



DICOM Conformance Statement

for Astroid® DICOM App version 2.1.1

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1 Introduction

This section provides the information about the purpose, scope, and contents of this Conformance Statement.

1.1 Purpose

This document contains the Conformance Statement for the .decimal astroid Dicom App. The astroid Dicom App is intended to receive DICOM formatted files and return defined standard data types that can be more easily used between other astroid Apps. The compliance has been specified through the Service Classes, Information Object Definitions, Transfer Syntaxes, and Communication Protocols supported by the implementation.

1.2 Target Audience

This document is intended for potential users of the astroid Dicom App. This document assumes familiarity with the DICOM standard as defined by NEMA.

1.3 General

The astroid Dicom App is a product of .decimal, LLC. The Dicom App will be revised as needed to meet future DICOM standards, and as such this may result in changes being made to the IODs listed in this Conformance Statement. It is the user's responsibility to ensure that the DICOM standard being used to send files to the app meet the requirements as defined in this Conformance Statement. Failure to do so can result in the loss of data types during the translation process.

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1.4 Trademarks

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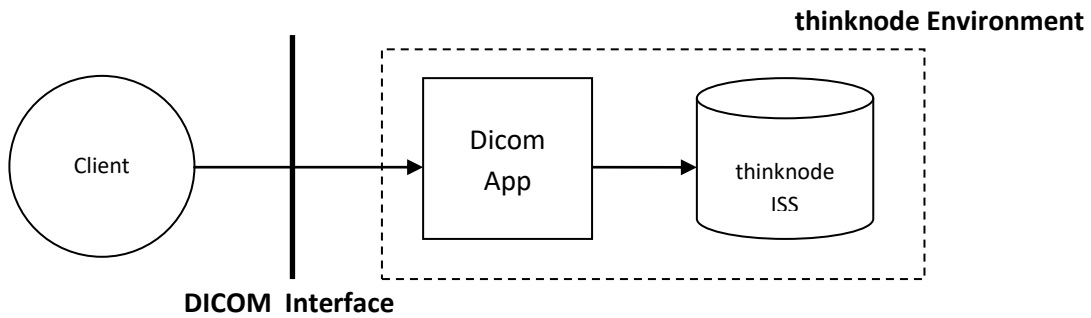
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2 Implementation Model

The astroid Dicom App runs as a calculation provider on the thinknode framework. As such, the Dicom App is not an interactive end user application. Users of the system will write scripts or use a separate interactive software program that makes calls to the functions provided by the astroid Dicom App API.

2.1 Application Data Flow



The astroid Dicom App waits for API calculation requests on the thinknode framework, where it is installed as a calculation provider. Requests are made using RESTful http transfer protocols over a TLS secured connection. Once a request is received by the calculation provider that is intended for the Dicom App, the app receives the request. The calculation request may consist of the different supported DICOM modalities (e.g. plan, structure set, ct images, or dose). The data is checked for validity and then processed based on the API function called in the calculation request. Data is stored in the internal thinknode Immutable Storage Service (ISS) as a defined standard type and referenced by a unique ID. A success response is sent to the remote client on successful processing and storage, otherwise an appropriate failure message is sent.

The once the DICOM request has been made, and the translated data stored in thinknode ISS, the data may be pulled from thinknode as another http request. The data, as a defined standard type, may then be easily used in other astroid apps or within programs and scripts made by the individual user that rely on the same defined standard types.

2.2 Functional Definition of Application Entities

The Dicom App acts as a Storage Service Class Provider.

2.3 Sequencing of Real World Activities

Not applicable.

3 AE Specifications

The Dicom App Application Entity provides standard conformance to the following DICOM Service Object Pairs (SOP) Classes as a Service Class Provider (SCP).

SOP Class Name	UID
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8

3.1 Number of Associations

The Dicom App will only handle one association at a time as the Dicom App runs as a calculation provider on the thinknode framework and the thinknode calculation supervisor will only assign one request at a time.

3.2 Asynchronous Nature

The Dicom App does not support asynchronous communication.

4 Supported IODs

Only the DICOM modules and tags defined in this section are processed by the astroid Dicom App. Unless otherwise indicated, all tags included in this list support both reading and writing, if the DICOM App provides both such functions for the modality at hand. If a tag is omitted from this list, it is not read or written by this application.

4.1 SOP Instance Reference - 10.8

Used for DICOM RT Plan, RT Structure Set, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Description
Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.
Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.

