

DICOM Correction Item

Correction Number		CP-1069
Log Summary: Inconsistent capitalization of X-Ray code meaning in radiation dose reports		
Type of Modification	Name of Standard	
Correction	PS 3.16 2009	
<p>Rationale for Correction</p> <p>The Projection X-Ray and CT dose reports are inconsistent in their capitalization of “X-Ray” versus “X-ray” in the code meaning of various content items.</p> <p>Since PS 3.3 and PS 3.6 have long since standardized (with the very occasional exception) on the usage of the capitalized form (“X-Ray”), change PS 3.16 to that form throughout, including various other code meanings in other context groups.</p> <p>This creates consistency of case with the keywords defined in PS 3.6, and defines consistency of case for code meaning strings in PS 3.16.</p>		
Sections of documents affected		
PS 3.16		
Correction Wording:		

Amend PS 3.16 templates:

X-RAY RADIATION DOSE SR IOD TEMPLATES

The templates that comprise the X-Ray Radiation Dose SR are interconnected as in Figure A-11.

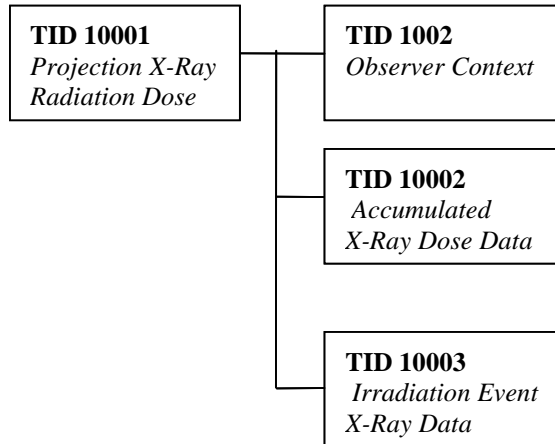


Figure A-11: X-Ray Radiation Dose SR IOD Template Structure

TID 10001 Projection X-Ray Radiation Dose

This template defines a container (the root) with subsidiary content items, each of which represents a single projection X-Ray irradiation event entry or plane-specific dose accumulations. There is a defined recording observer (the system or person responsible for recording the log, generally the system). A Biplane irradiation event will be recorded as two individual events, one for each plane. Accumulated values will be kept separate for each plane.

**TID 10001
PROJECTION X-RAY RADIATION DOSE
Type: Extensible**

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	M		DT (113704, DCM, "Projection X-Ray") DT (P5-40010, SRT, "Mammography")
3	>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	1	M		DCID (3629) Procedure Intent
4	>		INCLUDE	DTID (1002) Observer Context	1-n	M		
5	>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	M		DCID (10000) Scope of Accumulation
6	>>	HAS PROPERTIES	UIDREF	DCID (10001) UID Types	1	M		
7	>	CONTAINS	INCLUDE	DTID (10002) Accumulated X-Ray	1	MC	IFF Single Plane system	\$Plane = EV (113622, DCM, "Single Plane")

				Dose				
8	>	CONTAINS	INCLUDE	DTID (10002) Accumulated X-Ray Dose	1	MC	IFF Biplane system	\$Plane = EV (113620, DCM, "Plane A")
9	>	CONTAINS	INCLUDE	DTID (10002) Accumulated X-Ray Dose	1	MC	IFF Biplane system	\$Plane = EV (113621, DCM, "Plane B")
10	>	CONTAINS	INCLUDE	DTID (10003) Irradiation Event X- Ray Data	1-n	M		
11	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		
12	>	CONTAINS	IMAGE	EV (121342, DCM, "Dose Image")	1-n	U		
13	>	CONTAINS	INCLUDE	DTID (1020) Person Participant	1	U		\$PersonProcedureRole= EV (113850, DCM, "Irradiation Authorizing")
14	>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1-n	M		DCID (10020) Source of Projection X-Ray Dose Information

Content Item Descriptions

Row 4	The observer context may include both a Person Observer identification, as well as the identity of the equipment providing the values for the irradiation event (Device Observer identification), if not inherited.
Row 10	Details of the underlying irradiation events. If Row 6 has a value of "MPPS Content" then a TID 10003 item will be generated for each item in the MPPS Exposure Dose Sequence (0040,030E).
Row 12	The Dose Image references a graphic representation of the radiation dose distribution. This may be a Secondary Capture scan of a dosimetry film.
Row 13	The physician responsible for determining that the irradiating procedure was appropriate for the indications. The value may come from Requesting Physician (0032,1032), Requesting Physician Identification Sequence (0032,1031) or somewhere else based on hospital policies.
Row 14	The primary source of information from which this dose object was constructed.

TID 10002 Accumulated X-Ray Dose

This general template provides detailed information on projection X-Ray dose value accumulations over several irradiation events from the same equipment (typically a study or a performed procedure step).

Parameter Name	Parameter Usage
\$Plane	Coded term identifying to which acquisition plane the encoded information belongs.

