DICOM Correction Item

Correction Number	CP-776
Log Summary: Remove redundant conditions within sequences	
Type of Modification Correction	Name of Standard PS 3.3 2007
Rationale for Correction For some time it has been the convention not to make attributes inside sequences “required if a sequence item is present”, since this is assumed. Remove any remaining inconsistencies.	
Sections of documents affected PS 3.3	
Correction Wording:	

C.7.1.1 Patient Module

...

Table C.7-1
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced Patient Sequence	(0008,1120)	3	A sequence that provides reference to a Patient SOP Class/Instance pair. Only a single Item shall be permitted in this Sequence.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced Patient Sequence (0008,1120) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced Patient Sequence (0008,1120) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
…	…	…	…

C.7.1.2 Specimen Identification Module

...

Table C.7-2a
SPECIMEN IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Specimen Sequence	(0040,0550)	2	Detailed description of one or more specimens. Zero or more Items may be included in this Sequence.

>Specimen Identifier	(0040,0551)	2~~C~~	A departmental information system identifier for the Specimen. See Section C.7.1.2.1.2 for further explanation. ~~**Required if a sequence item is present.**~~
>Specimen Type Code Sequence	(0040,059A)	2C	Specimen Type. Only a single Item shall be permitted in this Sequence. Required if ~~**a sequence item is present and**~~ Specimen Identifier (0040,0551) is sent **with a value**.
>>Include 'Code Sequence Macro' Table 8.8-1		No Baseline Context IDs are defined	
>Slide Identifier	(0040,06FA)	2C	Identifier of the Slide. Required if ~~**a sequence item is present and**~~ the Specimen is a Slide.

…

C.7.2.1 General Study Module

...

Table C.7-3
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced Study Sequence	(0008,1110)	3	A sequence that provides reference to a Study SOP Class/Instance pair. The sequence may have zero or more Items.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced Study Sequence (0008,1110) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced Study Sequence (0008,1110) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
…	…	…	…

…

C.7.3.1 General Series Module

...

Table C.7-5a
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related (e.g. a Modality or General-Purpose Performed Procedure Step SOP Instance). The Sequence shall have zero or one Item.

>Referenced SOP Class UID	(0008,1150)	1~~C~~	Uniquely identifies the referenced SOP Class. ~~**Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.**~~
>Referenced SOP Instance UID	(0008,1155)	1~~C~~	Uniquely identifies the referenced SOP Instance. ~~**Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
…	…	…	…

…

C.8.4.10 NM Isotope Module

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Table C.8-10
NM ISOTOPE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Radiopharmaceutical Information Sequence	(0054,0016)	2	Sequence of Repeating Items that describe isotope information. Zero or more Items may be included in this sequence.
>Radionuclide Code Sequence	(0054,0300)	2~~C~~	Sequence that identifies the radionuclide. This sequence shall contain exactly one item. ~~**Required if a sequence Item is present.**~~
…		…	
>Calibration Data Sequence	(0054,0306)	3	Sequence that contains calibration data.
>>Energy Window Number	(0054,0308)	1~~C~~	The Item number in the Energy Window Information Sequence to which the following calibration data relates. The Items are numbered starting from 1. ~~**Required if a sequence Item is present.**~~
…	…	…	…

…

C.8.4.11 NM Detector Module

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Table C.8-11
NM DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Detector Information Sequence	(0054,0022)	2	Sequence of Repeating Items that describe the detectors used. The number of items shall be equal to Number of Detectors (0054,0021). The first item corresponds to frames with value of 1 in the Detector Vector (0054,0020), the

			second item with value 2, etc.
…	…	…	…
>Collimator Type	(0018,1181)	2~~C~~	Collimator type. Defined Terms: PARA = Parallel (default) PINH = Pinhole FANB = Fan-beam CONE = Cone-beam SLNT = Slant hole ASTG = Astigmatic DIVG = Diverging NONE = No collimator UNKN = Unknown ~~**Required if a sequence Item is present.**~~
…	…	…	…
>Focal Distance	(0018,1182)	2~~C~~	Focal distance, in mm. A value of 0 means infinite distance for parallel collimation. See C.8.4.11.1.1 for further specialization. ~~**Required if a sequence Item is present.**~~
…	…	…	…
>Distance Source to Detector	(0018,1110)	2C	Distance in mm from transmission source to the detector face. Required if Image Type (0008,0008) Value 4 is TRANSMISSION, **and** Value 3 is not TOMO~~**, and a sequence Item is present**~~.
…	…	…	…
>Image Orientation (Patient)	(0020,0037)	2~~C~~	The direction cosines of the first row and the first column with respect to the patient. See C.7.6.2.1.1 for further explanation. ~~**Required if a sequence Item is present.**~~
>Image Position (Patient)	(0020,0032)	2~~C~~	The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm. See C.7.6.2.1.1 for further explanation. ~~**Required if a sequence Item is present.**~~
…	…	…	…

