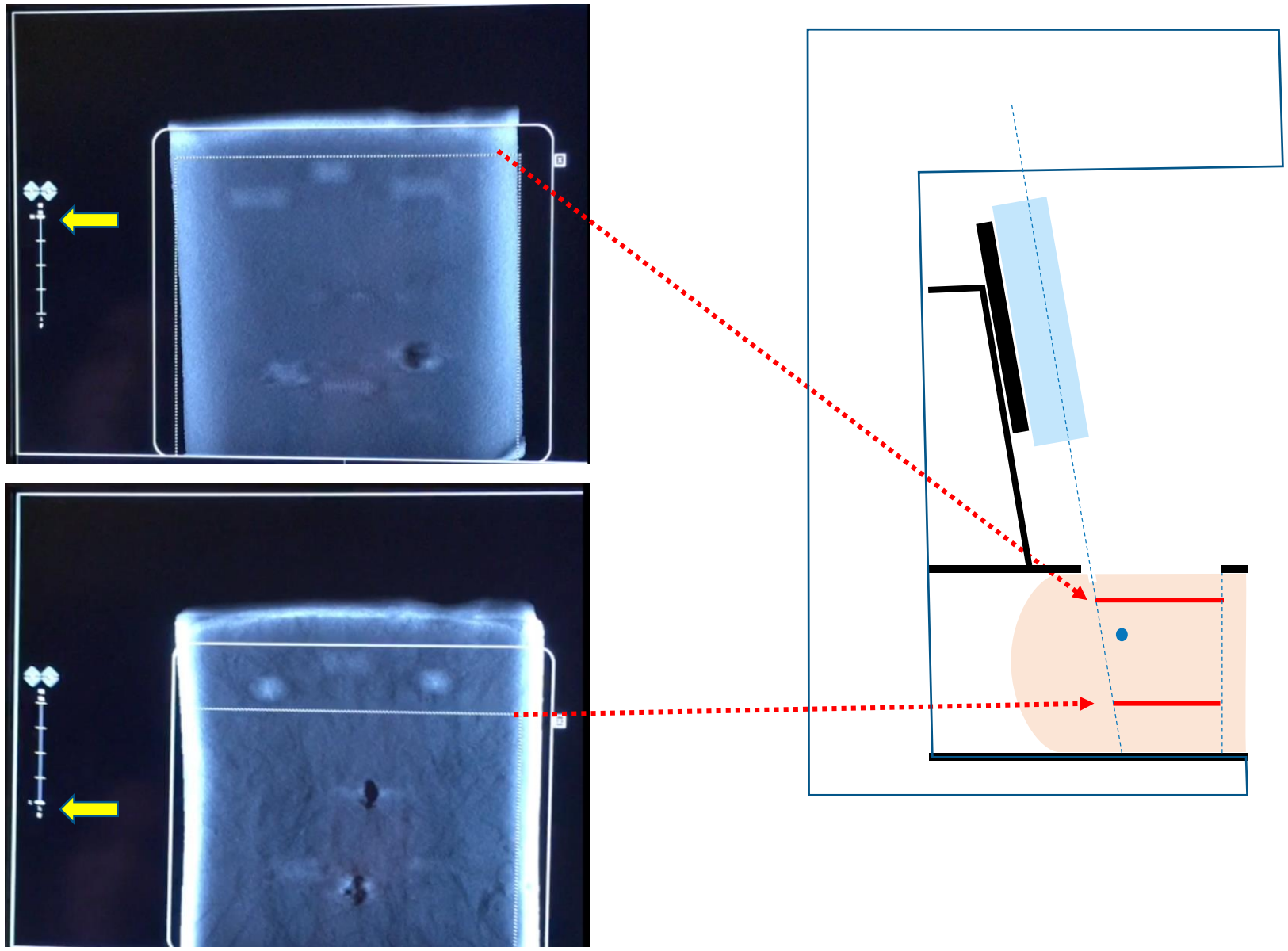
Center of Rotation at Breast Surface:

- Limited FOV for deep lesions

Center of Rotation at Detector:

- Limited FOV for proximal lesions that are off-centered on scout





(Slide courtesy of I. Reiser, “Physics of stereo vs. tomosynthesis-guided breast biopsy”, 2020 AAPM Annual Meeting)

# Clinical Indications

## Stereotactic Guided Biopsy

- Calcifications

## Tomo Guided Biopsy

- Architectural distortion
- Isodense or low density lesions
- Single View Findings

*(Kerger, AAPM Spring Clinical 2017)*

# Clinical Indications

- Compared with digital mammography stereotactic biopsy, digital breast tomosynthesis–guided biopsy was associated with a higher rate of biopsy for
  - architectural distortion
  - radial sclerosing lesions

  (*Rochat, 2020*)

# Procedure Time

- Initial reporting suggests procedure time might be reduced to almost half that of stereo-guided biopsy procedure when tomo-guidance is used (*Rochat, 2020*)
  - Fewer “steps” - Initial tomo is used to localize (no need for scout)
  - Localizing is “easier” (single click)
  - Targeting errors happen less frequently
  - Less likely to need to reposition the patient in order to view the lesion

| | Stereo | DBT |
|---|---|---|
| Advantages | • Visualization of calcifications<br>• No artifacts from the needle for pre- and post-fire images | • Reduced patient dose for the procedure<br>• Reduced procedure time<br>• Better visualization of architectural distortion, lesions only seen on DBT, or single-view findings |
| Disadvantages | • Depth uncertainty<br>• Potential errors from confusing lesions between stereo pairs<br>• Field-of-view limitations (particularly for rotating detector) | • Artifacts from needle (in pre- and post-fire images)<br>• Clusters of calcifications may not be visualized as well |

# Accreditation and Testing

## What’s required?

# State Regulations
*(MQSA does not apply!)*

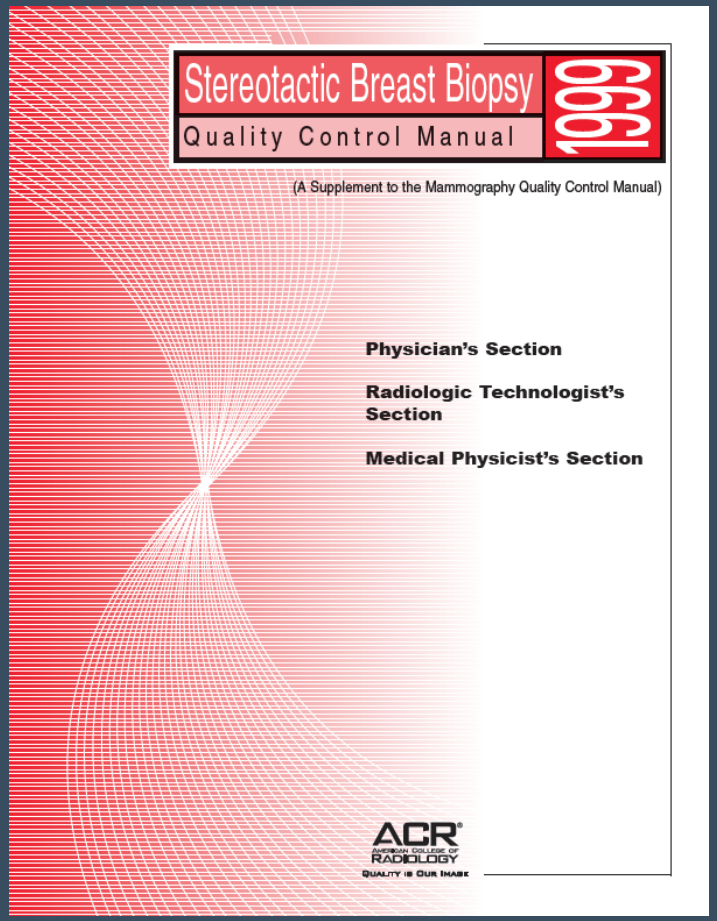
## ODH 3701:1-66-08 ← OHIO

(G) Quality control testing by a medical physicist shall be conducted on mammography radiation-generating equipment used for invasive localization or having stereotactically-guided breast biopsy capability. Quality control testing for stereotactically-guided breast biopsy equipment shall follow the "American College of Radiology (ACR) Practice Parameter for the Performance of Stereotactic-Guided Breast Interventional Procedures" (as revised in 2016). This document is available from the "American College of Radiology, 1891 Preston White Drive, Reston, Virginia 20191, telephone (703) 648-8900."

**VII. EQUIPMENT QUALITY CONTROL**

Refer to ACR stereotactic breast biopsy quality control manual [54].