4.2 General Contributing Sources Macro - 10.10

Used for DICOM RT Plan, RT Structure Set, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Description
Manufacturer	(0008,1090)	1C	Manufacturer of the equipment that produced the sources.
Manufacturer's Model Name	(0008,1090)	1C	Manufacturer's model name of the equipment that produced the sources. Required if present and consistent in the contributing SOP Instances.
Software Versions	(0018,1020)	1C	Manufacturer's designation of software version of the equipment that produced the sources. See Section C.7.5.1.1.3. Required if present and consistent in the

Attribute Name	Tag	Type	Description
			contributing SOP Instances.
Operators' Name	(0008,1070)	1C	Name(s) of the operator(s) supporting the Series. Required if present and consistent in the contributing SOP Instances. Written only.

4.3 Patient Module - C.2.2

Used for DICOM RT Plan, RT Structure Set, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Attribute Description
Patient's Name	(0010,0010)	Patient's full name
Patient ID	(0010,0020)	Primary hospital identification number or code for the patient.
Patient Identity Removed	(0012,0062)	The true identity of the patient has been removed from the Attributes and the Pixel Data Enumerated Values: YES NO

4.4 Patient Demographic Module - C.2.3

Used for DICOM RT Plan, RT Structure Set, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Attribute Description
Patient's Birth Date	(0010,0030)	Date of birth of the named patient
Patient's Sex	(0010,0040)	Sex of the named patient. Enumerated Values: M male F female O other

4.5 General Study Module - C.7.2.1

Used for DICOM RT Plan, RT Structure Set, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Unique identifier for the Study.
Study Date	(0008,0020)	2	Date the Study started.
Study Time	(0008,0030)	2	Time the Study started.
Referring Physician's Name	(0008,0090)	2	Name of the patient's referring physician
Study ID	(0020,0010)	2	User or equipment generated Study identifier.
Accession Number	(0008,0050)	2	A RIS generated number that identifies the order for the Study.
Study Description	(0008,1030)	3	Institution-generated description or classification of the Study (component) performed.
Referenced Study Sequence	(0008,1110)	3	A Sequence that provides reference to a Study SOP Class/Instance pair. One or more items are permitted in this Sequence.

4.6 General Series Module - C.7.3.1

Used for DICOM RT Plan, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the images in this Series. See Section C.7.3.1.1.1 for Defined Terms.
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
Patient Position	(0018,5100)	1C	<p>Patient position descriptor relative to the patient support device.</p> <p>Required if Isocenter Position (300A,012C) is present. May be present otherwise.</p> <p>See Section C.8.8.12.1.2 for Defined Terms and further explanation.</p> <p>Note</p> <p>The orientation of the patient relative to the patient support device is denoted in the same manner as in the RT Patient Setup Module. It defines the relation of the patient-based DICOM coordinate system identified by the Frame of Reference Module of the RT Image to the IEC coordinate system and together with Isocenter Position (300A,012C) allows the RT</p>

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the images in this Series. See Section C.7.3.1.1.1 for Defined Terms.
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
			Image to be placed into the patient frame of reference. It also allows a system using an RT Image to verify that the patient is setup in a similar position relative to the patient support device.

4.7 Frame of Reference Module - C.7.4.1

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	Uniquely identifies the frame of reference for a Series. See Section C.7.4.1.1.1 for further explanation.
Position Reference Indicator	(0020,1040)	2	Part of the imaging target used as a reference. See Section C.7.4.1.1.2 for further explanation. Written only.

4.8 Image Plane Module - C.7.6.2

Used for DICOM CT Image and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See Section 10.7.1.3 for further explanation.
Image Orientation (Patient)	(0020,0037)	1	The direction cosines of the first row and the first column with respect to the patient. See Section C.7.6.2.1.1 for further explanation.
Image Position (Patient)	(0020,0032)	1	The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm. See Section C.7.6.2.1.1 for further explanation.
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm.

4.9 Image Pixel Module - C.7.6.3

Used for DICOM CT Image and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Rows	(0028,0010)	1	Number of rows in the images.
Columns	(0028,0011)	1	Number of columns in the images.
Pixel Representation	(0028,0103)	1	Data representation of pixel samples. See Section C.8.5.6.1.3 for specialization.