…

C.8.4.12 NM TOMO Acquisition Module

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Table C.8-12
NM TOMO ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Rotation Information Sequence	(0054,0052)	2	Sequence of Repeating Items that describe TOMO rotational groups. A new rotation is defined whenever the direction of the detector motion changes, or the Table Traverse (0018,1131) changes. The number of items shall be equal to Number of Rotations (0054,0051). If Rotation

			Vector (0054,0050) is present, the first item corresponds to frames with value of 1 in the Rotation Vector (0054,0050), the second item with value 2, etc.
>Start Angle	(0054,0200)	1~~C~~	Position of the detector about the patient for the start of this rotation, in degrees. Zero degrees is referenced to the origin at the patient's back. Viewing from the patient's feet, angle increases in a counter-clockwise direction (detector normal rotating from the patient's back towards the patient's left side). ~~**Required if a sequence Item is present.**~~
>Angular Step	(0018,1144)	1~~C~~	The angular scan arc step between views of the TOMO acquisition, in degrees. See C.8.4.12.1.1 for further explanation. ~~**Required if a sequence Item is present.**~~
>Rotation Direction	(0018,1140)	1~~C~~	Direction of rotation of the detector about the patient. See Start Angle (0054,0200) for further explanation of direction. Enumerated Values: CW = clockwise (decreasing angle) CC = counter-clockwise (increasing angle). ~~**Required if a sequence Item is present.**~~
>Scan Arc	(0018,1143)	1~~C~~	The effective angular range of the scan data in degrees. The value shall be positive. ~~**Required if a sequence Item is present.**~~
>Actual Frame Duration	(0018,1242)	1~~C~~	Nominal acquisition time per angular position, in msec. ~~**Required if a sequence Item is present.**~~
…	…	…	…
>Distance Source to Detector	(0018,1110)	2~~C~~	Distance in mm from transmission source to the detector face. Required if Image Type (0008,0008), **and** Value 4, is TRANSMISSION ~~**and a sequence Item is present**~~.
>Number of Frames in Rotation	(0054,0053)	1~~C~~	Number of angular views in this rotation. ~~**Required if a sequence Item is present.**~~
…	…	…	…

…

C.8.4.13 NM Multi-gated Acquisition Module

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Table C.8-13
NM MULTI-GATED ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…

Gated Information Sequence	(0054,0062)	2C	Sequence of Repeating Items that describe R-R intervals. Each gated interval is defined by an upper and lower range of heart beat durations. Required if the Frame Increment Pointer (0028,0009) contains the Tag for R-R Interval Vector (0054,0060). The number of items shall be equal to Number of R-R Intervals (0054,0061). The first item corresponds to frames with value of 1 in the R-R Interval Vector (0054,0060), the second item with value 2, etc.
…	…	…	…
>Data Information Sequence	(0054,0063)	2~~C~~	Sequence of Repeating Items that describe gating criteria. See C.8.4.13.1.1. ~~**Required if a sequence Item is present.**~~
>>Frame Time	(0018,1063)	1~~C~~	Nominal time per individual frame in msec. ~~**Required if a sequence Item is present.**~~
…	…	…	…

…

C.8.4.14 NM Phase Module

…

Table C.8-14
NM PHASE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Phase Information Sequence	(0054,0032)	2C	Sequence of Repeating Items that describes each dynamic phase. Required if the Frame Increment Pointer (0028,0009) contains the Tag for Phase Vector (0054,0030). The number of items shall be equal to Number of Phases (0054,0031). The first item corresponds to frames with value of 1 in the Phase Vector (0054,0030), the second item with value 2, etc.
>Phase Delay	(0054,0036)	1~~C~~	Time paused between the last frame of the previous phase and the first frame of this phase, in msec. ~~**Required if a sequence Item is present.**~~
>Actual Frame Duration	(0018,1242)	1~~C~~	Nominal time of acquisition per individual frame, in msec. ~~**Required if a sequence Item is present.**~~
>Pause Between Frames	(0054,0038)	1~~C~~	Time paused between each frame of this phase (in msec). ~~**Required if a sequence Item is present.**~~
>Number of Frames in Phase	(0054,0033)	1~~C~~	Number of frames in this phase. ~~**Required if a sequence Item is present.**~~