# ACR Accreditation




**"… a voluntary accreditation program for facilities offering percutaneous needle biopsy of the breast under stereotactic imaging control."** (Page 3)

Hendrick RE, Dershaw D., et al." Stereotactic Breast Biopsy Quality Control Manual". Reston, Va: American College of Radiology; 1999

# What's required

- DBT guided biopsies – not addressed
- Add-ons
  - Addressed in Accreditation Support
    - "Special Cases in Stereotactic Breast Biopsy Quality Control"
      - https://accreditationsupport.acr.org/support/solutions/articles/11000072242-special-cases-in-stereotactic-breast-biopsy-quality-control

# Accreditation and Testing

## Evaluating Add-Ons

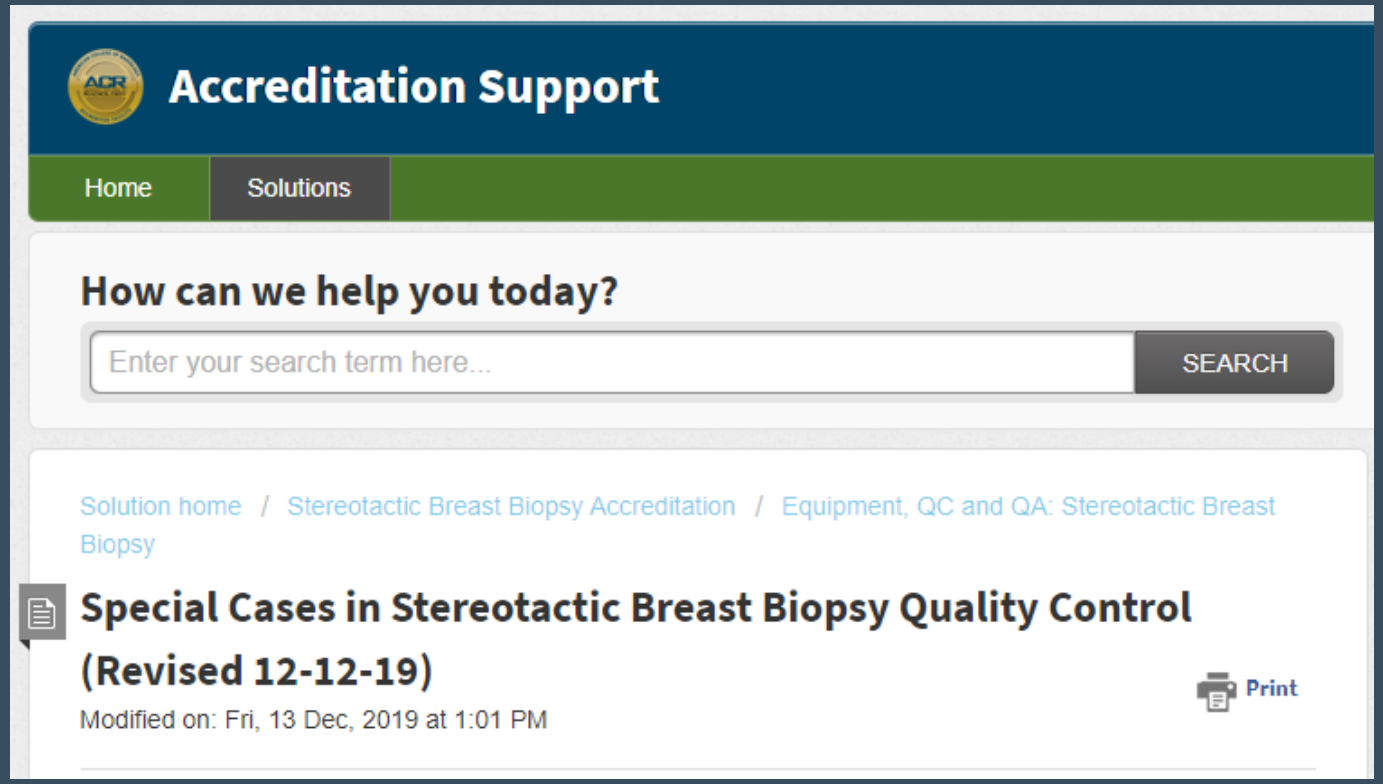
# Add-on Testing

- SBB uses same image receptor and x-ray tube as DM unit
- All the required tests must be performed
  - Several of these may already be covered by the manufacturer's QC manual for the digital mammography unit
  - If items have been verified as part of DM annual test, they do not need to be repeated

# Documentation

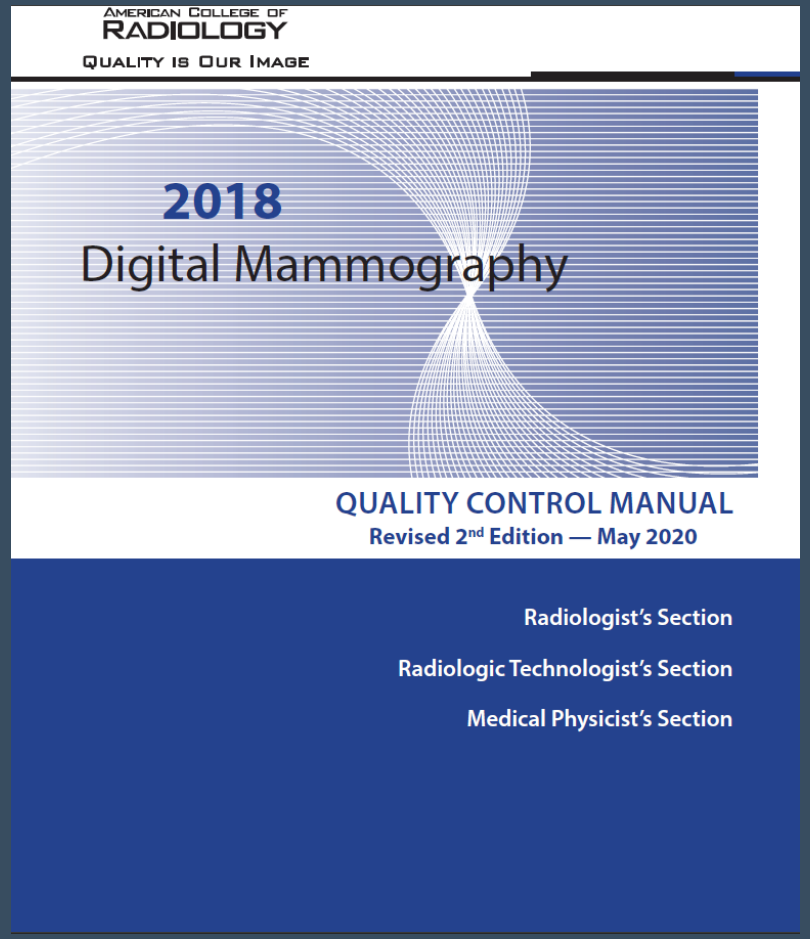
- Separate reports?
  - Cleaner, avoids confusion with the ACR
    - Tests in the expected order for SBB
  - Copy over the relevant tests from the DM survey
- One combined report?
  - Make sure to include the ACR “QC Test Summary” pages for SBB as well as those for DM

# Guidance for Add-ons




https://accreditationsupport.acr.org/support/solutions/articles/11000072242-special-cases-in-stereotactic-breast-biopsy-quality-control

# If follow ACR DMQC Manual…




+

**using either the Small ACR Mammography Phantom or the Mini Digital Stereotactic Phantom**

Image Quality Evaluation

Localization Accuracy Test

**Additional SBB Tests required by ACR**

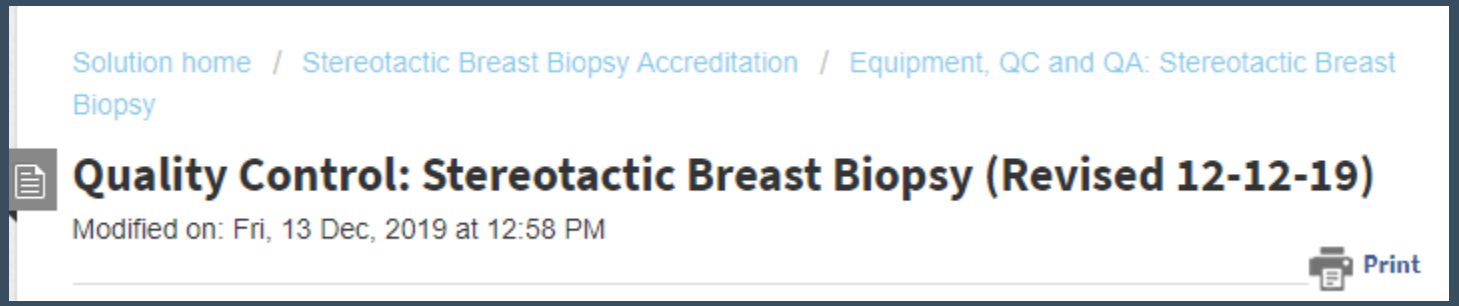
https://accreditationsupport.acr.org/support/solutions/articles/11000072242-special-cases-in-stereotactic-breast-biopsy-quality-control

# Things to keep in mind

- AEC settings might be different for stereo versus normal 2D
  - Stereo uses separate CNR tables from screening on Hologic
- Detector calibration may have separate file for stereo mode (impacts artifact detection)

# Collimation

- For upright systems, may use MQSA criteria (±2% of SID) instead of 5mm criteria