4.10 CT Image Module - C.8.2.1

Used for DICOM CT Image file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. See Section C.8.2.1.1.2 for specialization.
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data. See Section C.8.2.1.1.3 for specialization.
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See Section C.8.2.1.1.4 for specialization.
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See Section C.8.2.1.1.5 for specialization.
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See Section C.8.2.1.1.6 for specialization.
Rescale Intercept	(0028,1052)	1	The value b in relationship between stored values (SV) and the output units. Output units = $m \cdot SV + b$ If Image Type (0008,0008) Value 1 is ORIGINAL and Value 3 is not LOCALIZER, output units shall be Hounsfield Units (HU).
Rescale Slope	(0028,1053)	1	m in the equation specified in Rescale Intercept (0028,1052).
KVP	(0018,0060)	2	Peak kilo voltage output of the x-ray generator used

4.11 Multi-frame Module - C.7.6.6

Used for DICOM RT Dose file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Number of frames in a Multi-frame Image. See Section C.7.6.6.1.1 for further explanation.

4.12 RT Dose Module - C.8.8.3

Used for DICOM RT Dose file parsing and RT Dose DICOM file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1C	Number of samples (planes) in this image. See Section C.8.8.3.4.1 for specialization. Required if Pixel Data (7FE0,0010) is present.
Photometric Interpretation	(0028,0004)	1C	Specifies the intended interpretation of the pixel data. See Section C.8.8.3.4.2 for specialization. Required if Pixel Data (7FE0,0010) is present.
Bits Allocated	(0028,0100)	1C	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See Section C.8.8.3.4.3 for specialization. Required Pixel Data (7FE0,0010) is present.
Bits Stored	(0028,0101)	1C	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See Section C.8.8.3.4.4 for specialization. Required if Pixel Data (7FE0,0010) is present.
High Bit	(0028,0102)	1C	Most significant bit for each pixel sample. Each sample shall have the same high bit. See Section C.8.8.3.4.5 for specialization. Required if Pixel Data (7FE0,0010) is present.
Pixel Representation	(0028,0103)	1C	Data representation of the pixel samples. Each sample shall have the same pixel representation. See Section C.8.8.3.4.6 for specialization. Required Pixel Data (7FE0,0010) is present.
Dose Units	(3004,0002)	1	Units used to describe dose. Enumerated Values: GY Gray RELATIVE dose relative to implicit reference value
Dose Type	(3004,0004)	1	Type of dose. Defined Terms: PHYSICAL physical dose EFFECTIVE physical dose after correction for biological effect using user-defined modeling technique

Attribute Name	Tag	Type	Attribute Description
			ERROR difference between desired and planned dose
Dose Summation Type	(3004,000A)	1	Type of dose summation. Defined Terms: PLAN dose calculated for entire delivery of all fraction groups of RT Plan FRACTION dose calculated for entire delivery of a single Fraction Group within RT Plan BEAM dose calculated for entire delivery of one or more Beams within RT Plan
>Referenced Fraction Group Sequence	(300C,0020)	1C	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, FRACTION_SESSION, BEAM_SESSION, BRACHY_SESSION or CONTROL_POINT. Only a single Item shall be included in this Sequence. See Note 1.
>>Referenced Fraction Group Number	(300C,0022)	1	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).
>>Referenced Beam Sequence	(300C,0004)	1C	Sequence of Beams in current Fraction Group contributing to dose. Required if Dose Summation Type (3004,000A) is BEAM, BEAM_SESSION or CONTROL_POINT. One or more Items shall be included in this Sequence.
>>>Referenced Beam Number	(300C,0006)	1	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).
Dose Grid Scaling	(3004,000E)	1C	Scaling factor that when multiplied by the dose grid data found in Pixel Data (7FE0,0010) attribute of the Image Pixel Module, yields grid doses in the dose units as specified by Dose Units (3004,0002). Required if Pixel Data (7FE0,0010) is present.
Frame Increment Pointer	(0028, 0009)	1C	Contains the Data Element Tag of the attribute which is used as the frame increment in Multi-frame pixel data. Required if Number of Frames is sent.
Grid Frame Offset Vector	(3004,000C)	1C	An array that contains the dose image plane offsets (in mm) of the dose image frames in a multi-frame dose. Required if multi-frame pixel data are present and Frame Increment Pointer (0028,0009) points to Grid Frame Offset Vector (3004,000C). See Section C.8.8.3.2.