**TID 10002
ACCUMULATED X-RAY DOSE
Type: Extensible**

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		CONTAINER	EV (113702, DCM, "Accumulated X- Ray Dose Data")	1	M		

2	>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	M		\$Plane
3	>	CONTAINS	CONTAINER	EV (122505, DCM, "Calibration")	1-n	MC	IFF Calibration Data is available	
4	>>	HAS CONCEPT MOD	CODE	EV (113794, DCM, "Dose Measurement Device")	1	M		DCID (10010) Dose Measurement Devices
5	>>	CONTAINS	DATETIME	EV (113723, DCM, "Calibration Date")	1	M		
6	>>	CONTAINS	NUM	EV (122322, DCM, "Calibration Factor")	1	M		Units = EV (1, UCUM, "no units")
7	>>	CONTAINS	NUM	EV (113763, DCM, "Calibration Uncertainty")	1	M		Units = EV (% , UCUM, "Percent")
8	>>	CONTAINS	TEXT	EV (113724, DCM, "Calibration Responsible Party")	1	M		
9	>	CONTAINS	INCLUDE	DTID (10004) Accumulated Projection X-Ray Dose	1	MC	XOR row 11, IFF TID (10001) Row 2 = (113704, DCM, "Projection X-Ray")	
10	>	CONTAINS	INCLUDE	DTID (10005) Accumulated Mammography X- Ray Dose	1	MC	XOR row 10, IFF TID (10001) Row 2 = (P5- 40010, SRT, "Mammography")	

Content Item Descriptions

Row 5	Date that the calibration of the equipment's dose indicators was performed
Row 6	Factor by which the measured dose area product total was multiplied to obtain the Dose Area Product Total (Row 10).
Row 7	Value range from 0 to 100 percent. Uncertainty of the 'actual' value expressed as +/- of the mean.
Row 8	Identifies Individual or organization responsible for calibration

TID 10003 Irradiation Event X-Ray Data

This template conveys the dose and equipment parameters of a single irradiation event.

An irradiation event is the occurrence of radiation being applied to a patient in single continuous time-frame between the start (release) and the stop (cease) of the irradiation. The irradiation event is the "smallest" information entity to be recorded in the realm of Radiation Dose reporting. Individual Irradiation Events are described by a set of accompanying physical parameters that are sufficient to understand the "quality" of irradiation that is being applied. This set of parameters may be different for the various types of equipment that are able to create irradiation events. Any automatic on-off switching of the irradiation source during the event shall not be treated as separate events, rather the event includes the time between start and stop of irradiation as triggered by the user. E.g., a pulsed fluoro X-Ray acquisition shall be treated as a single irradiation event.

As described in Section 6.2.4, measurement concepts may be post-coordinated, even though not explicitly specified in the Template. In particular, post-coordination using modifier concept (121401, DCM, "Derivation"), with modifier values drawn from CID 10009 Measured/Calculated would be appropriate to encode indications of measured or of calculated values.

TID 10003
IRRADIATION EVENT X-RAY DATA
Type: Extensible

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113706, DCM, "Irradiation Event X-Ray Data")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	M		DCID (10003) Equipment Plane Identification
3	>	CONTAINS	DATETIME	DT (111526, DCM, "Date Time Started")	1	M		
4	>	CONTAINS	CODE	EV (113721, DCM, "Irradiation Event Type")	1	M		DCID (10002) Irradiation Event Types
5	>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	1	U		
6	>	CONTAINS	CODE	EV (T-D0005, SRT, "Anatomical structure")	1	U		
7	>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	1	UC	If anatomy is bi-lateral	DCID (244) Laterality
8	>	CONTAINS	TEXT	EV (113780, DCM, "Reference Point Definition")	1	MC	IF Row 13 or Row 14 is present and Row 9 is not present	
9	>	CONTAINS	CODE	EV (113780, DCM, "Reference Point Definition")	1	MC	IF Row 13 or Row 14 is present and Row 8 is not present	DCID (10025) Radiation Dose Reference Points
10	>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	M		
11	>	CONTAINS	NUM	EV (122130, DCM, "Dose Area Product")	1	MC	IFF TID (10001) Row 2 = (113704, DCM, "Projection X-Ray")	Units = EV (Gym2, UCUM, "Gym2")
12	>	CONTAINS	NUM	EV (111631, DCM, "Average Glandular Dose")	1	MC	IFF TID (10001) Row 2 = (P5-40010, SRT, "Mammography")	Units = EV (dGy, UCUM, "dGy")
13	>	CONTAINS	NUM	EV (113738, DCM, "Dose (RP)")	1	MC	IFF TID (10001) Row 2 = (113704, DCM, "Projection X-Ray") AND any of the values of TID (10001) Row 14 are not (113858, DCM, "MPPS Content")	Units = EV (Gy, UCUM, "Gy")
14	>	CONTAINS	NUM	EV (111636, DCM, "Entrance Exposure at RP")	1	MC	IFF TID (10001) Row 2 = (P5-40010, SRT, "Mammography")	Units = EV (mGy, UCUM, "mGy")
15	>	CONTAINS	NUM	EV (112011, DCM, "Positioner Primary Angle")	1	UC	XOR Row 19	Units = EV (deg, UCUM, "°")
16	>	CONTAINS	NUM	EV (112012, DCM, "Positioner Secondary Angle")	1	UC	XOR Row 19	Units = EV (deg, UCUM, "°")