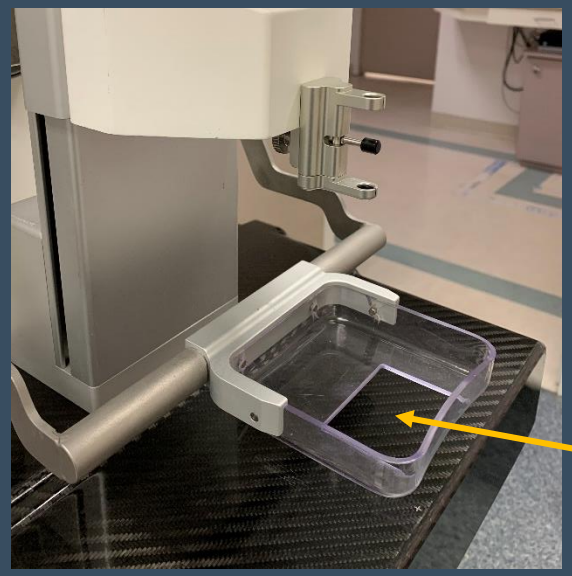



| | |
|---|---|
| Collimation Assessment | Ensures that the x-ray collimation does not allow significant radiation to extend beyond the edges of the image receptor and that the biopsy window aligns with the x-ray field (Collimation Test criteria requires "5 mm on any side" but per MQSA criteria, it is acceptable in upright systems if the collimation results fall within ±2% of the SID.) |

https://accreditationsupport.acr.org/support/solutions/articles/11000064161-quality-control-stereotactic-breast-biopsy-revised-12-12-19-

# HVL

- Has been verified as part of DM annual test
  - BUT for dosimetry should repeat measurement without paddle material in place for SBB dose calc



# AEC Testing

- Per the ACR
  - “The equivalent test of automatic exposure control that is annually performed for the digital mammography unit may be used to satisfy the requirements for the stereotactic breast biopsy unit. It should be representative of stereotactic breast biopsy performance.”

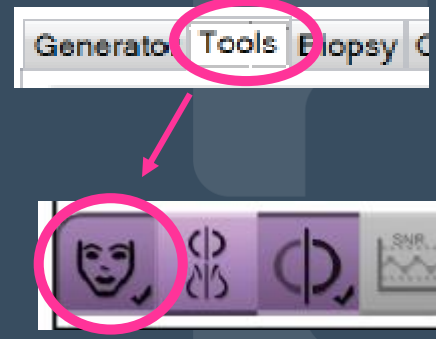
https://accreditationsupport.acr.org/support/solutions/articles/11000072242-special-cases-in-stereotactic-breast-biopsy-quality-control

# AEC Testing

- HOWEVER
  - AEC settings might be different for stereo versus normal 2D
    - Hologic has CNR correction tables specifically for stereo
  - Different field size = different scatter conditions

# AEC Testing: Tips!

- Hologic Affirm (upright):
  - For the correct CNR correction table to be applied across all thicknesses – must use clinical view
    - i.e. “RCC Stereo Scout” (NOT “ACR Phantom Stereo Scout” or “PPM Stereo Scout”)
    - Stereo CNR Correction tables listed in the Affirm User Guide
  - mAs values are not automatically displayed on the scout images
    - Need to enable the “patient information” overlay
      - (under “Tools”!)



# Image Receptor Uniformity

- Needs to be performed if the vendor does not have a quantitative image receptor uniformity test

# Uniformity: Tip!

- Hologic Affirm (upright):
  - Recommendations from the vendor*:
    - Use standard biopsy paddle
    - Override default collimation (18x24cm) to 10x10cm
      - Reduces scatter
    - Measure uniformity within the biopsy window
      - 64x64 ROI size
      - Do not place the ROIs too close to the chest wall edge

**Resolution provided via email by Hologic technical support in response to failure in uniformity measurements*

# AGD

- AGD should be measured in stereo mode
  - Separate AEC settings, smaller field size, hole in biopsy paddle
- 2D Scout image
- Use HVL and output measured without paddle material in place

# Image Quality

- Mini ACR phantom or small ACR mammography phantom
- 2D scout image
- Clinical technique for a standard breast
- Standard biopsy paddle
  - Be consistent!!

*Stereo only (ignoring tomo for the moment…)*

| ACR Annual SBB Tests | QC Manual for FFDM | Add-on: Repeat for stereo? |
|---|---|---|
| Unit Assembly Evaluation | ✓ | No |
| Collimation Assessment | ✓ | No |
| Limiting Resolution | ✓ | No |
| kVp Accuracy and Reproducibility | ✓ | No |
| Beam Quality Assessment (HVL) | ✓ | Yes* (for dosimetry) |
| AEC Manual Exposure or Performance Assessment | ✓ | Yes* |
| Digital Image Receptor Uniformity | Some | Yes (if not part of DM survey) |
| Breast Entrance Exposure, Average Glandular Dose and Exposure Reproducibility | ✓ | Yes |
| Image Quality Evaluation | ✓ | Yes |
| Artifact Evaluation | ✓ | Yes* |
| Localization Accuracy Test | n/a | Yes |

** Not required from an accreditation perspective, but physicist should consider performing*

# Accreditation and Testing

## Adapting the 1999 ACR QC Manual for DBT

# What's required

- For accreditation, technically "nothing"
  - Tomo-guided breast biopsies are not addressed by ACR
- Tomo-guided breast biopsy procedures are more prevalent
  - So… what *should* we test?

# Considerations for Tomo:

- May have different target/filter combinations and kVp ranges for tomo-guided biopsies
- Detector may have separate calibration file for tomo mode
- AEC will have different settings for tomo (vs stereo)

*Prone units – (ignoring add-ons for the moment…)*

| ACR Annual SBB Tests | Prone: SBB | Prone: Repeat for tomo? |
|---|---|---|
| Unit Assembly Evaluation | ✓ | No |
| Collimation Assessment | ✓ | No |
| Limiting Resolution | ✓ | Yes* |
| kVp Accuracy and Reproducibility | ✓ | Maybe* |
| Beam Quality Assessment (HVL) | ✓ | Maybe* |
| AEC Manual Exposure Performance Assessment | ✓ | Yes* |
| Digital Image Receptor Uniformity | ✓ | Yes* |
| Breast Entrance Exposure, Average Glandular Dose and Exposure Reproducibility | ✓ | Yes* |
| Image Quality Evaluation | ✓ | Yes* |
| Artifact Evaluation | ✓ | Yes* |
| Localization Accuracy Test | ✓ | Yes* |

** Not required from an accreditation perspective, but physicist should consider performing*

# Collimation Assessment

Setup for assessing congruence of x-ray field to active area of detector

Hologic Affirm:

- Radiation field larger than biopsy window
- White line does NOT correspond with radiation field, neither does light field

# Limiting Resolution

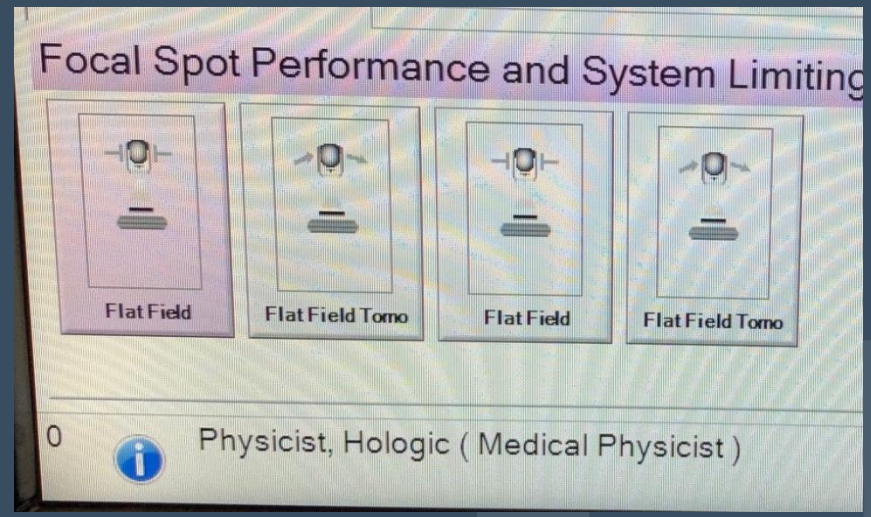
- High-contrast resolution differs between DM and DBT

**Digital System Limiting Resolution (Digital Systems Only)**

| Flat-Panel Monitor System | Previous | Current | Previous | Current |
|---|---|---|---|---|
| Viewing Mode: | LCD | | LCD | |
| Mode: | Conv (2D) | | Tomo | |
| Parallel to A-C axis (lp/mm): | 6 | 6 | 5 | 5 |
| Perpendicular to A-C axis (lp/mm): | 6 | 6 | 5 | 5 |
| Oriented at 45 degrees (lp/mm): | 9 | 9 | 7 | 7 |

**Action Limit:** Note any significant degradation from previous measurement and seek service.

**Not required**



# kVp Accuracy and Reproducibility

- Reproducibility:
  - Four exposures at the “most commonly used clinical kVp”
- Accuracy:
  - Single exposure at “clinically important” kVps
    - kVp ranges may differ for DBT versus DM