…	…	…	…

…

C.8.8.1 RT Series Module

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Table C.8-37 - RT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Uniquely identifies the Performed Procedure Step SOP Instance to which the Series is related (e.g. a Modality or General-Purpose Performed Procedure Step SOP Instance). One or more items may be included in this sequence.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
…	…	…	…

…

C.8.8.2 RT Image Module

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Table C.8-38—RT IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced RT Plan Sequence	(300C,0002)	3	Introduces sequence of one Class/Instance pair describing RT Plan associated with image. Only a single item shall be permitted in this sequence.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
…	…	…	…
Exposure Sequence	(3002,0030)	3	Introduces sequence of Exposure parameter sets, corresponding to exposures used in generating the image. One or more items

			may be included in this sequence. See C.8.8.2.4.
>Referenced Frame Number	(0008,1160)	1C	Identifies corresponding image frame in multi-frame image. Required if **~~Exposure Sequence (3002,0030) is sent,~~** there is more than one item in Exposure Sequence (3002,0030), and image is a multi-frame image.
>KVP	(0018,0060)	2C	Peak kilo voltage output (kV) of X-ray generator used to acquire image. Required if Value 3 of Image Type (0008,0008) is PORTAL, SIMULATOR or RADIOGRAPH **~~and Exposure Sequence (3002,0030) is sent~~**.
>X-Ray Tube Current	(0018,1151)	2C	Imaging device X-ray Tube Current (mA). Required if Value 3 of Image Type (0008,0008) is SIMULATOR or RADIOGRAPH **~~and Exposure Sequence (3002,0030) is sent~~**.
>Exposure Time	(0018,1150)	2C	Time of X-ray exposure (msec). Required if Value 3 of Image Type (0008,0008) is SIMULATOR or RADIOGRAPH **~~and Exposure Sequence (3002,0030) is sent~~**.
>Meterset Exposure	(3002,0032)	2C	Treatment machine Meterset duration over which image has been acquired, specified in Monitor units (MU) or minutes as defined by Primary Dosimeter Unit (300A,00B3). Required if Value 3 of Image Type (0008,0008) is PORTAL **~~and Exposure Sequence (3002,0030) is sent~~**.
…	…	…	…
>Beam Limiting Device Sequence	(300A,00B6)	3	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions for given exposure. One or more items may be included in this sequence.
>>RT Beam Limiting Device Type	(300A,00B8)	1**~~C~~**	Type of beam limiting device (collimator). **~~Required if Beam Limiting Device Sequence (300A,00B6) is sent.~~** Enumerated Values: X = symmetric jaw pair in IEC X direction Y = symmetric jaw pair in IEC Y direction ASYMX = asymmetric jaw pair in IEC X direction ASYMY = asymmetric pair in IEC Y direction MLCX = multileaf (multi-element) jaw pair in IEC X direction MLCY = multileaf (multi-element) jaw pair in IEC Y direction
…	…	…	…

>>Number of Leaf/Jaw Pairs	(300A,00BC)	1~~C~~	Number of leaf (element) or jaw pairs (equal to 1 for standard beam limiting device jaws). ~~**Required if Beam Limiting Device Sequence (300A,00B6) is sent.**~~
…	…	…	…
>>Leaf/Jaw Positions	(300A,011C)	1~~C~~	Positions of beam limiting device (collimator) leaf or jaw (element) pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), e.g. X-axis for MLCX, Y-axis for MLCY). Contains 2N values, where N is the Number of Leaf/Jaw Pairs (300A,00BC), in IEC leaf (element) subscript order 101, 102, ... 1N, 201, 202, ... 2N. ~~**Required if Beam Limiting Device Sequence (300A,00B6) is sent.**~~
>Applicator Sequence	(300A,0107)	3	Introduces sequence of Applicators associated with Beam. Only a single item shall be permitted in this sequence.
>>Applicator ID	(300A,0108)	1~~C~~	User or machine supplied identifier for Applicator. ~~**Required if Applicator Sequence (300A,0107) is sent.**~~
>>Applicator Type	(300A,0109)	1~~C~~	Type of Applicator. ~~**Required if Applicator Sequence (300A,0107) is sent.**~~ Defined Terms: ELECTRON_SQUARE = square electron applicator ELECTRON_RECT = rectangular electron applicator ELECTRON_CIRC = circular electron applicator ELECTRON_SHORT = short electron applicator ELECTRON_OPEN = open (dummy) electron applicator INTRAOPERATIVE = intraoperative (custom) applicator STEREOTACTIC = stereotactic applicator
…	…	…	…
>Number of Blocks	(300A,00F0)	1~~C~~	Number of shielding blocks associated with Beam. Required if Exposure Sequence (3002,0030) is sent.
>Block Sequence	(300A,00F4)	2C	Introduces sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is non-zero. One or more items may be included in this sequence.
…	…	…	…
>>Source to Block Tray Distance	(300A,00F6)	2~~C~~	Radiation Source to attachment edge of