Inconsistent capitalization of X-Ray code meaning in radiation dose reports

Status: Final Text

17	>	CONTAINS	NUM	EV (113739, DCM, "Positioner Primary End Angle")	1	UC	IFF Row 4 value = (113613, DCM, "Rotational Acquisition")	Units = EV (deg, UCUM, "°")
18	>	CONTAINS	NUM	EV (113740, DCM, "Positioner Secondary End Angle")	1	UC	IFF Row 4 value = (113613, DCM, "Rotational Acquisition")	Units = EV (deg, UCUM, "°")
19	>	CONTAINS	NUM	EV (113770, DCM, "Column Angulation")	1	UC	XOR Rows 15,16	Units = EV (deg, UCUM, "°")
20	>	CONTAINS	NUM	EV (113790, DCM, "Collimated Field Area")	1	U		Units = EV (m2, UCUM, "m^2")
21	>	CONTAINS	CONTAINER	EV (113771, DCM, "X-Ray Filters")	1-n	U		
22	>>	CONTAINS	CODE	EV (113772, DCM, "X-Ray Filter Type")	1	U		DCID (10007) X-Ray Filter Types
23	>>	CONTAINS	CODE	EV (113757, DCM, "X-Ray Filter Material")	1	U		DCID (10006) X-Ray Filter Materials
24	>>	CONTAINS	NUM	EV (113758, DCM, "X-Ray Filter Thickness Minimum")	1	U		Units = EV (mm, UCUM, "mm")
25	>>	CONTAINS	NUM	EV (113773, DCM, "X-Ray Filter Thickness Maximum")	1	U		Units = EV (mm, UCUM, "mm")
26	>	CONTAINS	CODE	EV (113732, DCM, "Fluoro Mode")	1	UC	IFF Row 4 value = (P5-06000, SRT, "Fluoroscopy")	DCID (10004) Fluoro Modes
27	>	CONTAINS	NUM	EV (113791, DCM, "Pulse Rate")	1	MC	IFF Row 26 value = (113631, DCM, "Pulsed")	Units = EV ((pulse)/s, UCUM, "pulse/s")
28	>	CONTAINS	NUM	EV (113768, DCM, "Number of Pulses")	1	MC	IFF Row 26 value = (113631, DCM, "Pulsed")	Units = EV (1, UCUM, "no units")
29	>>	HAS CONCEPT MOD	CODE	EV (121401, DCM, "Derivation")	1	MC	IFF count of pulses in Row 28 is estimated	EV (R-10260, SRT, "Estimated")
30	>	CONTAINS	NUM	EV (113733, DCM, "KVP")	1-n	U		Units = EV (kV, UCUM, "kV")
31	>	CONTAINS	NUM	EV (113734, DCM, "X-Ray Tube Current")	1-n	U		Units = EV (mA, UCUM, "mA")
32	>	CONTAINS	NUM	EV (113735, DCM, "Exposure Time")	1	U		Units = EV (ms, UCUM, "ms")
33	>	CONTAINS	NUM	EV (113793, DCM, "Pulse Width")	1-n	U		Units = EV (ms, UCUM, "ms")
34	>	CONTAINS	NUM	EV (113736, DCM, "Exposure")	1-n	U		Units = EV (uAs, UCUM, "uAs")
35	>	CONTAINS	NUM	EV (113766, DCM, "Focal Spot Size")	1	U		Units = EV (mm, UCUM, "mm")
36	>	CONTAINS	NUM	EV (113742, DCM, "Irradiation Duration")	1	U		Units = EV (s, UCUM, "s")
37	>	CONTAINS	NUM	EV (113767, DCM, "Average X-Ray Tube Current")	1	U		Units = EV (mA, UCUM, "mA")
38	>	CONTAINS	CODE	EV (113745, DCM, "Patient Table Relationship")	1	U		DCID (21) Patient Gantry Relationship

39	>	CONTAINS	CODE	EV (113743, DCM, "Patient Orientation")	1	U		DCID (19) Patient Orientation
40	>>	HAS CONCEPT MOD	CODE	EV (113744, DCM, "Patient Orientation Modifier")	1	M		DCID (20) Patient Orientation Modifier
41	>	CONTAINS	NUM	DCID (10008) Dose Related Distance Measurements	1-n	U		Units = EV (mm, UCUM, "mm")
42	>	CONTAINS	NUM	EV (113754, DCM, "Table Head Tilt Angle")	1	U		Units = EV (deg, UCUM, "°")
43	>	CONTAINS	NUM	EV (113755, DCM, "Table Horizontal Rotation Angle")	1	U		Units = EV (deg, UCUM, "°")
44	>	CONTAINS	NUM	EV (113756, DCM, "Table Cradle Tilt Angle")	1	U		Units = EV (deg, UCUM, "°")
45	>	CONTAINS	CODE	EV (123014 , DCM, ("Target Region"))	1	M		DCID (4031) Common Anatomic Regions
46	>	CONTAINS	CODE	EV (111632, DCM, "Anode Target Material")	1	U		DCID (10016) Anode Target Material
47	>	CONTAINS	NUM	EV (111633, DCM, "Compression Thickness")	1	U		Units = (mm, UCUM, "millimeter")
48	>	CONTAINS	NUM	EV (111634, DCM, "Half Value Layer")	1	U		Units = (mm, UCUM, "millimeter")
49	>	CONTAINS	CODE	EV (111635,DCM, "X-Ray Grid")	1-n	U		DCID (10017) X-Ray Grid
50	>	CONTAINS	INCLUDE	DTID (4007) Mammography CAD Breast Composition	1	U		
51	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		
52	>	CONTAINS	INCLUDE	DTID (1020) Person Participant	1-n	U		\$PersonProcedureRole = EV (113851, DCM, "Irradiation Administering")
53	>	CONTAINS	INCLUDE	DTID (1021) Device Participant	1	M		\$DeviceProcedureRole = EV (113859, DCM, "Irradiating Device")
54	>	CONTAINS	IMAGE	EV (113795, DCM, "Acquired Image")	1-n	MC	IFF Image Object is created for this irradiation event	

