DICOM Correction Proposal Form

STATUS	Final Text
Date of Last Update	2014/09/04
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Correction Number CP-1032
Log Summary: Fix Position Angle sign inconsistency in Mammography Image
Name of Standard PS 3.3 – 2013 + sup165_ft

Rationale for Correction:

The text in the attribute description and the subsequent diagram for the Primary Positioner Angle seem to contradict each other with respect to which direction of rotation is positive.

The left diagram seems to be drawn from the view of the patient facing into the page. (Or maybe I'm mis-remembering my drafting conventions for placing views).

Based on feedback that people were having trouble seeing the issue here is a more detailed explanation:

The vertical component of the gantry has been omitted in the left view so it is unclear which way the view is facing.

By the US/UK "third-angle" convention for orthgraphic views, the left view is looking from the patient/operator side of the gantry and the vertical is behind it. In that case, the labelling of both views are consistent with a right-handed coordinate system and both rotation directions follow the right hand rule. But then the attribute text for Primary Angle seems to conflict by saying that motion from the patient's right to vertical is positive.

By the European/Asian "first-angle" convention for orthographic views, the left view is looking from the back of the gantry and the patient is behind the gantry facing us. In that case, the labelling of both views are consistent with a left-handed coordinate system and both rotation directions follow the left hand rule.

Since DICOM convention is right-handed coordinate systems, we should either fix/clarify the attribute text, or clarify that Mammo uses a left-handed coordinate system. In either case it would help to add the vertical component and/or patient to the diagram in at least the left view.

DICOM WG 15 notes: The referenced Figure C.8-8 was not intended to represent Positioner Primary Angle, but rather to clarify Distance Source to Detector and Distance Source to Patient. Those are the only attributes that reference C.8.11.7.1.1.

Digital mammography modality manufacturers interpreted the Positioner Primary Angle description differently, so there is a large installed base of clinical digital mammography image data where the sign of the value for the same C-arm position differs depending on the manufacturer.

WG 15 addressed this sign inconsistency in Positioner Primary Angle values in Supplement 165 in the Breast Projection X-Ray Image IOD (for digital breast tomosynthesis projection images), and proposes to apply the same clarification to the Digital Mammography X-Ray Image IOD (for conventional 2D mammography images) and the Breast Tomosynthesis Acquisition module of the Breast Tomosynthesis Image IOD (for digital breast tomosynthesis projection image characteristics included for reference with reconstructed slices).

Correction Wording:

Amend PS 3.3, C.8.11.7 Mammography Image module as follows

C.8.11.7 Mammography Image Module

Table C.8-74 contains IOD Attributes that describe a Digital Mammography X-Ray Image including its acquisition and positioning.

Table C.8.-74. Mammography Image Module Attributes

…			
Positioner Primary Angle	(0018,1510)	3	**Signed ~~P~~p**osition in degrees of the X-Ray beam vector in the coronal anatomical plane as if the patient were standing **facing the equipment** where **~~movement of the X-Ray source from right to vertical is~~**

			~~positive, and~~ vertical is zero.
Positioner Primary Angle Direction	**(0018,9559)**	**3**	**The interpretation of the sign of the Positioner Primary Angle (0018,1510).** **Enumerated Values:** **CW = Clockwise. Positioner Primary Angle movement is positive when movement is from vertical to the patient's right (with patient standing, facing equipment).** **CC = Counter-clockwise. Positioner Primary Angle is positive when movement is from vertical to the patient's left (with patient standing, facing the equipment).** **See C.8.X.2.1.** <in sup165_ft, X not yet assigned>
Positioner Secondary Angle	(0018,1511)	3	Position in degrees of the X-Ray beam vector in the sagittal anatomical plane as if the patient were standing where movement of the X-Ray source from anterior to posterior is positive, and vertical is zero.
…			

C.8.11.7.1 Mammography Image Attribute Descriptions

C.8.11.7.1.1 Mammography X-Ray Beam and X-Ray Beam Vector Definition

Figure C.8.11.7-1 shows the X-Ray beam for a digital mammography system. The X-Ray beam vector is defined from the Focal Spot to the center of the chest wall line of the Image Detection device.