4.13 RT Structure Set Module - C.8.8.5

Used for DICOM RT Structure Set file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Structure Set Label	(3006,0002)	1	User-defined label for Structure Set.
Structure Set Name	(3006,0004)	3	User-defined name for Structure Set.
Referenced Frame of Reference Sequence	(3006,0010)	3	Sequence describing Frames of Reference in which the ROIs are defined. One or more Items are permitted in this Sequence. See Section C.8.8.5.1.
>Frame of Reference UID	(0020,0052)	1	Uniquely identifies Frame of Reference within Structure Set.
>RT Referenced Study Sequence	(3006,0012)	3	Sequence of Studies containing series to be referenced. One or more Items are permitted in this Sequence. See Section C.8.8.5.4.
>>RT Referenced Series Sequence	(3006,0014)	1	Sequence describing series of images within the referenced study that are used in defining the Structure Set. One or more Items shall be included in this Sequence.
>>>Series Instance UID	(0020,000E)	1	Unique identifier for the series containing the images.
>>>Contour Image Sequence	(3006,0016)	1	Sequence of items describing images in a given series used in defining the Structure Set (typically CT or MR images). One or more Items shall be included in this Sequence.
Structure Set ROI Sequence	(3006,0020)	1	ROIs for current Structure Set. One or more Items shall be included in this Sequence.
>ROI Number	(3006,0022)	1	Identification number of the ROI. The value of ROI Number (3006,0022) shall be unique within the Structure Set in which it is created.
>ROI Name	(3006,0026)	2	User-defined name for ROI.

4.14 ROI Contour Module - C.8.8.6

Used for DICOM RT Structure Set file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
ROI Contour Sequence	(3006,0039)	1	Sequence of Contour Sequences defining ROIs.

Attribute Name	Tag	Type	Attribute Description
			One or more Items shall be included in this Sequence.
>ROI Display Color	(3006,002A)	3	RGB triplet color representation for ROI, specified using the range 0-255.
>Contour Sequence	(3006,0040)	3	Sequence of Contours defining ROI. One or more Items are permitted in this Sequence.
>>Contour Geometric Type	(3006,0042)	1	Geometric type of contour. See Section 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	Number of points (triplets) in Contour Data (3006,0050).
>>Contour Data	(3006,0050)	1	Sequence of (x,y,z) triplets defining a contour in the patient based coordinate system described in Section C.7.6.2.1.1 (mm). See Section C.8.8.6.1 and Section 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.

4.15 RT ROI Observations Module - C.8.8.8

Used for DICOM RT Structure Set file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
RT ROI Observations Sequence	(3006,0080)	1	Sequence of observations related to ROIs defined in the ROI Module. One or more Items shall be included in this Sequence.
>Referenced ROI Number	(3006,0084)	1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).
>RT ROI Interpreted Type	(3006,00A4)	2	Type of ROI. See Section C.8.8.8.1. Defined Terms: EXTERNAL external patient contour PTV Planning Target Volume (as defined in ICRU50) CTV Clinical Target Volume (as defined in ICRU50)

Attribute Name	Tag	Type	Attribute Description
			GTV Gross Tumor Volume (as defined in ICRU50) TREATED_VOLUME Treated Volume (as defined in ICRU50) IRRAD_VOLUME Irradiated Volume (as defined in ICRU50) BOLUS patient bolus to be used for external beam therapy AVOIDANCE ORGAN region in which dose is to be minimized patient organ MARKER REGISTRATION patient marker or marker on a localizer registration ROI ISOCENTER treatment isocenter to be used for external beam therapy CONTRAST_AGENT volume into which a contrast agent has been injected CAVITY patient anatomical cavity BRACHY_CHANNEL brachytherapy channel BRACHY_ACCESSORY brachytherapy accessory device BRACHY_SRC_APP brachytherapy source applicator BRACHY_CHNL_SHLD brachytherapy channel shield SUPPORT external patient support device FIXATION external patient fixation or immobilization device DOSE_REGION ROI to be used as a dose reference CONTROL ROI to be used in control of dose optimization and calculation

4.16 RT General Plan Module C.8.8.9

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
RT Plan Label	(300A,0002)	1	User-defined label for treatment plan.
RT Plan Name	(300A,0003)	3	User-defined name for treatment plan.
RT Plan Description	(300A,0004)	3	User-defined description of treatment plan.
RT Plan Date	(300A,0006)	2	Date treatment plan was last modified.
RT Plan Time	(300A,0007)	2	Time treatment plan was last modified.
RT Plan Geometry	(300A,000C)	1	Describes whether RT Plan is based on patient or treatment device geometry. See Section C.8.8.9.1. Defined Terms: PATIENT RT Structure Set exists TREATMENT_DEVICE RT Structure Set does not exist
Referenced Structure Set Sequence	(300C,0060)	1C	The RT Structure Set on which the RT Plan is based. Only a single Item shall be included in this Sequence. Required if RT Plan Geometry (300A,000C) is PATIENT.

Attribute Name	Tag	Type	Attribute Description
>Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the references SOP Class.
>Referenced SOP Instance UID	(0008,1152)	1	Uniquely identifies the referenced SOP Instance.