# Hologic Affirm (Prone)

## Automatic Exposure Control (AEC) Technique Chart

**Site:** _____ **Room:** _____

### Clinical Techniques (2D)

| Breast Thickness (cm) | Target / Filter | kVp | mAs |
|---|---|---|---|
| < 2.4 | W/Ag | 25 | AEC |
| 2.5 - 3.4 | W/Ag | 26 | AEC |
| 3.5 - 3.9 | W/Ag | 27 | AEC |
| 4.0 - 5.4 | W/Ag | 28 | AEC |
| 5.5 - 5.9 | W/Ag | 29 | AEC |
| 6.0 - 6.4 | W/Ag | 30 | AEC |
| 6.5 - 6.9 | W/Ag | 31 | AEC |
| 7.0 - 7.4 | W/Ag | 32 | AEC |
| 7.5 - 7.9 | W/Ag | 33 | AEC |
| 8.0 - 8.4 | W/Ag | 34 | AEC |
| 8.5 - 9.0 | W/Ag | 35 | AEC |
| 9.0 - 9.4 | W/Ag | 36 | AEC |
| 9.5 - 10 | W/Ag | 37 | AEC |
| 10 - 10.5 | W/Ag | 38 | AEC |
| > 10.5 | W/Ag | 39 | AEC |

Focal spot size: 0.3 mm

Source-to-Image Distance: 80.0 cm

All 2D imaging uses W/Ag target/filter combination
All Tomo imaging uses W/Al target/filter combination
All clinical exams use AEC except where noted

### Clinical Techniques (Tomo)

| Breast Thickness (cm) | Target / Filter | kVp | mAs |
|---|---|---|---|
| < 4.0 | W/Al | 26 | AEC |
| 4.0 - 4.4 | W/Al | 27 | AEC |
| 4.5 - 4.9 | W/Al | 28 | AEC |
| 5.0 - 5.4 | W/Al | 29 | AEC |
| 5.5 - 5.9 | W/Al | 30 | AEC |
| 6.0 - 6.4 | W/Al | 31 | AEC |
| 6.5 - 6.9 | W/Al | 32 | AEC |
| 7.0 - 7.4 | W/Al | 33 | AEC |
| 7.5 - 8.0 | W/Al | 34 | AEC |
| 8.0 - 8.4 | W/Al | 35 | AEC |
| 8.5 - 8.9 | W/Al | 37 | AEC |
| 9.0 - 9.9 | W/Al | 38 | AEC |
| 10.0 - 10.4 | W/Al | 39 | AEC |
| 10.5 - 10.9 | W/Al | 40 | AEC |
| 11.0 - 11.5 | W/Al | 41 | AEC |
| 11.5 - 11.9 | W/Al | 42 | AEC |
| 12.0 - 12.4 | W/Al | 43 | AEC |
| 12.5 - 12.9 | W/Al | 44 | AEC |
| 13.0 - 13.4 | W/Al | 45 | AEC |
| 13.5 - 13.9 | W/Al | 46 | AEC |
| 14.0 - 14.4 | W/Al | 47 | AEC |
| > 14.5 | W/Al | 48 | AEC |

# EXAMPLE

- "Clinical kVp" (4.2 cm, 50/50 breast)
  - 2D: 28 kVp
  - Tomo: 27 kVp
- kVp range:
  - 2D: 25-39 kVp
  - Tomo: 26-48 kVp

# Beam Quality Assessment (HVL)

- Measure for:
  - Target-filter/kVp at which the system is normally used clinically
    - Repeat for “clinical” technique for tomo (will need later for dosimetry)
  - Repeat for other target-filter/kVp settings ranging from lowest to highest used clinically

# Beam Quality Assessment (HVL)

- Considerations:
  - Paddle
    - With or without hole? Or both?
    - If lateral approach is used for the biopsy, paddles without a hole may be used

Setup we use:

kVp, HVL, and output/linearity (used later in AGD calculation)

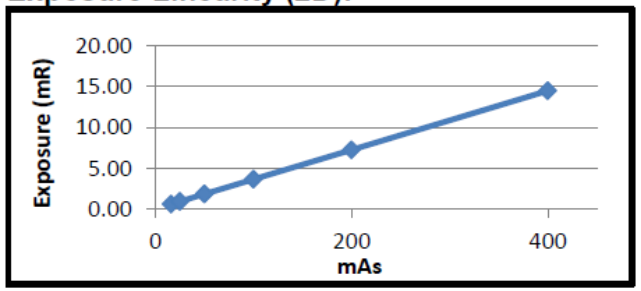
*Paddle pictured = LAT 15 cm*

**Performance Capability (Conv - 2D):**

| | | | "Clinical" | | | |
|---|---|---|---|---|---|---|
| Nominal kVp setting: | | 25 | 28 | 30 | 35 | 39 |
| Target: | | W | W | W | W | W |
| Filter: | | Ag | Ag | Ag | Ag | Ag |
| Focal spot (mm): | | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| mAs: | | 100 | 100 | 100 | 100 | 100 |
| Exposure time (ms): | | 769.9 | 770.4 | 625.7 | 589.5 | 556.3 |
| mGy: | | 2.51 | 3.641 | 4.37 | 6.143 | 7.64 |
| | **Measured kVp values:** | | | | | |
| 1: | | 25.5 | 28.5 | 31.0 | 36.2 | 40.0 |
| 2: | | | 28.5 | | | |
| 3: | | | 28.5 | | | |
| 4: | | | 28.5 | | | |
| Mean kVp: | | 25.5 | 28.5 | 31.0 | 36.2 | 40.0 |
| Standard deviation (SD): | | | 0.0000 | | | |
| | **Additional kVp measurements (if needed):** | | | | | |
| 5: | | | | | | |
| Calculated HVL (mm Al): | | 0.502 | 0.566 | 0.595 | 0.654 | 0.684 |
| | **Analysis:** | | | | | |
| Mean kVp: | | 25.5 | 28.5 | 31.0 | 36.2 | 40.0 |
| Standard deviation (SD): | | | 0.0000 | | | |
| Mean kVp - Nominal kVp: | | 0.5 | 0.5 | 1 | 1.2 | 1 |
| 0.05 x Nominal kVp: | | 1.25 | 1.40 | 1.50 | 1.75 | 1.95 |
| **% Error:** | | 2.0% | 1.8% | 3.3% | 3.4% | 2.6% |
| **Acceptably Accurate?:** | | Yes | Yes | Yes | Yes | Yes |
| **Coefficient of variation:** | | | 0.0000 | | | |
| **Acceptably Reproducible?:** | | | Yes | | | |

| Mode: | | Conv (2D) | | | | |
|---|---|---|---|---|---|---|
| | | | "Clinical" | | | |
| Nominal kVp setting: | | 25 | 28 | 30 | 35 | **39** |
| Nominal mAs setting: | | 100 | 100 | 100 | 100 | 100 |
| Target material: | | W | W | W | W | W |
| Filter: | | Ag | Ag | Ag | Ag | Ag |
| Paddle in place: | | Yes | Yes | Yes | Yes | Yes |
| | [redacted] | | | | | |
| **Calculated HVL (mm Al):** | | 0.502 | 0.566 | 0.595 | 0.654 | 0.684 |
| **Minimum allowed HVL:** | | 0.28 | 0.31 | 0.33 | 0.38 | 0.42 |
| **Maximum allowed HVL*:** | | -- | -- | -- | -- | -- |
| **Acceptable?:** | | Yes | Yes | Yes | Yes | Yes |

**Exposure Linearity (2D):**




| Clinical kVp: | | | 28 |
|---|---|---|---|
| mAs | mGy | mGy/mAs | Linear |
| 16 | 0.59 | 0.037 | -- |
| 25 | 0.92 | 0.037 | Yes |
| 50 | 1.83 | 0.037 | Yes |
| 100 | 3.64 | 0.036 | Yes |
| 200 | 7.25 | 0.036 | Yes |
| 400 | 14.50 | 0.036 | Yes |

**Action Limit:** The system shall be linear, such that the average ratios of exposure to the indicated milliampere-second product ((C/kg)/mAs or mR/mAs) obtained at any two consecutive tube current or mAs selector settings shall not differ by more than 0.10 times their sum.

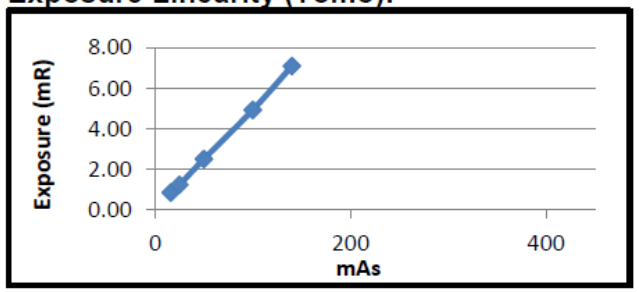
# EXAMPLE
# 2D
# (Hologic Affirm Prone)