Content Item Descriptions

Row 3	Provide DateTime the application of X-Ray started. This shall correspond to the start of the first irradiation in the Irradiation Event, which defines the starting point for the calculation of Row 36 "Irradiation Duration".
Row 8	A text definition of the Reference Point (RP) used for RP-related dose values.
Row 9	A coded definition of the Reference Point (RP) used for RP-related dose values
Row 10	If the image generating entity does not assign a DICOM UID to the irradiation event (e.g., for non-digital imaging equipment), the application generating this report shall assign a UID.
Row 13	Dose applied by this irradiation event, relative to defined reference point.
Row 15	Angle in patient's "equatorial" plane (LAO to RAO). For dynamically changing angle during the event, the start value shall be provided. Equivalent to (0018,1510) in an image instance.

Row 16	Angle in patient's "sagittal" plane (CRAN to CAUD). For dynamically changing angle during the event, the start value shall be provided. Equivalent to (0018,1511) in an image instance.
Row 17	In case of motion during irradiation event, Positioner Primary ending angle
Row 18	In case of motion during irradiation event., Positioner Secondary ending angle
Row 19	Column device Angle in equipment based coordinates
Row 20	Collimated area at the receptor plane.
Row 21	If one or more Filter(s) were applied during this irradiation event
Row 28	If a precise count of pulses is not available, an estimated number shall be provided, and the Row 29 Concept Modifier shall indicate "Estimated"
Row 30	KVP value as measured/recorded by system, either as a single mean value, or as multiple values. If multiple values are provided, their number shall match the value in Row 28 "Number of Pulses".
Row31	Tube current as measured/recorded by system, either as a single mean value, or as multiple values. If multiple values are provided, their number shall match the value in Row 28 "Number of Pulses".
Row 32	Exposure time as measured/recorded by the system.
Row 33	Pulse width as measured/recorded by the system, either as a single total value, or as multiple values. If multiple values are provided, their number shall match the value in Row 28 "Number of Pulses".
Row 34	Exposure as measured/recorded by system, either as a single total value, or as multiple values. If multiple values are provided, their number shall match the value in Row 28 "Number of Pulses". The Exposure will be affected by the shape of the pulse and other factors, and may not be a simple multiplication of tube current and exposure time.
Row 45	The target region is the anatomy exposed.
Row 52	People responsible for the administration of the radiation reported in the irradiation event. May include values which would appear in Performing Physicians' Name (0008,1050), Performing Physician Identification Sequence (0008,1052), Operators' Name (0008,1070) and/or Operator Identification Sequence (0008,1072).
Row 53	The device which produced the irradiation in this Irradiation Event. I.e. the X-Ray source.
Row 54	Reference to Image instances created during this event, if any. The UID reference(s) provided here shall be the values at the time the images were initially created. (Note that image UIDs may be changed as the images are managed over a long term.)

TID 10004 Accumulated Projection X-Ray Dose

This general template provides detailed information on projection X-Ray dose value accumulations over several irradiation events from the same equipment (typically a study or a performed procedure step).

**TID 10004
ACCUMULATED PROJECTION X-RAY DOSE**

Type: Extensible

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113722, DCM, "Dose Area Product Total")	1	M		Units = EV (Gym2, UCUM, "Gym2")
2			NUM	EV (113725, DCM, "Dose (RP) Total")	1	MC	IF any of the values of TID (10001) Row 14 are not (113858, DCM, "MPPS Content"). May be present otherwise.	Units = EV (Gy, UCUM, "Gy")
3			NUM	EV (113726, DCM, "Fluoro Dose Area Product Total")	1	MC	IFF TID(10003) Row 4 value = (P5-06000, SRT, "Fluoroscopy") for at least one irradiation event	Units = EV (Gym2, UCUM, "Gym2")

4			NUM	EV (113728, DCM, "Fluoro Dose (RP) Total")	1	MC	IFF TID(10003) Row 4 value = (P5-06000, SRT, "Fluoroscopy") for at least one irradiation event AND any of the values of TID (10001) Row 14 are not (113858, DCM, "MPPS Content").	Units = EV (Gy, UCUM, "Gy")
5			NUM	EV (113730, DCM, "Total Fluoro Time")	1	MC	IFF TID(10003) Row 4 value = (P5-06000, SRT, "Fluoroscopy") for at least one irradiation event.	Units = EV (s, UCUM, "s")
6			NUM	EV (113727, DCM, "Acquisition Dose Area Product Total")	1	M		Units = EV (Gym2, UCUM, "Gym2")
7			NUM	EV (113729, DCM, "Acquisition Dose (RP) Total")	1	MC	IF any of the values of TID (10001) Row 14 are not (113858, DCM, "MPPS Content"). May be present otherwise.	Units = EV (Gy, UCUM, "Gy")
8			NUM	EV (113855, DCM, "Total Acquisition Time")	1	M		Units = EV (s, UCUM, "s")
9			NUM	EV (113731, DCM, "Total Number of Radiographic Frames")	1	U		Units = EV (1, UCUM, "no units")
10			CODE	EV (113780, DCM, "Reference Point Definition")	1	MC	IF Row 2, Row 4 or Row 7 is present and Row 11 is not present.	DCID (10025) Radiation Dose Reference Points
11			TEXT	EV (113780, DCM, "Reference Point Definition")	1	MC	IF Row 2, Row 4 or Row 7 is present and Row 10 is not present.	