4.17 RT Prescription Module - C.8.8.10

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Dose Reference Sequence	(300A,0010)	3	Sequence of Dose References. One or more Items are permitted in this Sequence.
>Dose Reference Number	(300A,0012)	1	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.
>Dose Reference UID	(300A,0013)	3	A unique identifier for a Dose Reference that can be used to link the same entity across multiple RT Plan objects.
>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.
>Dose Reference Structure Type	(300A,0014)	1	Structure type of Dose Reference. 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
>Dose Reference Description	(300A,0016)	3	User-defined description of Dose Reference.
>Dose Reference Point Coordinates	(300A,0018)	1C	Coordinates (x,y,z) of Reference Point in the patient based coordinate system described in Section C.7.6.2.1.1 (mm). Required if Dose Reference Structure Type (300A,0014) is COORDINATES.
>Dose Reference Type	(300A,0020)	1	Type of Dose Reference. Defined Terms: TARGET treatment target (corresponding to GTV, PTV, or CTV in ICRU50) ORGAN_AT_RISK Organ at Risk (as defined in ICRU50)

Attribute Name	Tag	Type	Attribute Description
>Delivery Maximum Dose	(300A,0023)	3	The maximum dose (in Gy) that can be delivered to the dose reference.
>Target Minimum Dose	(300A,0025)	3	Minimum permitted dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) is TARGET.
>Target Prescription Dose	(300A,0026)	3	Prescribed dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) is TARGET.
>Target Maximum Dose	(300A,0027)	3	Maximum permitted dose (in Gy) to Dose Reference if Dose Reference Type (300A,0020) is TARGET.
>Target Underdose Volume Fraction	(300A,0028)	3	Maximum permitted fraction (in percent) of Target to receive less than the Target Prescription Dose if Dose Reference Type (300A,0020) is TARGET and Dose Reference Structure Type (300A,0014) is VOLUME. See Section C.8.8.10.1.

4.18 RT Ion Tolerance Table Module - C.8.8.24

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Ion Tolerance Table Sequence	(300A,03A0)	3	Sequence of tolerance tables to be used for delivery of treatment plan. One or more Items are permitted in this Sequence. See Note 1.
>Tolerance Table Number	(300A,0042)	1	Identification number of the Tolerance Table. The value of Tolerance Table Number (300A,0042) shall be unique within the RT Plan in which it is created.
>Tolerance Table Label	(300A,0043)	3	User-defined label for Tolerance Table.
>Gantry Angle Tolerance	(300A,0044)	3	Maximum permitted difference (in degrees) between planned and delivered Gantry Angle.
>Beam Limiting Device Angle Tolerance	(300A,0046)	3	Maximum permitted difference (in degrees) between planned and delivered Beam Limiting Device Angle.
>Beam Limiting Device Tolerance Sequence	(300A,0048)	3	Sequence of beam limiting device (collimator) tolerances. One or more Items are permitted in this Sequence.
>>RT Beam Limiting Device Type	(300A,00B8)	1	Type of beam limiting device (collimator). 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

Attribute Name	Tag	Type	Attribute Description
			MLCX multileaf (multi-element) jaw pair in IEC X direction MLCY multileaf (multi-element) jaw pair in IEC Y direction
>>Beam Limiting Device Position Tolerance	(300A,004A)	1	Maximum permitted difference (in mm) between planned and delivered leaf (element) or jaw positions for current beam limiting device (collimator).
>Patient Support Angle Tolerance	(300A,004C)	3	Maximum permitted difference (in degrees) between planned and delivered Patient Support Angle.
>Table Top Vertical Position Tolerance	(300A,0051)	3	Maximum permitted difference (in mm) between planned and delivered Table Top Vertical Position.
>Table Top Longitudinal Position Tolerance	(300A,0052)	3	Maximum permitted difference (in mm) between planned and delivered Table Top Longitudinal Position.
>Table Top Lateral Position Tolerance	(300A,0053)	3	Maximum permitted difference (in mm) between planned and delivered Table Top Lateral Position.
>Table Top Pitch Angle Tolerance	(300A,004F)	3	Maximum permitted difference (in degrees) between planned and delivered Table Top Pitch Angle.
>Table Top Roll Angle Tolerance	(300A,0050)	3	Maximum permitted difference (in degrees) between planned and delivered Table Top Roll Angle.
>Snout Position Tolerance	(300A,004B)	3	Maximum permitted difference (in mm) between planned and delivered Snout Position.