**Performance Capability (Tomo):**

| | | | "Clinical" | | | |
|---|---|---|---|---|---|---|
| Nominal kVp setting: | | 26 | 27 | 35 | 40 | 48 |
| Target: | | W | W | W | W | W |
| Filter: | | Al | Al | Al | Al | Al |
| Focal spot (mm): | | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| mAs: | | 100 | 100 | 100 | 100 | 100 |
| Exposure time (ms): | | 3645 | 3643 | 3637 | 3636 | 3644 |
| mGy: | | 4.358 | 4.921 | 10.28 | 13.98 | 18.57 |
| | Measured kVp values: | | | | | |
| 1: | | 26.8 | 27.7 | 35.6 | 40.7 | 48.0 |
| 2: | | | 27.7 | | | |
| 3: | | | 27.5 | | | |
| 4: | | | 27.7 | | | |
| Mean kVp: | | 26.8 | 27.7 | 35.6 | 40.7 | 48.0 |
| Standard deviation (SD): | | | 0.1000 | | | |
| | Additional kVp measurements (if needed): | | | | | |
| 5: | | | | | | |
| Calculated HVL (mm Al): | | 0.470 | 0.500 | 0.668 | 0.764 | 1.050 |
| | Analysis: | | | | | |
| Mean kVp: | | 26.8 | 27.7 | 35.6 | 40.7 | 48.0 |
| Standard deviation (SD): | | | 0.1000 | | | |
| Mean kVp - Nominal kVp: | | 0.8 | 0.65 | 0.6 | 0.7 | 0 |
| 0.05 x Nominal kVp: | | 1.30 | 1.35 | 1.75 | 2.00 | 2.40 |
| **% Error:** | | 3.1% | 2.4% | 1.7% | 1.8% | 0.0% |
| **Acceptably Accurate?:** | | Yes | Yes | Yes | Yes | Yes |
| **Coefficient of variation:** | | | 0.0036 | | | |
| **Acceptably Reproducible?:** | | | Yes | | | |

| Mode: | Tomo-Only | | | | | |
|---|---|---|---|---|---|---|
| | | | "Clinical" | | | |
| Nominal kVp setting: | | 26 | 27 | 35 | 40 | 48 |
| Nominal mAs setting: | | 100 | 100 | 100 | 100 | 100 |
| Target material: | | W | W | W | W | W |
| Filter: | | Al | Al | Al | Al | Al |
| Paddle in place: | | Yes | Yes | Yes | Yes | Yes |
| | [redacted] | | | | | |
| **Calculated HVL (mm Al):** | | 0.470 | 0.500 | 0.668 | 0.764 | 1.050 |
| **Minimum allowed HVL:** | | 0.29 | 0.30 | 0.38 | 0.43 | 0.51 |
| **Maximum allowed HVL*:** | | -- | -- | -- | -- | |
| **Acceptable?:** | | Yes | Yes | Yes | Yes | Yes |

**Exposure Linearity (Tomo):**




| Clinical kVp: | | | 27 |
|---|---|---|---|
| mAs | mGy | mGy/mAs | Linear |
| 16 | 0.86 | 0.054 | -- |
| 25 | 1.24 | 0.050 | Yes |
| 50 | 2.51 | 0.050 | Yes |
| 100 | 4.92 | 0.049 | Yes |
| 140 | 7.08 | 0.051 | Yes |
| | | | |

**Action Limit:** The system shall be linear, such that the average ratios of exposure to the indicated milliampere-second product ((C/kg)/mAs or mR/mAs) obtained at any two consecutive tube current or mAs selector settings shall not differ by more than 0.10 times their sum.

Raysafe X2:

- MAM sensor will not read above 40kVp
- Will need to switch to RF sensor for 48 kVp, and possibly for 40 kVp

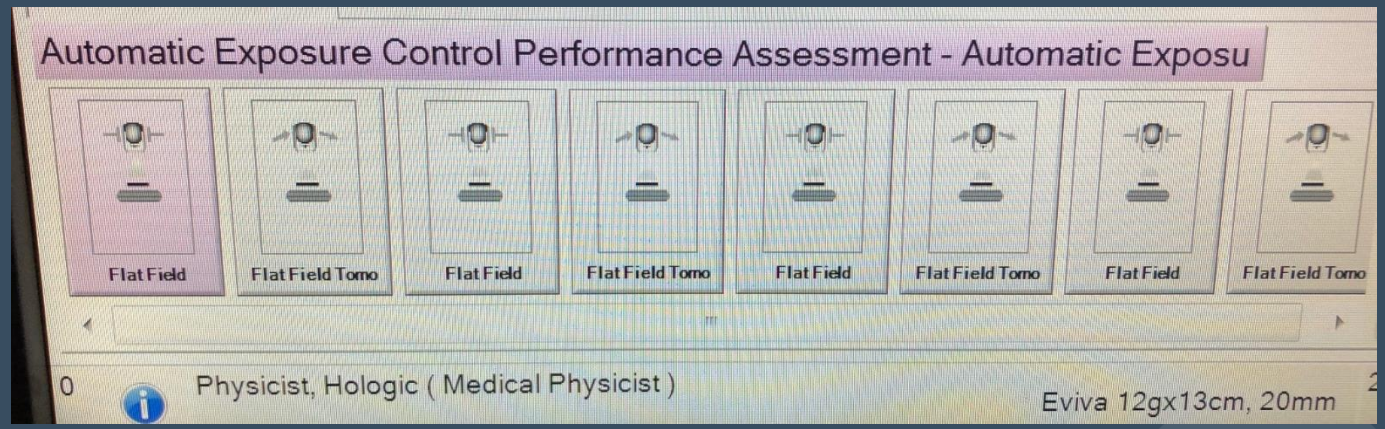
# *EXAMPLE*

## *Tomo*

## *(Hologic Affirm Prone)*

# AEC Performance Assessment

- Measure for:
  - 2, 4, 6, and 8cm
- Considerations:
  - Paddle to use?
  - Material to use
    - (BR-12, Acrylic)?



# AEC Performance Assessment

**Thickness Compensation (2D):**

| CONTACT IMAGING, Lg FS w/ Grid | | | | | | | AEC Position: | 3 |
|---|---|---|---|---|---|---|---|---|
| Phantom Thickness (cm) | Mode | Filter | KVp | mAs | Density | Exposure Index | CNR corr | Corrected Pixel Value |
| 2 | AEC | Ag | 25 | 71 | 0 | 724 | 0.71 | 949.3 |
| 4 | AEC | Ag | 28 | 122 | 0 | 934 | 0.94 | 940.4 |
| 6 | AEC | Ag | 30 | 301 | 0 | 1298 | 1.30 | 960.0 |
| 8 | AEC | Ag | 34 | 441 | 0 | 1663 | 1.71 | 943.3 |

| Corrected Mean Pixel Value | Corrected Pixel Value Range | | | Allowed Range (±20% of 4cm value) | | | Pass / Fail |
|---|---|---|---|---|---|---|---|
| 948.2 | 940.4 | to | 960.0 | 752.3 | to | 1128.5 | Pass |

**Action Limit:** If the signal range exceeds +/- 20% of signal for 4 cm phantom, Revise technique chart

**Thickness Compensation (Tomo):**

| CONTACT IMAGING, Lg FS w/o Grid | | | | | | | AEC Position: | 3 |
|---|---|---|---|---|---|---|---|---|
| Phantom Thickness (cm) | Mode | Filter | KVp | mAs | Density | Exposure Index | CNR corr | Corrected Pixel Value |
| 2 | AEC | Al | 26 | 53 | 0 | 170 | 0.88 | 136.4 |
| 4 | AEC | Al | 27 | 109 | 0 | 177 | 0.94 | 135.1 |
| 6 | AEC | Al | 31 | 136 | 0 | 257 | 1.53 | 135.3 |
| 8 | AEC | Al | 35 | 162 | 0 | 357 | 2.32 | 132.3 |

| Corrected Mean Pixel Value | Corrected Pixel Value Range | | | Allowed Range (±20% of 4cm value) | | | Pass / Fail |
|---|---|---|---|---|---|---|---|
| 134.8 | 132.3 | to | 136.4 | 108.1 | to | 162.1 | Pass |

**Action Limit:** If the signal range exceeds +/- 20% of signal for 4 cm phantom, Revise technique chart

## *EXAMPLE*
## *(Hologic Affirm Prone)*

Vendor Setup:

- Paddle = LAT 15cm
- AEC Position 3
- Set exact thickness (if possible)

# AEC Performance Assessment

**Thickness Compensation (Stereo):**

| Phantom Thickness | Target | Filter | kVp | mAs | Mean Signal Value | SNR |
|---|---|---|---|---|---|---|
| 2 cm | W | Rh | 26 | 46.1 | 719.8 | 108.0 |
| 4 cm | W | Rh | 28 | 96.3 | 716.9 | 104.2 |
| 6 cm | W | Rh | 30 | 192.0 | 716.0 | 100.9 |
| 8 cm | W | Rh | 32 | 330.6 | 714.6 | 93.6 |
| | | | | | | |
| **Mean Pixel Value** | **Signal Range** | | | **Allowed Range (4 cm value ± 20%)** | | |
| **716.8** | **715** | **to** | **720** | **574** | **to** | **860** |

**Action Limit:** If the signal range exceeds +/- 20% of signal for 4 cm phantom, revise technique chart.

**Thickness Compensation (Tomo):**

| Phantom Thickness | Target | Filter | kVp | mAs | Mean Signal | SNR |
|---|---|---|---|---|---|---|
| 2 cm | W | Rh | 26 | 70.3 | 185.6 | 25.1 |
| 4 cm | W | Rh | 28 | 142.8 | 186.9 | 24.9 |
| 6 cm | W | Rh | 30 | 276.0 | 187.0 | 24.0 |
| 8 cm | W | Rh | 32 | 485.6 | 194.5 | 23.3 |
| | | | | | | |
| **Mean Pixel Value** | **Signal Range** | | | **Allowed Range (4 cm value ± 20%)** | | |
| **188.5** | **186** | **to** | **195** | **150** | **to** | **224** |

## *EXAMPLE (Siemens Revelation)*

- Use clinical procedure / exam tag
- Measure values off of RAW images
  - 0 degree projection for tomo