Content Item Descriptions

Row 1	Sum of acquisition and fluoroscopy
Row 2	Sum of acquisition and fluoroscopy, relative to reference point.
Rows 3-5	Fluoroscopic component only
Rows 6-8	Acquisition component only
Row 10	A coded definition of the Reference Point (RP) used for RP-related dose values.
Row 11	A text definition of the Reference Point (RP) used for RP-related dose values.

TID 10005 Accumulated Mammography X-Ray Dose

This modality specific template provides detailed information on mammography X-Ray dose value accumulations over several irradiation events from the same equipment (typically a study or a performed procedure step).

TID 10005
ACCUMULATED MAMMOGRAPHY X-RAY DOSE
 Type: Extensible

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (111637, DCM, "Accumulated Average Glandular Dose")	1-2	M		Units = EV (dGy, UCUM, "dGy")
2	>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	1	M		DCID (6022) Side

CT RADIATION DOSE SR IOD TEMPLATES

The templates that comprise the CT Radiation Dose SR are interconnected as in Figure A-12

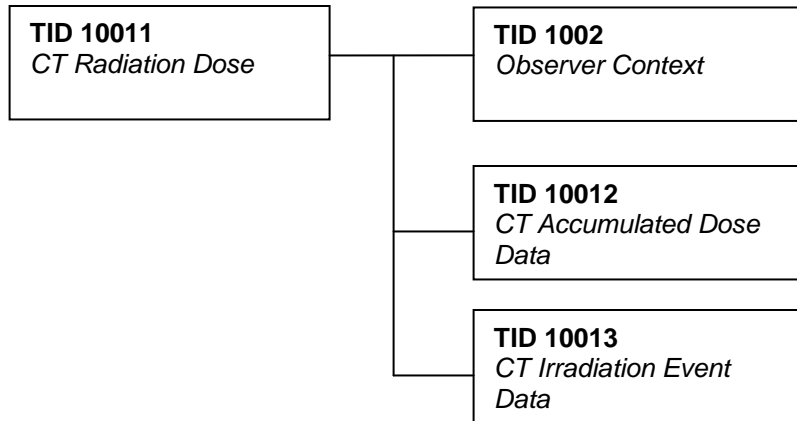


Figure A-12: CT Radiation Dose SR IOD Template Structure

TID 10011 CT Radiation Dose

This template defines a container (the root) with subsidiary content items, each of which corresponds to a single CT ~~X-ray~~X-Ray irradiation event entry. There is a defined recording observer (the system or person responsible for recording the log, generally the system). Accumulated values shall be kept for a whole Study or at least a part of a Study, if the Study is divided in the workflow of the examination, or a performed procedure step. Multiple CT Radiation Dose objects may be created for one Study.

TID 10011
CT RADIATION DOSE
Type: Extensible

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113701, DCM, "X-rayX-Ray Radiation Dose Report")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	M		EV (P5-08000,SRT, "Computed Tomography X-rayX-Ray")
3	>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	1	M		DCID (3629) Procedure Intent
4	>		INCLUDE	DTID (1002) Observer Context	1-n	M		
5	>	HAS OBS CONTEXT	DATETIME	EV (113809, DCM, "Start of X-rayX-Ray Irradiation")	1	M		
6	>	HAS OBS CONTEXT	DATETIME	EV (113810, DCM, "End of X-rayX-Ray Irradiation")	1	M		
7	>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	M		DCID (10000) Scope of Accumulation
8	>>	HAS PROPERTIES	UIDREF	DCID (10001) UID Types	1	M		
9	>	CONTAINS	INCLUDE	DTID (10012) CT Accumulated Dose Data	1	M		
10	>	CONTAINS	INCLUDE	DTID (10013) CT Irradiation Event Data	1-n	M		
11	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		
12	>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1-n	M		DCID (10021) Source of CT Dose Information
13	>	CONTAINS	INCLUDE	DTID (1020) Person Participant	1	U		\$PersonProcedureRole = EV (113850, DCM, "Irradiation Authorizing")

Content Item Descriptions

Row 4	The observer context may include both a Person Observer identification, as well as the identity of the equipment providing the values for the irradiation event (Device Observer identification), if not inherited.
Row 5	Start, Date Time of the first CT Irradiation Event of the accumulation
Row 6	End, Date Time of the last CT Irradiation Event of the accumulation
Row 12	The primary source of information from which this dose object was constructed.
Row 13	The physician responsible for determining that the irradiating procedure was appropriate for the indications. The value may come from Requesting Physician (0032,1032), Requesting Physician Identification Sequence (0032,1031) or somewhere else based on hospital policies.

TID 10012 CT Accumulated Dose Data

This general template provides detailed information on CT ~~X-ray~~X-Ray dose value accumulations over several irradiation events from the same equipment and over the scope of accumulation specified for the report (typically a Study or a Performed Procedure Step).