4.19 RT Patient Setup Module - C.8.8.12

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Patient Setup Sequence	(300A,0180)	1	Sequence of patient setup data for current plan. One or more Items shall be included in this Sequence.
>Patient Setup Number	(300A,0182)	1	Identification number of the Patient Setup. The value of Patient Setup Number (300A,0182) shall be unique within the RT Plan in which it is created.
>Patient Setup Label	(300A,0183)	3	The user-defined label for the patient setup.
>Patient Position	(0018,5100)	1C	Patient position descriptor relative to the equipment. Required if Patient Additional Position (300A,0184) is not present. See Section C.8.8.12.1.2 for Defined Terms and further explanation.
>Setup Technique	(300A,01B0)	3	Setup Technique used in Patient Setup. Defined Terms: ISOCENTRIC FIXED_SSD

Attribute Name	Tag	Type	Attribute Description
			TBI BREAST_BRIDGE SKIN_APPOSITION
>Table Top Vertical Setup Displacement	(300A,01D2)	3	Vertical Displacement in IEC TABLE TOP coordinate system (in mm) relative to initial Setup Position, i.e., vertical offset between patient positioning performed using setup and treatment position.
>Table Top Longitudinal Setup Displacement	(300A,01D4)	3	Longitudinal Displacement in IEC TABLE TOP coordinate system (in mm) relative to initial Setup Position, i.e., longitudinal offset between patient positioning performed using setup and treatment position.
>Table Top Lateral Setup Displacement	(300A,01D6)	3	Lateral Displacement in IEC TABLE TOP coordinate system (in mm) relative to initial Setup Position, i.e., lateral offset between patient positioning performed using setup and treatment position.

4.20 RT Fraction Scheme Module - C.8.8.13

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
Fraction Group Sequence	(300A,0070)	1	Sequence of Fraction Groups in current Fraction Scheme. One or more Items shall be included in this Sequence.
>Fraction Group Number	(300A,0071)	1	Identification number of the Fraction Group. The value of Fraction Group Number (300A,0071) shall be unique within the RT Plan in which it is created.
>Fraction Group Description	(300A,0072)	3	The user defined description for the fraction group. Written only.
>Number of Fractions Planned	(300A,0078)	2	Total number of treatments (Fractions) prescribed for current Fraction Group.
>Number of Fraction Pattern Digits Per Day	(300A,0079)	3	Number of digits in Fraction Pattern (300A,007B) used to represent one day. See Note 2. Written only.
>Repeat Fraction Cycle Length	(300A,007A)	3	Number of weeks needed to describe treatment pattern. See Note 2. Written only.
>Fraction Pattern	(300A,007B)	3	String of 0's (no treatment) and 1's (treatment) describing treatment pattern. Length of string is 7 x Number of Fraction Pattern Digits Per Day x Repeat Fraction Cycle Length. Pattern shall start on a Monday. See Note 2.

Attribute Name	Tag	Type	Attribute Description
			Written only.
>Number of Beams	(300A,0080)	1	Number of Beams in current Fraction Group. If Number of Beams is greater then zero, Number of Brachy Application Setups (300A,00A0) shall equal zero. Written only.
>Referenced Beam Sequence	(300C,0004)	1C	Sequence of treatment beams in current Fraction Group. One or more Items shall be included in this Sequence. Required if Number of Beams (300A,0080) is greater than zero. Written only.
>>Referenced Beam Number	(300C,0006)	1	Uniquely identifies Beam specified by Beam Number (300A,00C0) within Beam Sequence (300A,00B0) in RT Beams Module. Written only.
>>Beam Dose Specification Point	(300A,0082)	3	Coordinates (x,y,z) of point at which Beam Dose is specified in the patient based coordinate system described in Section C.7.6.2.1.1 (mm). See Note 3. Written only.
>>Beam Dose	(300A,0084)	3	Dose (in Gy) at Beam Dose Specification Point (300A,0082) due to current Beam for one treatment fraction. Written only.
>>Beam Meterset	(300A,0086)	3	Machine setting to be delivered for current Beam, specified in Monitor Units (MU) or minutes as defined by Primary Dosimeter Unit (300A,00B3) (in RT Beams Module) for referenced Beam. See Note 4. Written only.
>Number of Brachy Application Setups	(300A,00A0)	1	Number of Brachy Application Setups in current Fraction Group. If Number of Brachy Application Setups is greater then zero, Number of Beams (300A,0080) shall equal zero. Written only.

4.21 RT Beams Module - C.8.8.14

Used for DICOM RT Plan file parsing ad writing.

