Service Technical Bulletin

CTB-00434

Date: October 16, 2017

Author: Tushita Patel / Service Engineering

Product: Dimensions **Subsystem:** System

Subject: Collimation Assessment QC in Tomo Mode

Purpose

Provide instructions to the physicist for correctly measuring the alignment of the x-ray field to the image receptor in tomo mode with software versions 1.9 and 2.0.

Scope

Applicable to Selenia Dimensions systems running software version 1.9 and 3Dimensions systems running software versions 2.0.

Reason

During tomo acquisitions with the 18 x 24 cm paddle, the collimation size for the x-ray field is 18 x 29 cm. In previous software versions, the light field before the exposure also had the same 18 x 29 cm collimation size. Since the reconstructed image only shows the 18 x 24 cm area covered by the 18 x 24 cm paddle, placement of tissue at the edges of the 29 cm dimension will result in tissue cutoff in the reconstructed volume. If the technologist uses the 18 x 29 cm light field as a reference, tissue will be incorrectly placed at the extremes of the 29 cm width of the detector, leading to missed tissue and patient recalls.

With software versions 1.9 and 2.0, updates have been made so that the light field in tomo mode with the 18 x 24 cm paddle is representative of tissue coverage in the reconstructed volume, not the 18 x 29 cm area that is exposed in the projections. Before the acquisition, the light field shows an 18 x 24 cm area, and during the x-ray exposures, the system reverts to an 18 x 29 cm collimation for the x-ray field. The purpose of the software change was to ensure that the technologist would correctly place the breast within the 18 x 24 cm area to prevent tissue cutoff in the final reconstruction.

This update was meant to only be applied where the 18 x 24 cm paddle is used in clinical views and not to tomo QC views. However, with the current software version, all tomo views using the 18 x 24 cm paddle (clinical and QC) use

the 18 x 24 cm light field instead of the 18 x 29 cm light field before the exposures. As a result, it will appear as if the system does not pass the collimation assessment test that is outlined for tomo in the Hologic QC manual.

Instructions

Perform the X-ray Field to Image Receptor Alignment test for tomo using the following instructions. These instructions will only apply until a software change is made to modify the light field collimation to 18 x 29 cm both before and during the tomo QC view acquisitions with the 18 x 24 cm paddle.

Test Procedure

Note
The x-ray field to light field alignment should only be tested for the 24 x 29 cm collimation as is described in the QC manual since the offset determined from this section of the test will be the same for all other collimation sizes.

1. Select the **Zero-Degree Tomo** view (Tomosynthesis Option). Add the view if necessary.
2. Install the 24 x 29 cm flat compression paddle.

Note
Since the 18 x 24 cm and 24 x 29 cm paddles have the same x-ray field collimation size in the 29 cm dimension (left and right edge) for tomo views, the 24 x 29 cm collimation will be used to check alignment in the 29 cm dimension for the 18 x 29 cm tomo x-ray field.

3. Place two attenuators directly on the detector surface, one on the left edge and one on the right edge of the detector.
4. Turn the collimator light ON and move the two attenuators inside the light field with one edge of each attenuator just touching the edge of the light field (middle of the penumbra).
5. Move the compression paddle 4.2 cm from the breast platform as indicated by the thickness display on the compression device.
6. Make sure that the collimation size displayed on the tube head is correct.

7. Acquire a manual exposure using the following techniques:

Table 1: Collimation Assessment Exposure Techniques (Tomosynthesis Option)

Mode	kVp	mAs	Filter	Focal Spot
Manual	25	30	Al	Large

8. Click the **Accept** button to accept the image in the Procedure screen of the Acquisition Workstation display.
9. Add another **Zero-Degree Tomo** view and select the view.
10. Install the 18 x 24 cm flat compression paddle.
11. Place two attenuators directly on the detector surface, one on the chest wall side and one on the anterior side of the detector.
12. Turn the collimator light ON and move the two attenuators inside the light field with one edge of each attenuator just touching the edge of the light field (middle of the penumbra) on the anterior and chest sides.

Note
The light field will show the 18 x 24 cm area that will be presented in the final reconstructed volume, not the 18 x 29 cm collimation that will actually be used during imaging. This portion of the test should be performed to check the x-ray field to image receptor alignment in the 18 cm direction alone.

13. Move the compression paddle 4.2 cm from the breast platform as indicated by the thickness display on the compression device.
14. Make sure that the collimation size displayed on the tube head is correct.
15. Acquire a manual exposure using the techniques from Table 1.
16. Click the **Accept** button to accept the image in the Procedure screen of the Acquisition Workstation display.

Data Analysis and Interpretation

1. Select the **Zero-Degree Tomo** thumbnail image that corresponds to the 24 x 29 cm compression paddle from the Procedure screen on the Acquisition Workstation to display in the Preview screen. This image will be used to measure the alignment in the 29 cm direction for the 18 x 29 cm tomo x-ray field size.
2. The edges of the preview image represent the boundaries of the image receptor. Use the distance-measuring tool to measure the two distances

from the edge of the image to the inner edge of each attenuator in the preview window and record the numbers as "Preview Measurement" in the record form for the 18 x 29 cm left and right edges. Start from the edge of the image moving inwards to assure that the measurement numbers will be displayed on the image window.

3. Correct the "Preview Measurements" by multiplying the displayed distance by the f(ERMF) factor to project the measurement on the plane of the attenuator. The f(ERMF) factor can be computed as f(ERMF) = (67.5 - height) * ERMF / 70.0, where "height" is the distance between the top of the breast support platform and the bottom of the attenuator and ERMF = 1.073 by default or 1.0 if changed by Field Service on customer request.
4. Measure the physical width of each attenuator at the direction of the measurement in the Preview screen for the left and right edges. Subtract the recorded "f(ERMF) Corrected" number from the physical width of the attenuator, maintaining the sign. Record the results as "Attenuator Difference" in the record form under the 18 x 29 cm collimation size for the left and right edges.
5. Select the **Zero-Degree Tomo** thumbnail image that corresponds to the 18 × 24 cm compression paddle. Repeat Step 2 through Step 4 to check the alignment at the chest and anterior edges (18 cm dimension). Record the results in the record form under the 18 x 29 cm collimation size for the anterior and chest edges.
6. Project the attenuator difference to the image receptor plane by multiplying "Attenuator Difference" by the geometric magnification factor f(geom) = 70.0 / (67.5 - height) where "height" is the distance between the top of the breast support platform and the bottom of the attenuator. Add the x-ray to light field deviation for each edge as computed in Section 3.2.6.1 of the Hologic QC manual (MAN-03076). Record the results as "Total Deviation" in the record form.
7. Calculate the % of SID deviation, maintaining the sign, and record the results in the record form.

Recommended Performance Criteria and Corrective Action

The x-ray field must not extend by more than 2% of the SID at any of the four sides of the image receptor.

The radiation field must extend beyond the edge of the digital image receptor on the chestwall side of the detector.

If the recommended performance criteria are not met, the source of the problem must be identified and corrective action must be taken within thirty days of the test date.