TID 10012
CT ACCUMULATED DOSE DATA
 Type: Extensible

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113811, DCM, "CT Accumulated Dose Data")	1	M		
2	>	CONTAINS	NUM	EV (113812, DCM, "Total Number of Irradiation Events")	1	M		Units = EV ((events) UCUM, "events")
3	>	CONTAINS	NUM	EV (113813, DCM, "CT Dose Length Product Total")	1	M		Units = EV (mGycm, UCUM, "mGycm")
4	>	CONTAINS	NUM	EV (113814, DCM, "CT Effective Dose Total")	1	U		Units = EV (mSv, UCUM, "mSv")
5	>>	HAS PROPERTIES	TEXT	EV (121406, DCM, "Reference Authority")	1	MC	XOR row 6	
6	>>	HAS PROPERTIES	CODE	EV (121406, DCM, "Reference Authority")	1	MC	XOR row 5	DCID (10015) CT Dose Reference Authority
7	>>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	1	M		DCID (10011) Effective Dose Evaluation Method
8	>>	HAS PROPERTIES	TEXT	EV (113815, DCM, "Patient Model")	1	MC	IF the value of row 7 equals (113800, DCM, "DLP to E conversion via MC computation") or equals (113801, DCM, "CTDI _{freeair} to E conversion via MC computation")	
9	>>	HAS PROPERTIES	CONTAINER	EV (113816, DCM, "Condition Effective Dose measured")	1	MC	IF the value of row 7 equals (113802, DCM, "DLP to E conversion via measurement") or equals (113803, DCM, "CTDI _{freeair} to E conversion via measurement")	
10	>>>	CONTAINS	TEXT	EV (113817, DCM, "Effective Dose Phantom Type")	1	M		
11	>>>	CONTAINS	TEXT	EV (113818, DCM, "Dosimeter Type")	1	M		
12	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		

Content Item Descriptions

Row 2	Total Number of CT irradiation events . A CT irradiation event is one continuous irradiation procedure and is defined through consistent acquisition parameters. In the case of dose modulation the calculations are based on the effective parameters (e.g. the effective mA recorded in the Mean X-ray X-Ray Tube Current), and these acquisition parameters are consistent.
Row 3	The Dose Length Product (DLP) is calculated for every irradiation event. The Dose Length Product Total is the sum of the DLP values. The calculation is based on the CTDI _{vol} result of each irradiation event.
Row 4	Effective dose (E, in units of mSv) evaluated as a total over the scope is defined in Row 6 of template TID 10011. Effective dose is defined by the reference in Rows 5 or 6 of this template. It may be calculated from a product of DLP and an 'Effective Dose Conversion Factor' (E/DLP). Or it may be calculated from a product of the Mean CTDI _{free air} and the ratio E/CTDI _{free air} . The ratios E/DLP or E/CTDI _{free air} may be evaluated either from computer simulations applying Monte Carlo (MC) sampling techniques or from dosimetric measurements in an anthropomorphic phantom, e.g., the Alderson-Rando phantom.. The specific method used is identified in Rows 7 through 11.
Row 5 - 6	Reference of the base publication defining the Effective Dose, either as a coded value, or a textual bibliographic reference. ICRP Publications shall be referenced using their assigned coded values.
Row 7	Description of the method used for Effective Dose evaluations.
Row 8	Description of the reference-patient mathematical or computational model used when Effective Dose is derived via Monte Carlo simulations of radiation transport in such models. Examples of publications which specify particular reference patient models are NUREG/CR-1159, ORNL/NUREG/TM-367 (1980); NRPB-R186 (1985); GSF-Bericht S-885 (1986); Fill et al., Health Physics Vol. 86 (3): 253-272 (2004).
Row 9	Description of the condition Effective Dose measured
Row 10	Type of Effective Dose phantom used, e.g. Alderson-Rando
Row 11	Type of dosimeter used, e.g. TLD (Thermo Luminescence Dosimeter)

TID 10013 CT Irradiation Event Data

This template conveys the dose and equipment parameters of a single irradiation event.

A CT irradiation event is the occurrence of irradiation being applied to a patient in single continuous time-frame between the start (release) and the stop (cease) of the irradiation. Any on-off switching of the radiation source during the event shall not be treated as separate events; rather the event includes the time between start and stop of radiation as triggered by the user, e.g., a single sequence of scanning comprised of multiple slices acquired with successive tube rotations and table increments shall be treated as a single irradiation event. Depending on the examination workflow and the anatomical target region the CT irradiation event data may split into multiple instances of this template for better dose estimation. The irradiation event is the "smallest" information entity to be recorded in the realm of Radiation Dose reporting. Individual Irradiation Events are described by a set of accompanying physical parameters that are sufficient to understand the "quality" of irradiation that is being applied. This set of parameters may be different for the various types of equipment that are able to create irradiation events.