>>Source to Surface Distance	(300A,0130)	3	Source to Patient Surface (skin) distance (mm).
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4.22 Approval Module - C.8.8.16

Used for DICOM RT Plan file parsing and writing.

Approval Status	(300E,0002)	1	Approval status at the time the SOP Instance was created. Enumerated Values: APPROVED Reviewer recorded that object met an implied criterion UNAPPROVED No review of object has been recorded REJECTED Reviewer recorded that object failed to meet an implied criterion
Review Date	(300E,0004)	2C	Date on which object was reviewed. Required if Approval Status (300E,0002) is APPROVED or REJECTED.
Review Time	(300E,0005)	2C	Time at which object was reviewed. Required if Approval Status (300E,0002) is APPROVED or REJECTED.
Reviewer Name	(300E,0008)	2C	Name of person who reviewed object. Required if Approval Status (300E,0002) is APPROVED or REJECTED.

4.23 RT Ion Beams Module - C.8.8.25

Used for DICOM RT Plan file parsing and writing.

Attribute Name	Tag	Type	Description
Ion Beam Sequence	(300A,03A2)	1	Sequence of setup and/or treatment beams for current RT Ion Plan. One or more Items shall be included in this Sequence.
>Beam Number	(300A,00C0)	1	Identification number of the Beam. The value of Beam Number (300A,00C0) shall be unique within the RT Ion Plan in which it is created. See Section C.8.8.25.1.
>Beam Name	(300A,00C2)	1	User-defined name for Beam. See Section C.8.8.25.1.
>Beam Description	(300A,00C3)	3	User-defined description for Beam. See Section C.8.8.25.1.
>Beam Type	(300A,00C4)	1	Motion characteristic of Beam. Enumerated Values: STATIC all beam parameters remain unchanged during delivery DYNAMIC one or more beam parameters changes during delivery
>Scan Mode	(300A,0308)	1	The method of beam scanning to be used during treatment. Defined Terms: NONE No beam scanning is performed.

Attribute Name	Tag	Type	Description
			<p>UNIFORM The beam is scanned between control points to create a uniform lateral fluence distribution across the field.</p> <p>MODULATED The beam is scanned between control points to create a modulated lateral fluence distribution across the field.</p>
>Radiation Type	(300A,00C6)	1	<p>Particle type of Beam.</p> <p>Defined Terms: PROTON ION</p>
>Treatment Machine Name	(300A,00B2)	2	User-defined name identifying treatment machine to be used for beam delivery. See Section C.8.8.25.2.
>Manufacturer	(0008,0070)	3	<p>Manufacturer of the equipment to be used for beam delivery.</p> <p>Written only.</p>
>Institution Name	(0008,0080)	3	<p>Institution where the equipment is located that is to be used for beam delivery.</p> <p>Written only.</p>
>Manufacturer's Model Name	(0008,1090)	3	<p>Manufacturer's model name of the equipment that is to be used for beam delivery.</p> <p>Written only.</p>
>Primary Dosimeter Unit	(300A,00B3)	1	<p>Measurement unit of machine dosimeter.</p> <p>Enumerated Values: MU Monitor Unit NP number of particles</p>
>Patient Support Type	(300A,0350)	1	<p>Defined Terms: TABLE CHAIR</p> <p>Read, but not used. Written, TABLE.</p>
>Referenced Tolerance Table Number	(300C,00A0)	3	Uniquely identifies Tolerance Table specified by Tolerance Table Number (300A,0042) within Tolerance Table Sequence in RT Ion Tolerance Tables Module. These tolerances are to be used for verification of treatment machine settings.
>Virtual Source-Axis Distances	(300A,030A)	1	<p>Distance (in mm) from virtual source position to gantry rotation axis or nominal isocenter position (fixed beam-lines) of the equipment to be used for beam delivery. Specified by a numeric pair – the VSAD in the IEC Gantry X direction followed by the VSAD in the IEC Gantry Y direction.</p> <p>The VSAD is commonly used for designing apertures in contrast</p>

