DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2014/04/01
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Correction Number	CP-1285
Log Summary: Add Irradiation Event UID to X-Ray 3D IODs	
Name of Standard PS 3.3, 3.6 2011	
Rationale for Correction: The Irradiation Event UIDs that contributed to the 3D reconstruction would need to be added to the X-Ray 3D IODs. The reason is to have access to the Irradiation Event UIDs directly within the X-Ray 3D image without needing to look into each contributing source object, or when there is no DICOM contributing source at all. There is no one-to-one relationship between the X-Ray 3D Instance and the Irradiation Event. Indeed, the 3D object can be reconstructed from several projection instances issued from different Irradiation Events. Because of it, the Irradiation Event Identification Macro (Table C.7.6.16-19) at top level of the X-Ray 3D IOD is not appropriate for this purpose because only a single Item is allowed in the Irradiation Event Identification Sequence (0018, 9477). Similarly, the Irradiation Event UID (0008,3010) at top level is not appropriate neither because its multiplicity is 1. One approach could be to include the Irradiation Event UIDs in the macros that contain information of the contributing sources. However, the X-Ray 3D IOD may be created from data internal to the X-Ray equipment and not from DICOM Instances, and in such case the contributing sources macros would not be present. Therefore, the Irradiation Event UIDs should be included in a new sequence at top level, in the “X-Ray 3D Image Module” (table C.8.21.1-1) which is common to all X-Ray 3D IODs. This new sequence would contain as many items as Irradiation Events contributing to the 3D reconstruction. Additionally, in some cases like Breast Tomosynthesis the reconstruction can be made from multiple projections within the same acquisition context, each projection having its own Irradiation Event UID. In this case, there is an interest to relate each Irradiation Event UID to the corresponding projection. For this purpose, the Irradiation Event UID should be also included in the “Breast Tomosynthesis Acquisition Module” (Table C.8.21.3.4-1) in the Per Projection Acquisition Sequence (0018,9538) of the X-Ray 3D Acquisition Sequence (0018,9507). This CP also adds the cumulative Entrance Dose in mGy (0040,8302) and Organ Dose (0040,0316) to the X-Ray 3D Acquisition Sequence (0018,9507) of the “Breast Tomosynthesis Acquisition Module”.	
Correction Wording:	

Amend PS 3.3 C.8.21.1:

C.8.21.1 X-Ray 3D Image Module

This section describes the X-Ray 3D Image Module. Table C.8.21.1-1 contains IOD Attributes that describe a X-Ray 3D Image by specializing Attributes of the General Image and Image Pixel Modules, and adding additional Attributes.

Table C.8.21.1-1
X-Ray 3D IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…			
Presentation LUT Shape	(2050,0020)	1	Specifies a predefined identity transformation for the Presentation LUT such that the output of all grayscale transformations, if any, are defined to be in P-Values. Enumerated Values: IDENTITY = output is in P-Values
Source Irradiation Event Sequence	**(0008,3011)**	**3**	**The set of Irradiation Events that were produced in this acquisition context.** **See C.8.21.1.1.2** **One or more Items shall be included in this Sequence.**
>Irradiation Event UID	**(0008,3010)**	**1**	**Unique identification of the irradiation event(s) associated with the acquisition of this image.**

C.8.21.1.1 X-Ray 3D Image Module Attribute Description

…

C.8.21.1.1.2 Source Irradiation Event Sequence

The Source Irradiation Event Sequence (0008,3011) contains the Irradiation Event UIDs of all the original projection images that were used in the 3D reconstruction process of this X-Ray 3D Image, regardless whether the projection images are encoded as DICOM images or not. Therefore, it allows relating the reconstructed X-Ray 3D image to its contributing irradiation events contained in the Radiation Dose SR.

The equipment generating the projection images associates these images to one or more Irradiation Event UIDs. All these UIDs are then included in the Radiation Dose SR as well as in the appropriate projection DICOM images. An X-Ray 3D image reconstructed from a set of projection images will include those Irradiation Event UIDs of the images that participated to that 3D reconstruction. In case the projection images are not encoded as DICOM images, the X-Ray equipment is responsible for including the contributing Irradiation Event UIDs in any further X-Ray 3D image reconstructed on that equipment.

An X-Ray 3D image derived from one or more X-Ray 3D images will include in the derived image all the Irradiation Event UIDs of the source images.

Amend PS 3.3 C.8.21.3.4:

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.
…			
>Half Value Layer	(0040,0314)	1	The thickness of Aluminum in mm required to reduce the X-Ray Output (0040,0312) by a factor of two. Note: This value may be a calibrated value rather than measured during the exposure.
>Organ Dose	**(0040,0316)**	**3**	**Organ dose value measured in dGy representing the collective total for all acquired frames described in this sequence item.** **Note: This may be an estimated value.**
>Entrance Dose in mGy	**(0040,8302)**	**3**	**Entrance dose value measured in mGy at the surface of the patient representing the collective total for all acquired frames described in this sequence item.** **Note: This may be an estimated value based on assumptions about the patient's body size and habitus.**
…			
>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.
…			
>>Entrance Dose in mGy	(0040,8302)	3	Average entrance dose value measured in mGy at the surface of the patient during the acquisition of this projection image. Note: This may be an estimated value based on assumptions about the patient's body size and habitus.
>>Include Table 10-23 'Exposure Index Macro'			

>>Irradiation Event UID	**(0008,3010)**	**3**	**Unique identification of the irradiation event(s) associated with the acquisition of this image.**

Amend PS 3.6, Section 6

Tag	Name	Keyword	VR	VM
(0008,3011)	**Source Irradiation Event Sequence**	**SourceIrradiationEventSequence**	**SQ**	**1**