TID 10013
CT IRRADIATION EVENT DATA
Type: Extensible

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113819, DCM, "CT Acquisition")	1	M		
2	>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	1	U		
3	>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	1	M		DCID (4030) CT and MR Anatomy Imaged
4	>	CONTAINS	CODE	EV (113820, DCM, "CT Acquisition Type")	1	M		DCID (10013) CT Acquisition Types
5	>	CONTAINS	CODE	EV (G-C32C, SRT, "Procedure Context")	1	U		DCID (10014) Contrast Imaging Technique
6	>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	M		
7	>	CONTAINS	CONTAINER	EV (113822, DCM, "CT Acquisition Parameters")	1	M		
8	>>	CONTAINS	NUM	EV (113824, DCM, "Exposure Time")	1	M		Units = EV (s, UCUM, "s")
9	>>	CONTAINS	NUM	EV (113825, DCM, "Scanning Length")	1	M		Units = EV (mm, UCUM, "mm")
10	>>	CONTAINS	NUM	EV (113826, DCM, "Nominal Single Collimation Width")	1	M		Units = EV (mm, UCUM, "mm")
11	>>	CONTAINS	NUM	EV (113827, DCM, "Nominal Total Collimation Width")	1	M		Units = EV (mm, UCUM, "mm")
12	>>	CONTAINS	NUM	EV (113828, DCM, "Pitch Factor")	1	MC	IF row 4 equals (P5-08001, SRT, "Spiral Acquisition") or equals (113804, DCM, "Sequenced Acquisition")	Units = EV (ratio), UCUM, "ratio")
13	>>	CONTAINS	NUM	EV (113823, DCM, "Number of <u>X-rayX-Ray</u> Sources")	1	M		Units = EV (X-rayX-Ray sources), UCUM, "X-rayX-Ray sources")
14	>>	CONTAINS	CONTAINER	EV (113831, DCM, "CT <u>X-rayX-Ray</u> Source Parameters")	1-n	M		
15	>>>	CONTAINS	TEXT	EV (113832, DCM, "Identification Number of the <u>X-rayX-Ray</u> Source")	1	M		
16	>>>	CONTAINS	NUM	EV (113733, DCM, "KVP")	1	M		Units = EV (kV, UCUM, "kV")
17	>>>	CONTAINS	NUM	EV (113833, DCM, "Maximum <u>X-rayX-Ray</u> Tube Current")	1	M		Units = EV (mA, UCUM, "mA")
18	>>>	CONTAINS	NUM	EV (113734, DCM, "X-Ray Tube Current")	1	M		Units = EV (mA, UCUM, "mA")
19	>>>	CONTAINS	NUM	EV (113834, DCM, "Exposure Time per Rotation")	1	MC	IF row 4 does not equal (113805, DCM, "Constant Angle Acquisition")	Units = EV (s, UCUM, "s")

20	>>>	CONTAINS	NUM	EV (113821, DCM, " X-ray X-Ray Filter Aluminum Equivalent")	1	U		Units = EV (mm, UCUM, "mm")
21	>	CONTAINS	CONTAINER	EV (113829, DCM, "CT Dose")	1	MC	IF row 4 does not equal (113805, DCM, "Constant Angle Acquisition")	
22	>>	CONTAINS	NUM	EV (113830, DCM, "Mean CTDIvol ")	1	M		Units = EV (mGy, UCUM, "mGy")
23	>>	CONTAINS	CODE	EV (113835, DCM, "CTDIw Phantom Type")	1	M		DCID (4052) Phantom Devices
24	>>	CONTAINS	NUM	EV (113836, DCM, "CTDIfreeair Calculation Factor")	1	U		Units = EV (mGy/mAs, UCUM, "mGy/mAs")
25	>>	CONTAINS	NUM	EV (113837, DCM, "Mean CTDIfreeair")	1	U		Units = EV (mGy, UCUM, "mGy")
26	>>	CONTAINS	NUM	EV (113838, DCM, "DLP")	1	M		Units = EV (mGycm, UCUM, "mGycm")
27	>>	CONTAINS	NUM	EV (113839, DCM, "Effective Dose")	1	U		Units = EV (mSv, UCUM, "mSv")
28	>>>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	1	MC	IF row 27 is present	DCID (10011) "Effective Dose Evaluation Method")
29	>>> >	HAS PROPERTIES	NUM	EV (113840, DCM, "Effective Dose Conversion Factor")	1	MC	IF row 28 is present and equals (113800, DCM, "DLP to E conversion via MC computation") or equals (113802, DCM, "DLP to E conversion via measurement")	Units = EV (mSv/mGycm, UCUM, "mSv/mGycm")
30	>	CONTAINS	TEXT	EV (113842, DCM, " X-ray X-Ray Modulation Type")	1	U		
31	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		
32	>	CONTAINS	INCLUDE	DTID (1020) Person Participant	1-n	U		\$PersonProcedureRole = EV (113851, DCM, "Irradiation Administering")
33	>	CONTAINS	INCLUDE	DTID (1021) Device Participant	1	M		\$DeviceProcedureRole = EV (113859, DCM, "Irradiating Device")