			block tray assembly (mm). ~~**Required if Block Sequence (300A,00F4) is sent.**~~
>>Block Type	(300A,00F8)	1~~C~~	Type of block. ~~**Required if Block Sequence (300A,00F4) is sent.**~~ Enumerated Values: SHIELDING = blocking material is inside contour APERTURE = blocking material is outside contour
>>Block Divergence	(300A,00FA)	2~~C~~	Indicates presence or otherwise of geometrical divergence. ~~**Required if Block Sequence (300A,00F4) is sent.**~~ Enumerated Values: PRESENT = block edges are shaped for beam divergence ABSENT = block edges are not shaped for beam divergence
…	…	…	…
>>Block Number	(300A,00FC)	1~~C~~	Identification Number of the Block. The value of Block Number (300A,00FC) shall be unique within the Beam in which it is created. ~~**Required if Block Sequence (300A,00F4) is sent.**~~
…	…	…	…
>>Material ID	(300A,00E1)	2~~C~~	User-supplied identifier for material used to manufacture Block. ~~**Required if Block Sequence (300A,00F4) is sent.**~~
…	…	…	…
>>Block Number of Points	(300A,0104)	2~~C~~	Number of (x,y) pairs defining the block edge. ~~**Required if Block Sequence (300A,00F4) is sent.**~~
>>Block Data	(300A,0106)	2~~C~~	A data stream of (x,y) pairs which comprise the block edge. The number of pairs shall be equal to Block Number of Points (300A,0104), and the vertices shall be interpreted as a closed polygon. Coordinates are projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm). ~~**Required if Block Sequence (300A,00F4) is sent.**~~
…	…	…	…

…

C.8.8.3 RT Dose Module

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Table C.8-39—RT DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description

…	…	…	…
Referenced RT Plan Sequence	(300C,0002)	1C	Introduces sequence of one Class/Instance pair describing RT Plan associated with dose. Required if Dose Summation Type (3004,000A) is PLAN, FRACTION, BEAM, BRACHY or CONTROL_POINT. Only a single item shall be permitted in this sequence. See Note 1.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
>Referenced Fraction Group Sequence	(300C,0020)	1C	Introduces sequence of one Fraction Group containing beams or brachy application setups contributing to dose. Required if Dose Summation Type (3004,000A) is FRACTION, BEAM, BRACHY or CONTROL_POINT. Only a single item shall be permitted in this sequence. See Note 1.
>>Referenced Fraction Group Number	(300C,0022)	1~~C~~	Uniquely identifies Fraction Group specified by Fraction Group Number (300A,0071) in Fraction Group Sequence of RT Fraction Scheme Module within RT Plan referenced in Referenced RT Plan Sequence (300C,0002). ~~**Required if Referenced Fraction Group Sequence (300C,0020) is sent.**~~
>>Referenced Beam Sequence	(300C,0004)	1C	Introduces sequence of Beams in current Fraction Group contributing to dose. Required if Dose Summation Type (3004,000A) is BEAM or CONTROL_POINT. One or more items may be included in this sequence.
>>>Referenced Beam Number	(300C,0006)	1~~C~~	Uniquely identifies Beam specified by Beam Number (300A,00C0) in Beam Sequence of RT Beams Module within RT Plan referenced in Referenced RT Plan Sequence (300C,0002). ~~**Required if Referenced Beam Sequence (300C,0004) is sent.**~~
>>>Referenced Control Point Sequence	(300C,00F2)	1C	Sequence defining the Control Points in current Beam contributing to dose. Required if Dose Summation Type (3004,000A) is CONTROL_POINT. Only a single item shall be present in this sequence.
…	…	…	…