# Digital Receptor Uniformity

- Considerations:
  - Use reconstructed tomo slice or RAW projection image?
    - We use 0 degree projection image

*Note for Hologic: acquisition workstation does not permit ROI measurements on reconstructed tomo slices (but it does on projections!)*

# EXAMPLE (Hologic Affirm Prone)

| | |
|---|---|
| Attenuator: | Acrylic |
| Thickness: | 4 cm |
| Target / Filter: | W/Ag |
| kVp: | 28 |
| Focal Spot: | 0.3 mm |
| AEC Position: | 3 |
| Imaging Mode: | 2D |
| mAs: | 122 |

**Performance Capability (2D)**
***For units with ROI measurement capability***

| | | |
|---|---|---|
| **ROI Upper Left** | Mean* | 881.9 |
| | Minimum | 891 |
| | Maximum | 973 |
| | SD | 10.62 |
| | SNR* | 83.0 |
| | $SNR_{UL}$ / $SNR_{Center}$ | 0.99 |

| | | |
|---|---|---|
| **ROI Upper Right** | Mean* | 884.5 |
| | Minimum | 893 |
| | Maximum | 979 |
| | SD | 10.76 |
| | SNR* | 82.2 |
| | $SNR_{UR}$ / $SNR_{Center}$ | 0.98 |

| | | |
|---|---|---|
| **ROI Center** | Mean* | 885.6 |
| | Minimum | 893 |
| | Maximum | 975 |
| | SD | 10.54 |
| | SNR* | 84.0 |

| | | |
|---|---|---|
| **ROI Lower Left** | Mean* | 884.9 |
| | Minimum | 889 |
| | Maximum | 981 |
| | SD | 11.59 |
| | SNR* | 76.3 |
| | $SNR_{LL}$ / $SNR_{Center}$ | 0.91 |

| | | |
|---|---|---|
| **ROI Lower Right** | Mean* | 886.8 |
| | Minimum | 892 |
| | Maximum | 981 |
| | SD | 11.45 |
| | SNR* | 77.4 |
| | $SNR_{LR}$ / $SNR_{Center}$ | 0.92 |

| | |
|---|---|
| Attenuator: | Acrylic |
| Thickness: | 4 cm |
| Target / Filter: | W/Al |
| kVp: | 27 |
| Focal Spot: | 0.3 mm |
| AEC Position: | 3 |
| Imaging Mode: | Tomo |
| mAs: | 109 |

Measurements made on 0 degree projection image

**Performance Capability (Tomo)**
***For units with ROI measurement capability***

| | | |
|---|---|---|
| **ROI Upper Left** | Mean* | 128.8 |
| | Minimum | 150 |
| | Maximum | 212 |
| | SD | 7.94 |
| | SNR* | 16.2 |
| | $SNR_{UL}$ / $SNR_{Center}$ | 0.99 |

| | | |
|---|---|---|
| **ROI Upper Right** | Mean* | 129.3 |
| | Minimum | 144 |
| | Maximum | 208 |
| | SD | 7.97 |
| | SNR* | 16.2 |
| | $SNR_{UR}$ / $SNR_{Center}$ | 0.99 |

| | | |
|---|---|---|
| **ROI Center** | Mean* | 128.9 |
| | Minimum | 145 |
| | Maximum | 208 |
| | SD | 7.9 |
| | SNR* | 16.3 |

| | | |
|---|---|---|
| **ROI Lower Left** | Mean* | 128.3 |
| | Minimum | 144 |
| | Maximum | 214 |
| | SD | 8.31 |
| | SNR* | 15.4 |
| | $SNR_{LL}$ / $SNR_{Center}$ | 0.95 |

| | | |
|---|---|---|
| **ROI Lower Right** | Mean* | 128.3 |
| | Minimum | 146 |
| | Maximum | 210 |
| | SD | 8.35 |
| | SNR* | 15.4 |
| | $SNR_{LR}$ / $SNR_{Center}$ | 0.94 |

Use image acquired with 4cm of acrylic/BR-12 during AEC Performance Assessment

(we use this image for artifact detection too!)

# Entrance Exposure, AGD, Reproducibility

- Considerations:
  - If comparing *displayed* AGD to *calculated* AGD:
    - Which paddle does the vendor assume to estimate HVL and entrance skin exposure?

# Entrance Exposure, AGD, Reproducibility

| | | | | | | |
|---|---|---|---|---|---|---|
| Imaging Mode: | Digital | | SID (cm): | 80 | | |
| Field Restriction: | Automatic | | | | | |
| Breast thickness (cm): | 4.2 | | 4.2 | | | |
| Phantom Manufacturer: | Gammex | | Gammex | | | |
| Phantom Serial: | 483F | | 483F | | | |
| Digital Acquisition Mode: | Conv (2D) | | Tomo-Only | | | |
| Target: | W | | W | | | |
| Filter: | Ag | | Al | | | |
| AEC Mode: | AEC | | AEC | | | |
| AEC Position: | 3 | | 3 | | | |
| Exp Compensation Step: | 0 | | 0 | | | |
| Nominal kVp setting: | 28 | | 27 | | | |
| Measured HVL (mm Al): | 0.566 | | 0.500 | | | |

**Breast Entrance Exposure (Air Kerma):**

| | mGy | mAs | mGy | mAs | | |
|---|---|---|---|---|---|---|
| Exposure #1: | 5.0 | 136.0 | 6.2 | 123.0 | | |
| Exposure #2: | 5.0 | 137.0 | 5.9 | 118.0 | | |
| Exposure #3: | 4.9 | 134.0 | 6.2 | 123.0 | | |
| Exposure #4: | 4.9 | 135.0 | 6.2 | 123.0 | | |
| Mean values: | 4.9 | 135.5 | 6.1 | 121.8 | | |
| Standard deviation (SD): | 0.0470 | 1.2910 | 0.1255 | 2.5000 | | |
| Coefficient of variation (CV): | 0.0095 | 0.0095 | 0.0205 | 0.0205 | | |
| Acceptably Reproducible?: | Yes | Yes | Yes | Yes | | |

**Action Limit:** If coefficient of variation for either R or mAs exceeds 0.05, seek service.

**Average Glandular Dose:**

| | | | |
|---|---|---|---|
| Corrected incident skin air kerma (mGy): | 4.93 | 6.11 | |
| Dose conversion factor (mrad/R): | 294 | 265 | |
| Dose conversion factor (mGy-g/mGy-air) | 0.336 | 0.302 | |
| Computed average glandular dose (mGy): | **1.66** | **1.85** | |

**Action Limit:** If average glandular dose exceeds **300 mrad (3 mGy)** for 4.2 cm effective breast thickness at the clinical acquisition technique (512x512 unless otherwise specified), seek service or technique adjustment. **Corrective action must be taken before further examinations are performed if the test results fail ACR regulations.**

## *EXAMPLE*
## *(Hologic Affirm Prone)*

Consistency:

- Use same paddle used for HVL and output measurements

# Image Quality Evaluation

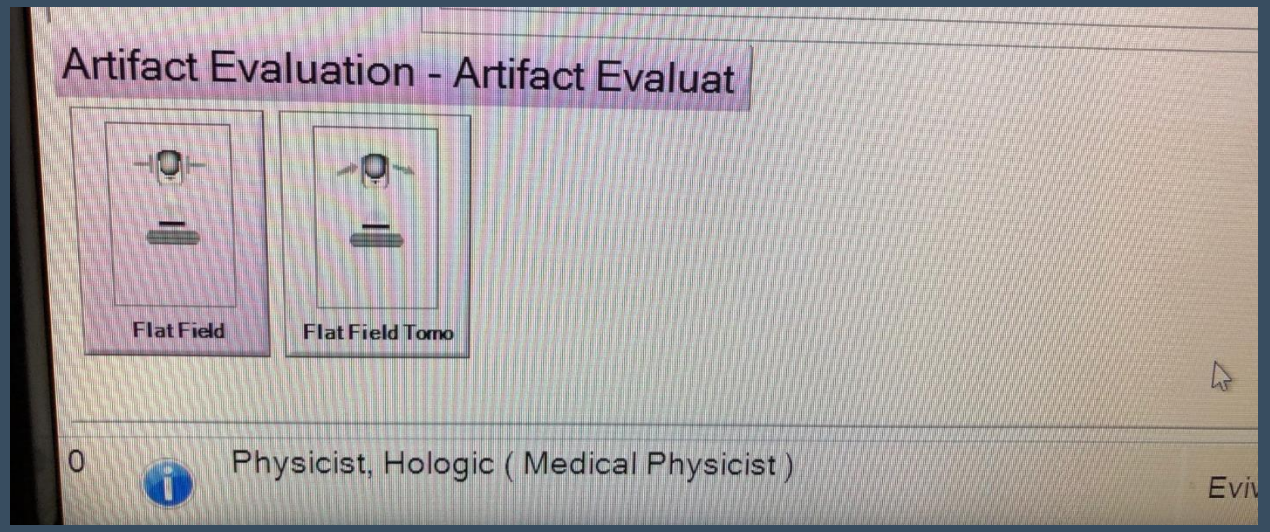
| Imaging Mode: 2D | Previous Image | Current Image |
|---|---|---|
| kVp: | 28 | 28 |
| Phototimed mAs: | 142.0 | 136 |
| **mAs change:** | -- | -6.0 |
| **mAs difference (%):** | -- | **-4%** |
| **Exposure Index:** | 981.0 | 913 |
| **Background signal change (%):** | -- | **7%** |
| Number of fibers seen: | 3.5 | 3.5 |
| **Fibers seen after deduction:** | 3.5 | 3.5 |
| **Fiber change:** | -- | **0.0** |
| Number of speck groups seen: | 3.0 | 3.0 |
| **Speck groups after deduction:** | 3.0 | 3.0 |
| **Speck group change:** | -- | **0.0** |
| Number of masses seen: | 3.5 | 3.5 |
| **Masses seen after deduction:** | 3.5 | 3.5 |
| **Mass change:** | -- | **0.0** |