Content Item Descriptions

Row 2	User-defined type of clinical acquisition protocol for creating images or image-derived measurements. May be taken from Protocol Name (0018,1030) or from Performed Procedure Step Description (0040,0254).
Row 3	The target region is the anatomy exposed.
Row 4	Description of the method used during acquisition of this CT irradiation event, may be derived from Acquisition Type (0018,9302).
Row 5	The acquisition was performed with or without contrast medium application.
Row 8	Total time the patient has received X-ray X-Ray exposure during the irradiation event.
Row 9	For Spiral scanning, the scanning length is normally the table travel in mm during the tube loading. For Sequenced scanning, the scanning length is the table travel between consecutive

	scans times the number of scans. For Stationary and Free scanning, the scanning length is the nominal width of the total collimation.
Row 10	The value of the nominal width (referenced to the location of the isocenter along the z axis) of a single collimated slice in mm.
Row 11	The value of the nominal width (referenced to the location of the isocenter along the z axis) of the nominal total collimation in mm over the area of active X-rayX-Ray detection (z-coverage).
Row 12	Pitch Factor: For Spiral Acquisition, the Pitch Factor is the ratio of the Table Feed per Rotation to the Nominal Total Collimation Width. For Sequenced Acquisition, the Pitch Factor is the ratio of the Table Feed per single sequenced scan to the Nominal Total Collimation Width.
Row 14	CT X-rayX-Ray source parameters related to the acquisition. For each X-rayX-Ray source an item must be present.
Row 15	Identification Number of the X-rayX-Ray source. Identifies the particular X-rayX-Ray source (in a multi-source CT system) for which the set of X-rayX-Ray source parameter values is reported.
Row 16	KVP value as measured/recorded by system.
Row 18	Mean tube current as measured/recorded by system.
Row 19	Exposure time as measured/recorded by the system per rotation.
Row 20	Thickness of an equivalent filter constructed from aluminum, in case of multi source CT systems AND if Row 4 is not present
Row 21	CT Dose for one acquisition
Row 22	<p>“Mean CTDI_{vol}” refers to the average value of the CTDI_{vol} applied within this acquisition. CTDI_{vol} is the volume CTDI_w, where CTDI_w is the weighted computed tomography dose index 100 as defined in IEC 60601-2-44.</p> <p>For Sequenced and Spiral scanning, CTDI_{vol} = CTDI_w/Pitch Factor.</p> <p>For Stationary and Free scanning, CTDI_{vol} = CTDI_w × Cumulative Exposure Time/ Exposure Time Per Rotation.</p> <p>According to IEC 60601-2-44 Ed 3 for Constant Angle Acquisition may be calculated as CTDI_{vol} = (CTDI_w / Current Time Product (mAs)) × X-rayX-Ray Tube Current (mA) × (Nominal Total Collimation Width (mm) / Table Speed (mm/s)).</p> <p>Note: The ratio CTDI_w / Current Time Product is evaluated independently of the Constant Angle Acquisition but with the same settings of tube voltage and Total Collimation Width as those of the Constant Angle Acquisition.</p> <p>See also CTDI_{vol} (0018,9345) and Spiral Pitch Factor (0018,9311) in the Enhanced CT Information Object Description (PS 3.3).</p>
Row 23	The type of phantom used for CTDI measurement according to IEC 60601-2-44 (e.g. Head 16 cm diameter PMMA, Body 32 cm diameter PMMA).
Row 24	The CTDI _{free air} Calculation Factor is the CTDI _{free air} per mAs, expressed in units of mGy/mAs. The CTDI _{free air} Calculation Factor may be used in one method calculating Dose. For example, for this acquisition, Effective Dose = Mean X-rayX-Ray Tube Current × Cumulative Exposure Time × CTDI _{free air} Calculation Factor × (Effective Dose/ CTDI _{free air}).
Row 25	Mean CTDI _{free air} is the mean CTDI for this acquisition, evaluated free-in-air according to IEC 60601-2-44. Mean CTDI _{free air} = Mean X-rayX-Ray Tube Current × Cumulative Exposure Time × CTDI _{free air} Calculation Factor. The CTDI _{free air} may be used in one method of calculating Effective Dose.
Row 26	For Spiral scanning, DLP = CTDI _{vol} × Scanning Length. For Sequenced scanning, DLP = CTDI _{vol} × Nominal Total Collimation Width × Cumulative Exposure Time / Exposure Time per Rotation. For Stationary and Free scanning, DLP = CTDI _{vol} × Nominal Total

	Collimation Width (according to IEC 60601-2-44).
Row 27	Effective Dose in mSv of the single continuous time-frame of the irradiation computed as described in TID 10012.
Row 29	The Effective Dose Conversion Factor is the ratio of the Effective Dose to the DLP, expressed in units of mSv/mGycm, and it is used as a factor in one method of estimating Effective Dose. Monte Carlo Simulations (or dosimetric measurements in an anthropomorphic phantom, e.g., the Alderson-Rando phantom) may be used as a basis for the evaluation of Effective Dose Conversion Factors.
Row 30	The type of exposure modulation. May use the value of Exposure Modulation Type (0018,9323) from CT Exposure Macro or from CT Image Module.
Row 32	People responsible for the administration of the radiation reported in the irradiation event. May include values which would appear in Performing Physicians' Name (0008,1050), Performing Physician Identification Sequence (0008,1052), Operators' Name (0008,1070) and/or Operator Identification Sequence (0008,1072).
Row 33	The device which produced the irradiation in this Irradiation Event. I.e. the CT scanner.

Amend PS 3.16 context groups:

CID 3090 Time Synchronization Channel Types

Context ID 3090

Time Synchronization Channel Types

Type: Extensible Version: 20020904

Coding Scheme	Code Value	Code Meaning
DCM	109001	Digital timecode (NOS)
DCM	109002	ECG-based gating signal, processed
DCM	109003	IRIG-B timecode
DCM	109004	X-ray X-Ray Fluoroscopy On Signal
DCM	109005	X-ray X-Ray On Trigger

Amend PS 3.16 definitions to replace "X-ray" and "x-ray" with "X-Ray" in text.