>>Referenced Brachy Application Setup Sequence	(300C,000A)	1C	Introduces sequence of Brachy Application Setups in current Fraction Group contributing to dose. Required if Dose Summation Type (3004,000A) is BRACHY. One or more items may be included in this sequence.
>>>Referenced Brachy Application Setup Number	(300C,000C)	1~~C~~	Uniquely identifies Brachy Application Setup specified by Brachy Application Setup Number (300A,0234) in Brachy Application Setup Sequence (300A,0230) of RT Brachy Application Setups Module within RT Plan referenced in Referenced RT Plan Sequence (300C,0002). ~~**Required if Referenced Brachy Application Setup Sequence (300C,000A) is sent.**~~
…	…	…	…

…

C.8.8.5 Structure Set Module

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Table C.8-41—STRUCTURE SET MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced Frame of Reference Sequence	(3006,0010)	3	Introduces sequence of items describing Frames of Reference in which the ROIs are defined. One or more items may be included in this sequence. See C.8.8.5.1.
>Frame of Reference UID	(0020,0052)	1~~C~~	Uniquely identifies Frame of Reference within Structure Set. ~~**Required if Referenced Frame of Reference Sequence (3006,0010) is sent.**~~
>Frame of Reference Relationship Sequence	(3006,00C0)	3	Introduces sequence of transforms that relate other Frames of Reference to this Frame of Reference.
>>Related Frame of Reference UID	(3006,00C2)	1~~C~~	Frame of Reference Coordinate System to be transformed to the current Frame of Reference. ~~**Required if Frame of Reference Relationship Sequence (3006,00C0) is sent.**~~
>>Frame of Reference Transformation Type	(3006,00C4)	1~~C~~	Type of Transformation. ~~**Required if Frame of Reference Relationship Sequence (3006,00C0) is sent.**~~ Defined Terms: HOMOGENEOUS
>>Frame of Reference Transformation Matrix	(3006,00C6)	1~~C~~	Four-by-four transformation Matrix from Related Frame of Reference to current Frame of Reference. Matrix elements shall be listed in row-major order. ~~**Required if Frame of Reference**~~

			~~**Relationship Sequence (3006,00C0) is sent.**~~ See C.8.8.5.2.
…	…	…	…
>RT Referenced Study Sequence	(3006,0012)	3	Introduces sequence of Studies containing series to be referenced. One or more items may be included in this sequence.
~~**>>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if RT Referenced Study Sequence (3006,0012) is sent.**~~
~~**>>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if RT Referenced Study Sequence (3006,0012) is sent.**~~
>>Include SOP Instance Reference Macro Table 10-11			
>>RT Referenced Series Sequence	(3006,0014)	1~~**C**~~	Introduces sequence of items describing series of images within the referenced study which are used in defining the Structure Set. ~~**Required if RT Referenced Study Sequence (3006,0012) is sent.**~~ One or more items may be included in this sequence.
>>>Series Instance UID	(0020,000E)	1~~**C**~~	Unique identifier for the series containing the images. ~~**Required if RT Referenced Series Sequence (3006,0014) is sent.**~~
>>>Contour Image Sequence	(3006,0016)	1~~**C**~~	Introduces sequence of items describing images in a given series used in defining the Structure Set (typically CT or MR images). ~~**Required if RT Referenced Series Sequence (3006,0014) is sent.**~~ One or more items may be included in this sequence.
>>>>*Include 'Image SOP Instance Reference Macro' Table 10-3*			
Structure Set ROI Sequence	(3006,0020)	3	Introduces sequence of ROIs for current Structure Set. One or more items may be included in this sequence.
>ROI Number	(3006,0022)	1~~**C**~~	Identification number of the ROI. The value of ROI Number (3006,0022) shall be unique within the Structure Set in which it is created. ~~**Required if Structure Set ROI Sequence (3006,0020) is sent.**~~
>Referenced Frame of Reference UID	(3006,0024)	1~~**C**~~	Uniquely identifies Frame of Reference in which ROI is defined, specified by Frame of Reference UID (0020,0052) in Referenced Frame of Reference Sequence (3006,0010). ~~**Required if Structure Set ROI Sequence (3006,0020) is sent.**~~
>ROI Name	(3006,0026)	2**C**	User-defined name for ROI. ~~**Required if Structure Set ROI Sequence (3006,0020) is sent.**~~