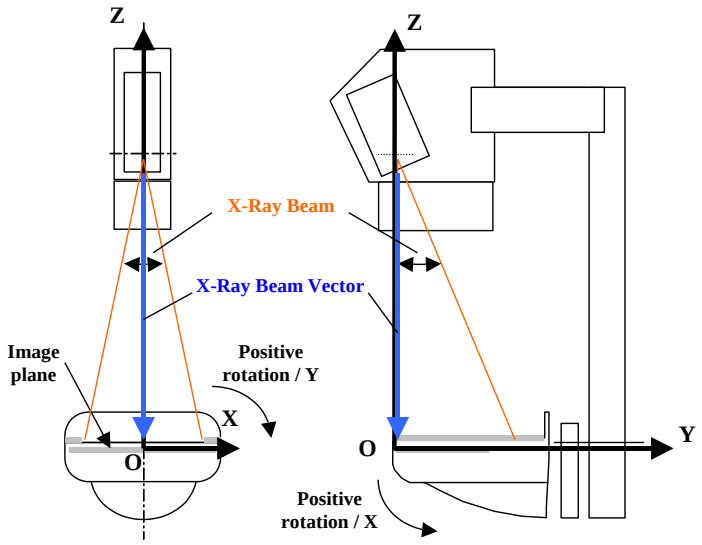

Figure C.8.11.7-1 X-Ray Beam for a Digital Mammography System

Amend PS 3.3, C.8.21.3.4 Breast Tomosynthesis Acquisition module as follows

C.8.21.3.4 Breast Tomosynthesis Acquisition Module

This section describes the Breast Tomosynthesis Acquisition Module.

Table C.8.21.3.4-1. Breast Tomosynthesis Acquisition Module Attributes

Attribute Name	Tag	Type	Attribute Description
X-Ray 3D Acquisition Sequence	(0018, 9507)	1	Each Item represents an acquisition context related to one or more reconstructions. The values of the Acquisition Index (0020,9518) attribute may be used as index in this sequence. One or more Items shall be included in this sequence.
…			
>Include Table C.8.21.3.1.3-1 "X-Ray 3D General Positioner Movement Macro Attributes"			
…			
>Per Projection Acquisition Sequence	(0018,9538)	1	Sequence containing detailed acquisition context of each individual projection used in this acquisition context. One or more Items shall be included in this sequence.
>>Include Table C.8.21.3.1.2-1 "X-Ray 3D General Per Projection Acquisition Macro Attributes"			
>>Positioner Primary Angle	(0018,1510)	1	**Signed ~~P~~p**osition in degrees of the X-Ray beam vector in the coronal anatomical plane as if the patient were standing **facing the equipment** where ~~**movement of the X-Ray source from right to vertical is positive, and**~~ vertical is zero.
>>Positioner Primary Angle Direction	**(0018,9559)**	**3**	**The interpretation of the sign of the Positioner Primary Angle (0018,1510).** **Enumerated Values:** **CW = Clockwise. Positioner Primary Angle movement is positive when movement is from vertical to the patient's right (with patient standing, facing equipment).** **CC = Counter-clockwise. Positioner Primary Angle is positive when movement is from vertical to the patient's left (with patient standing, facing the equipment).** **See C.8.X.2.1.** <in sup165_ft, X not yet assigned>
>>Positioner Secondary Angle	(0018,1511)	1C	Position in degrees of the X-Ray beam vector in the sagittal anatomical plane as if the patient were standing where movement of the X-Ray source from anterior to posterior is positive, and vertical is zero.

			Required if secondary positioner was used during acquisition.
>>Exposure Time in ms	(0018,9328)	1	Duration of X-Ray exposure in milliseconds. See C.8.7.2.1.1.
…			

Referenced figure and its context from sup165_ft:

C.8.X.2 Breast X-Ray Positioner Macro

Table C.8.X.2-1 specifies the Attributes of the Breast X-Ray Positioner Functional Group macro.

…

C.8.X.2.1 Breast X-Ray Positioner Attribute Descriptions

Figure C.8.X.2-1 illustrates the Defined Terms for Positioner Primary Angle Direction (0018,9559), indicating which C-arm movement direction defines a positive value for Positioner Primary Angle (0018,1510).

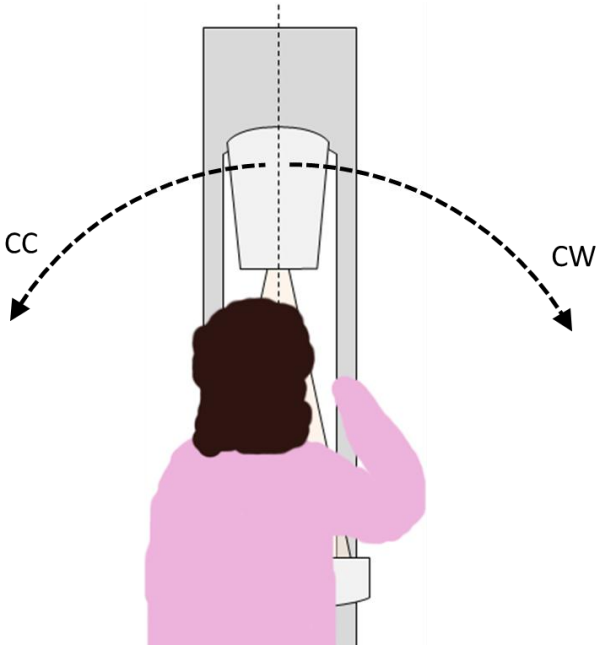

Figure C.8.X.2-1
Illustration of Positioner Primary Angle Direction