| Imagin Mode: Tomo | Previous Image | Current Image |
|---|---|---|
| kVp: | 27 | 27 |
| Phototimed mAs: | 118.0 | 123 |
| **mAs change:** | -- | 5.0 |
| **mAs difference (%):** | -- | **4%** |
| **Exposure Index:** | 177.0 | 174 |
| **Background signal change (%):** | -- | **2%** |
| Number of fibers seen: | 3.0 | 3.0 |
| **Fibers seen after deduction:** | 3.0 | 3.0 |
| **Fiber change:** | -- | **0.0** |
| Number of speck groups seen: | 3.0 | 3.0 |
| **Speck groups after deduction:** | 3.0 | 3.0 |
| **Speck group change:** | -- | **0.0** |
| Number of masses seen: | 3.0 | 3.0 |
| **Masses seen after deduction:** | 3.0 | 3.0 |
| **Mass change:** | -- | **0.0** |

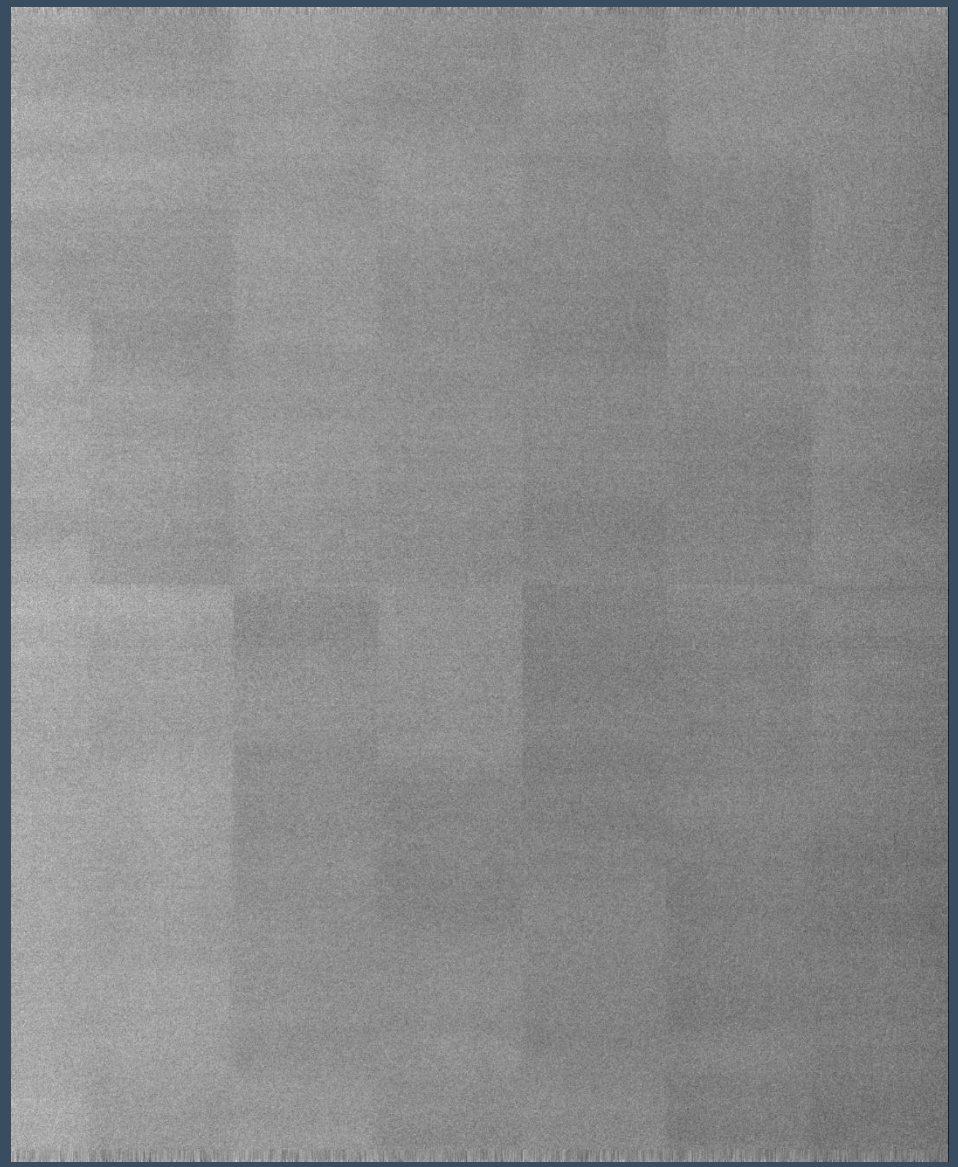
*EXAMPLE (Hologic Affirm Prone)*

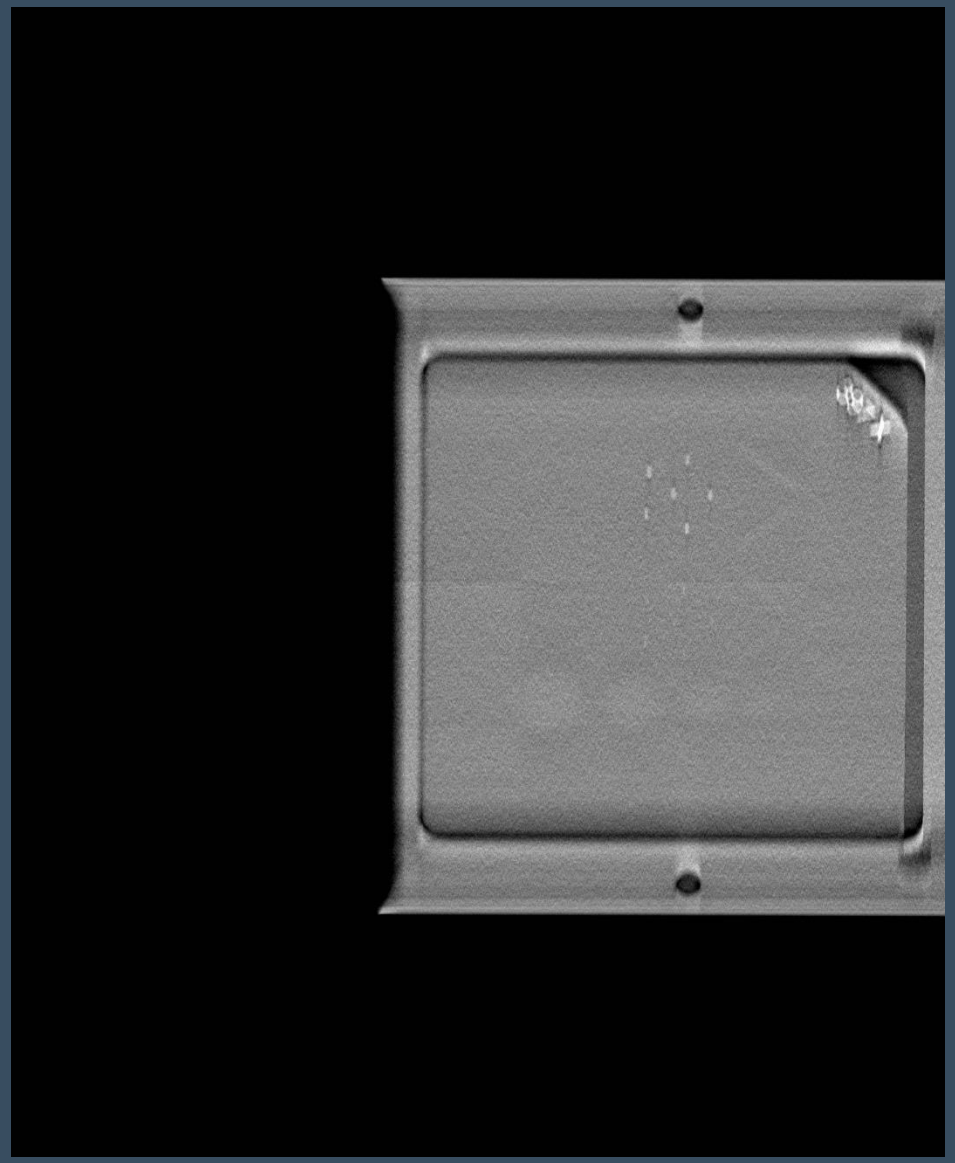
# Artifact Evaluation

- Considerations:
  - Review projection images only, or reconstructed tomo slices?