…	…	…	…
>ROI Generation Algorithm	(3006,0036)	2~~C~~	Type of algorithm used to generate ROI. ~~**Required if Structure Set ROI Sequence (3006,0020) is sent.**~~ Defined Terms: AUTOMATIC = calculated ROI SEMIAUTOMATIC = ROI calculated with user assistance MANUAL = user-entered ROI
…	…	…	…

…

C.8.8.6 ROI Contour Module

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Table C.8-42—ROI CONTOUR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
ROI Contour Sequence	(3006,0039)	1	Introduces sequence of Contour Sequences defining ROIs. One or more items may be included in this sequence.
…	…	…	…
>Contour Sequence	(3006,0040)	3	Introduces sequence of Contours defining ROI. One or more items may be included in this sequence.
…	…	…	…
>>Contour Geometric Type	(3006,0042)	1~~C~~	Geometric type of contour. ~~**Required if Contour Sequence (3006,0040) is sent.**~~ See C.8.8.6.1. Enumerated Values: POINT = single point OPEN_PLANAR = open contour containing coplanar points OPEN_NONPLANAR = open contour containing non-coplanar points CLOSED_PLANAR = closed contour (polygon) containing coplanar points
..	…	…	…
>>Number of Contour Points	(3006,0046)	1~~C~~	Number of points (triplets) in Contour Data (3006,0050). ~~**Required if Contour Sequence (3006,0040) is sent.**~~
>>Contour Data	(3006,0050)	1~~C~~	Sequence of (x,y,z) triplets defining a contour in the patient based coordinate system described in C.7.6.2.1.1 (mm). ~~**Required if Contour Sequence (3006,0040) is sent.**~~ See C.8.8.6.1 and C.8.8.6.3. Note: Contour Data may not be properly

			encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.

…

C.8.8.8 RT ROI Observations Module

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Table C.8-44—RT ROI OBSERVATIONS MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
RT ROI Observations Sequence	(3006,0080)	1	Introduces sequence of observations related to ROIs defined in the ROI Module. One or more items may be included in this sequence.
…	…	…	…
>RT Related ROI Sequence	(3006,0030)	3	Introduces sequence of significantly related ROIs, e.g. CTVs contained within a PTV. One or more items may be included in this sequence.
>>Referenced ROI Number	(3006,0084)	1~~C~~	Uniquely identifies the related ROI described in the Structure Set ROI Sequence (3006,0020). ~~**Required if RT Related ROI Sequence (3006,0030) is sent.**~~
…	…	…	…
>Related RT ROI Observations Sequence	(3006,00A0)	3	Introduces sequence of related ROI Observations. One or more items may be included in this sequence.
>>Observation Number	(3006,0082)	1~~C~~	Uniquely identifies a related ROI Observation. ~~**Required if Related RT ROI Observations Sequence (3006,00A0) is sent.**~~
…	…	…	…
>ROI Physical Properties Sequence	(3006,00B0)	3	Introduces sequence describing physical properties associated with current ROI interpretation. One or more items may be included in this sequence.
>>ROI Physical Property	(3006,00B2)	1~~C~~	Physical property specified by ROI Physical Property Value (3006,00B4). ~~**Required if ROI Physical Properties Sequence (3006,00B0) is sent.**~~ Defined Terms: REL_MASS_DENSITY = mass density relative to water REL_ELEC_DENSITY = electron density relative to water EFFECTIVE_Z = effective atomic number EFF_Z_PER_A = ratio of effective atomic number to mass (AMU^{-1})

			REL_STOP_RATIO = linear stopping power ratio relative to water
>>ROI Physical Property Value	(3006,00B4)	1~~C~~	User-assigned value for physical property. ~~**Required if ROI Physical Properties Sequence (3006,00B0) is sent.**~~