# *EXAMPLE (Hologic Affirm Prone)*





Slice 31 ☺

Note: this is “normal” (present on ALL of our Affirm prone units)

*Was advised by Hologic that the tomo reconstruction and image processing doesn’t handle uniform objects well, and that only the projection images should be reviewed for artifact detection purposes*

# Localization Accuracy Test

- Purpose is 3-fold:
  - Accuracy of localization
    - Should be verified under stereo-guidance and tomo-guidance
      - Standard approach
      - Lateral approach (if applicable)
        - *Repeat for Left and Right Lateral?*
  - Technical competency
  - Ability of biopsy system to successfully obtain a sample

# In Summary

- Hologic makes it easy for you – they assume that you will perform all applicable tests in tomo mode as well as stereo
  - Applications trained our technologists to perform QC for both as well
- Note which paddle you have used for each test and keep it consistent

# Add-on Units w/ Tomo-Guidance

- On upright units, AEC settings and detector calibration files for DBT are typically the same, whether a biopsy is being performed or not
  - AEC performance and artifact evaluation do not need to be repeated with the stereo attachment in place
- BUT paddle with hole is often used for biopsy procedures:
  - HVL, AGD, and Phantom Image Quality should be repeated with standard biopsy paddle in place

| ACR Annual SBB Tests | QC Manual for FFDM | Add-on: Repeat for stereo? | Add-on: Repeat for tomo biopsy? |
|---|---|---|---|
| Unit Assembly Evaluation | ✓ | No | No |
| Collimation Assessment | ✓ | No | No |
| Limiting Resolution | ✓ | No | No |
| kVp Accuracy and Reproducibility | ✓ | No | No |
| Beam Quality Assessment (HVL) | ✓ | Yes* (for dosimetry) | Yes* (for dosimetry) |
| AEC Manual Exposure or Performance Assessment | ✓ | Yes* | No |
| Digital Image Receptor Uniformity | Some | Yes (if not part of DM survey) | Yes* (if not part of DM survey) |
| Breast Entrance Exposure, Average Glandular Dose and Exposure Reproducibility | ✓ | Yes | Yes* |
| Image Quality Evaluation | ✓ | Yes | Yes* |
| Artifact Evaluation | ✓ | Yes* | No |
| Localization Accuracy Test | n/a | Yes | Yes* |

** Not required from an accreditation perspective, but physicist should consider performing*

# Technologist QC

- Localization Accuracy Test (Daily)
- Phantom Images (Weekly)
- Hardcopy Output Quality *if applicable* (Monthly)
- Visual Checklist (Monthly)
- Compression (Semiannually)
- Repeat Analysis (Semiannually)
- Zero Alignment Test *if applicable* (Before each patient)

Prone:

- Consider having the technologist perform in 2D and tomo mode

Upright Add-On:

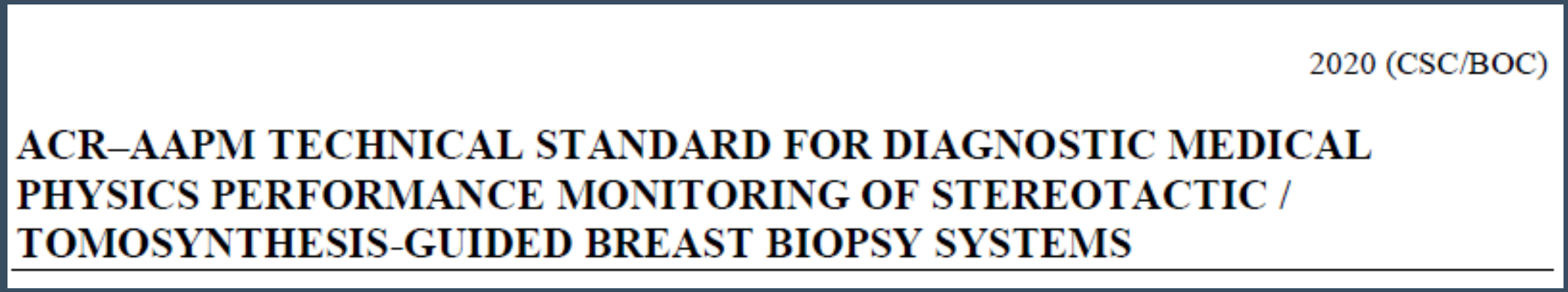
- Phantom image quality for DBT already being performed during routine QC of mamm unit

# Future Directions

ACR-AAPM Technical Standard

ACR SBB QC Manual Update

# ACR-AAPM Technical Standard



2020 (CSC/BOC)

**ACR–AAPM TECHNICAL STANDARD FOR DIAGNOSTIC MEDICAL PHYSICS PERFORMANCE MONITORING OF STEREOTACTIC / TOMOSYNTHESIS-GUIDED BREAST BIOPSY SYSTEMS**

https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Breast-Stereo-Tomo-Guided-Standard.pdf

- Effective October 1, 2020
- Consensus-based *guidance* document

# ACR-AAPM Technical Standard

- The Qualified Medical Physicist's monitoring of performance characteristics must comply with appropriate federal, state, and local regulations. **The 2018 ACR Digital Mammography Quality Control Manual may be used as a guide in performing many of the tests outlined below** [2]. If an add-on biopsy device is used on a 2-D or digital breast tomosynthesis (DBT) full-field digital mammography system, the 2-D or DBT results obtained following the 2018 ACR Digital Mammography QC Manual or the manufacturer's QC manual may be used to fulfill applicable tests in the sections below.

https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Breast-Stereo-Tomo-Guided-Standard.pdf

# Additional Acceptance Tests

Acceptance tests must include tests performed during the annual performance evaluation and, additionally, should include the following items in both conventional and tomosynthesis modes if applicable:

1. Compliance with applicable local and federal regulatory requirements
2. Compliance with all terms and line items of the purchase agreement or contract (*if the documentation is available to the Qualified Medical Physicist*)
3. Compliance with manufacturer's relevant imaging and safety performance specifications
4. Evaluation of radiation shielding
5. Verify that manufacturer calibrations have been completed
6. Compression thickness indicator accuracy evaluation
7. Evaluation of compression force
8. Tube potential (kVp) accuracy and reproducibility measurements
9. Beam quality assessment (eg, half-value layer measurement)
10. Collimation assessment
11. Ghost image evaluation *(optional)*

**No longer recommended as annual tests**

https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Breast-Stereo-Tomo-Guided-Standard.pdf

# Recommended Annual Tests

1. The performance of each stereotactic/tomosynthesis-guided system must be evaluated at least annually. At a minimum, this evaluation should include the following items in both conventional and tomosynthesis modes if applicable:

   a. Stereotactic/tomosynthesis-guided system unit assembly assessment (ie, unit checklist)
   b. Image quality and artifact evaluation
   c. Assessment of receptor uniformity
   d. Spatial resolution assessment
   e. Automatic exposure control (AEC) system
   f. Average glandular dose measurement
   g. Verification of localization accuracy
   h. Acquisition workstation monitor performance assessment
   i. Evaluation of site's technologist quality control (QC) program
   j. Verify that there are policies in place for the quality, safety, infection control, and patient education programs
   k. Additionally, for breast biopsy equipment with tomosynthesis capabilities, the performance evaluation should include tomosynthesis volume coverage.

**Outlined in 2018 ACR DMQC Manual**

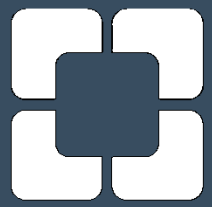
https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Breast-Stereo-Tomo-Guided-Standard.pdf

# ACR Update

- ACR's Breast X-Ray Imaging Physics Subcommittee has launched a revision of the SBBAP QC Manual
- The subcommittee consists of ***the audience's colleagues*** who understand and share the challenges the audience faces and the concerns they have
- AAPM Annual Meeting will include another brief update from Bill Geiser during the ACR Activities session

# References


- Hendrick RE, Dershaw D., et al.” Stereotactic Breast Biopsy Quality Control Manual”. Reston, Va: American College of Radiology; 1999
- L. Grimm, “Clinical Benefits of Tomosynthesis Guided Breast Biopsy”, Hologic Inc. (2018)
- “Affirm Prone Biopsy System Service Manual”, MAN-04482 Rev 004 (p93), Hologic Inc.
- JJ Carret al, “Stereotactic localization of breast lesions: How it works and methods to improve accuracy”. RadioGraphics 21, p463–473 (2001)
- I. Reiser, “Physics of stereo vs. tomosynthesis-guided breast biopsy”, 2020 AAPM Annual Meeting, AAPM Virtual Library video and handout (https://www.aapm.org/education/VL/vl.asp?id=14380)
- ACR-AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Stereotactic / Tomosynthesis-Guided Breast Biopsy Systems, 2020 (CSC/BOC) (https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Breast-Stereo-Tomo-Guided-Standard.pdf)
- A. Kerger, “A Clinical Perspective on DBT-Guided Stereotactic Biopsy”, 2017 AAPM Spring Clinical Meeting, AAPM Virtual Library video and handout (https://www.aapm.org/education/VL/vl.asp?id=11839)
- C. Rochat, G. Baird, et al., “Digital Mammography Stereotactic Biopsy versus Digital Breast Tomosynthesis-guided Biopsy”, Radiology 294 (3), p518-527 (2020)



Cleveland Clinic

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