…

C.8.8.9 RT General Plan Module

Table C.8-45—RT GENERAL PLAN MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Referenced Structure Set Sequence	(300C,0060)	1C	Introduces sequence of one Class/Instance pair describing instance of RT Structure Set on which the RT Plan is based. Only a single item shall be permitted in this sequence. Required if RT Plan Geometry (300A,000C) is PATIENT.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced Structure Set Sequence (300C,0060) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced Structure Set Sequence (300C,0060) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
Referenced Dose Sequence	(300C,0080)	3	Introduces sequence of related SOP Class/Instance pairs describing related instances of RT Dose (for grids and named/unnamed point doses). One or more items may be included in this sequence. See Note 1.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced RT Dose Sequence (300C,0080) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced RT Dose Sequence (300C,0080) is sent.**~~
>Include SOP Instance Reference Macro Table 10-11			
Referenced RT Plan Sequence	(300C,0002)	3	Introduces sequence of related SOP Class/Instance pairs describing related instances of RT Plan. One or more items may be included in this sequence.
~~**>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~
~~**>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~

>Include SOP Instance Reference Macro Table 10-11			
>RT Plan Relationship	(300A,0055)	1~~C~~	Relationship of referenced plan with respect to current plan. ~~**Required if Referenced RT Plan Sequence (300C,0002) is sent.**~~ Defined Terms: PRIOR = plan delivered prior to current treatment ALTERNATIVE = alternative plan prepared for current treatment PREDECESSOR = plan used in derivation of current plan VERIFIED_PLAN = plan which is verified using the current plan. This value shall only be used if Plan Intent (300A,000A) is present and has a value of VERIFICATION.

…

C.8.8.10 RT Prescription Module

Table C.8-46—RT PRESCRIPTION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Dose Reference Sequence	(300A,0010)	3	Introduces sequence of Dose References. One or more items may be included in this sequence.
>Dose Reference Number	(300A,0012)	1~~C~~	Identification number of the Dose Reference. The value of Dose Reference Number (300A,0012) shall be unique within the RT Plan in which it is created. ~~**Required if Dose Reference Sequence (300A,0012) is sent.**~~
…	…	…	…
>Dose Reference Structure Type	(300A,0014)	1~~C~~	Structure type of Dose Reference. ~~**Required if Dose Reference Sequence (300A,0010) is sent.**~~ Defined Terms: POINT = dose reference point specified as ROI VOLUME = dose reference volume specified as ROI COORDINATES = point specified by Dose Reference Point Coordinates (300A,0018) SITE = dose reference clinical site
…	…	…	…
>Referenced ROI Number	(3006,0084)	1C	Uniquely identifies ROI representing the dose reference specified by ROI Number (3006,0022) in Structure Set ROI

			Sequence (3006,0020) in Structure Set Module within RT Structure Set in Referenced Structure Set Sequence (300C,0060) in RT General Plan Module. Required if Dose Reference Structure Type (300A,0014) is POINT or VOLUME ~~**and Dose Reference Sequence (300A,0010) is sent**~~.
>Dose Reference Point Coordinates	(300A,0018)	1C	Coordinates (x,y,z) of Reference Point in the patient based coordinate system described in C.7.6.2.1.1 (mm). Required if Dose Reference Structure Type (300A,0014) is COORDINATES ~~**and Dose Reference Sequence (300A,0010) is sent**~~.
…	…	…	…
>Dose Reference Type	(300A,0020)	1~~**C**~~	Type of Dose Reference. ~~**Required if Dose Reference Sequence (300A,0010) is sent.**~~ Defined Terms: TARGET = treatment target (corresponding to GTV, PTV, or CTV in ICRU50) ORGAN_AT_RISK = Organ at Risk (as defined in ICRU50)
…	…	…	…

…

F.3.2.2 Directory Information Module

…

Table F.3-3
DIRECTORY INFORMATION MODULE

Attribute Name	Tag	Type	Attribute Description
Offset of the First Directory Record of the Root Directory Entity	(0004,1200)	1	Offset of the first byte (of the Item Data Element) of the first Directory Record of the Root Directory Entity. This Offset is a number of bytes starting with the first byte of the File Meta Information. When the Root Directory Entity contains no Directory Record, this offset shall be set to 00000000H. Note: This offset includes the File Preamble and the DICM Prefix.
…	…	…	…
Directory Record Sequence	(0004,1220)	2	Sequence of zero or more repeating Items where each Item contains a Directory Record by including the Directory Elements from (0004,1400) to (0004,1511) and Record selection Keys as defined below (marked with a >). A zero length Value indicates that no Directory Records are contained in the Root Directory Entity.
>Offset of the	(0004,1400)	1~~**C**~~	Offset of the first byte (of the Item Data Element) of the next

Next Directory Record			Directory Record of the same Directory Entity. This Offset is an unsigned integer representing a number of bytes starting with the first byte of the File Meta-information. A zero offset shall be used to mean that there is no other Directory Record in this Directory Entity. ~~**Required if the Directory Record Sequence (0004,1220) is not zero length.**~~ This Offset may be used to keep an inactive Record (0004,1410) chained with the next Directory Record of the same Directory Entity. Note: This offset includes the File Preamble and the DICM Prefix.
>Record In-use Flag	(0004,1410)	1~~C~~	This flag facilitates the deletion of referenced files. Enumerated Values: FFFFH = record is in use. 0000H = record is inactive. All attributes of an inactive Directory Record except (0004,1400) and (0004,1410) shall be ignored. Other Values are reserved and shall not be set by File-set Creators, but if present shall be interpreted as FFFFH by File-set Readers or Updaters. ~~**Required if the Directory Record Sequence (0004,1220) is not zero length.**~~ If a Directory Record is changed from in use to inactive, the FSU shall ensure that all Directory Records of referenced lower-level Directory Entities are changed to inactive.
>Offset of Referenced Lower-Level Directory Entity	(0004,1420)	1~~C~~	Offset of the first byte (of the Item Data Element) of the first Directory Record of the Referenced Lower Level Directory Entity. This Offset is a number of bytes starting with the first byte of the File Meta Information. ~~**Required if the Directory Record Sequence (0004,1220) is not zero length.**~~ When no lower-level Directory Entity (containing at least one Directory Record) is referenced, this Attribute shall have a Value of 00000000H. Note: This offset includes the File Preamble and the DICM Prefix.
>Directory Record Type	(0004,1430)	1~~C~~	Defines a specialized type of Directory Record by reference to its position in the Media Storage Directory Information Model (see Section F.4). ~~**Required if the Directory Record Sequence (0004,1220) is not zero length.**~~ Enumerated Values (see Section F.5): PATIENT STUDY SERIES IMAGE RT DOSE RT STRUCTURE SET RT PLAN RT TREAT RECORD PRESENTATION WAVEFORM SR DOCUMENT KEY OBJECT DOC SPECTROSCOPY RAW DATA REGISTRATION FIDUCIAL HANGING PROTOCOL ENCAP DOC

			HL7 STRUC DOC VALUE MAP STEREOMETRIC PRIVATE = Privately defined record hierarchy position. Type shall be defined by Private Record UID (0004,1432). Notes: 1. Enumerated Values PRINT QUEUE, FILM SESSION, FILM BOX, and IMAGE BOX were previously defined in DICOM for this Attribute. They are now retired. See PS3.3-1998. 2. Enumerated Values OVERLAY, MODALITY LUT, VOI LUT, CURVE, TOPIC, VISIT, RESULTS, INTERPRETATION, STUDY COMPONENT and STORED PRINT were previously defined in DICOM for this Attribute. They are now retired. See PS3.3-2004. 3. Enumerated Value MRDR was previously defined in DICOM for this Attribute, to allow indirect reference to a File by multiple Directory Records. It is now retired. FSUs and FSRs are unlikely to be capable of supporting this mechanism. See PS3.3-2004.
…	…	…	…

…

F.5.23 Presentation State Directory Record Definition

...

Table F.5-23
PRESENTATION KEYS

Key	Tag	Type	Attribute Description
…	…	…	…
Referenced Series Sequence	(0008,1115)	1	Sequence of Repeating Items where each Item includes the Attributes of one or more Series.
>Series Instance UID	(0020,000E)	1~~C~~	Unique identifier of a Series that is part of this Study. ~~**Required if sequence item is present.**~~
>Referenced Image Sequence	(0008,1140)	1~~C~~	Sequence of Repeating Items where each Item provides reference to a selected set of Image SOP Class/SOP Instance pairs that are part of this Study and the Series defined by Series Instance UID (0020,000E). ~~**Required if a sequence item is present.**~~
~~**>>Referenced SOP Class UID**~~	~~**(0008,1150)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Class. Required if sequence item is present. Shall be the same for all Images referenced by this presentation state.**~~
~~**>>Referenced SOP Instance UID**~~	~~**(0008,1155)**~~	~~**1C**~~	~~**Uniquely identifies the referenced SOP Instance. Required if sequence item is present.**~~
>>Include SOP Instance Reference Macro Table 10-11			
…	…	…	…

…