Attribute Name	Tag	Type	Description
			to the effective source-axis-distance (ESAD) that is commonly used with the inverse square law for calculating the dose decrease with distance. See Section C.8.8.25.4.
>Referenced Patient Setup Number	(300C,006A)	3	Uniquely identifies Patient Setup to be used for current beam, specified by Patient Setup Number (300A,0182) within Patient Setup Sequence of RT Patient Setup Module.
>Treatment Delivery Type	(300A,00CE)	1	Delivery Type of treatment. Defined Terms: TREATMENT SETUP Normal patient treatment No treatment beam is applied for this RT Beam. To be used for specifying the gantry, couch, and other machine positions where X-Ray set-up images or measurements shall be taken.
>Number of Wedges	(300A,00D0)	1	Number of wedges associated with current beam. Written only, 0.
>Number of Compensators	(300A,00E0)	1	Number of compensators associated with current Beam.
>Ion Range Compensator Sequence	(300A,02EA)	1C	Sequence of compensators. Required if Number of Compensators (300A,00E0) is non-zero. The number of items shall be identical to the value of Number of Compensators (300A,00E0).
>>Compensator Number	(300A,00E4)	1	Identification number of the Compensator. The value of Compensator Number (300A,00E4) shall be unique within the Beam in which it is created.
>>Material ID	(300A,00E1)	2	User-supplied identifier for material used to manufacture Compensator.
>>Compensator ID	(300A,00E5)	3	User-supplied identifier for the compensator.
>>Compensator Divergence	(300A,02E0)	1	Indicates presence or absence of geometrical divergence of the range compensator. Enumerated Values: PRESENT the range compensator is shaped according to the beam geometrical divergence. ABSENT the range compensator is not shaped according to the beam geometrical divergence.
>>Compensator Mounting Position	(300A,02E1)	1	Indicates on which side of the Compensator Tray the compensator is mounted. Enumerated Values: PATIENT_SIDE the Compensator is mounted on the side of the Compensator Tray that is towards the patient.

Attribute Name	Tag	Type	Description
			<p>SOURCE_SIDE the Compensator is mounted on the side of the Compensator Tray that is towards the radiation source.</p> <p>DOUBLE_SIDED the Compensator has a shaped (i.e., non-flat) surface on both sides of the Compensator Tray.</p>
>>Compensator Rows	(300A,00E7)	1	Number of rows in the range compensator. A row is defined to be in the X direction of the IEC Beam Limiting Device Coordinate system.
>>Compensator Columns	(300A,00E8)	1	Number of columns in the range compensator. A column is defined to be in the Y direction of the IEC Beam Limiting Device Coordinate system.
>>Compensator Pixel Spacing	(300A,00E9)	1	Physical distance (in mm) between the center of each pixel projected onto machine isocentric plane. Specified by a numeric pair – adjacent row spacing followed by adjacent column spacing. See Section 10.7.1.3 for further explanation of the value order.
>>Compensator Position	(300A,00EA)	1	The x and y coordinates of the upper left hand corner (first pixel transmitted) of the range compensator, projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm).
>>Compensator Column Offset	(300A,02E5)	1C	The offset distance (in mm) applied to the x coordinate of Compensator Position (300A,00EA) for even numbered rows. Required if the compensator pattern is hexagonal.
>>Compensator Thickness Data	(300A,00EC)	1	A data stream of the pixel samples that comprise the range compensator, expressed as physical thickness (in mm), either parallel to radiation beam axis if Compensator Divergence (300A,02E0) equals ABSENT, or divergent according to the beam geometrical divergence if Compensator Divergence (300A,02E0) equals PRESENT. The order of pixels sent is left to right, top to bottom (upper left pixel, followed by the remainder of row 1, followed by the remainder of the rows).
>>Isocenter to Compensator Tray Distance	(300A,02E4)	1C	Isocenter to compensator tray attachment edge distance (in mm) for current range compensator. Required if Compensator Mounting Position (300A,02E1) is not DOUBLE_SIDED. See Section C.8.8.25.4.
>>Compensator Relative Stopping Power Ratio	(300A,02E7)	3	Compensator Linear Stopping Power Ratio, relative to water, at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Ion Control Point Sequence (300A,03A8).
>Number of Boli	(300A,00ED)	1	Number of boli associated with current Beam. Written only, 0.
>Number of Blocks	(300A,00F0)	1	Number of shielding blocks associated with Beam.
>Ion Block Sequence	(300A,03A6)	1C	Sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is non-zero.

Attribute Name	Tag	Type	Description
			The number of items shall be identical to the value of Number of Blocks (300A,00F0).
>>Block Tray ID	(300A,00F5)	3	User-supplied identifier for block tray.
>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader. Shall not be present if Block Slab Sequence (300A,0441) is present within the same item of Ion Block Sequence (300A,03A6) or when the Block Type (300A,00F8) has a value of APERTURE and Block Slab Sequence (300A,0441) is present in another item having this value.
>>Isocenter to Block Tray Distance	(300A,00F7)	1	Isocenter to downstream edge of block tray (mm). See Section C.8.8.25.4
>>Block Type	(300A,00F8)	1	Type of block. See Section C.8.8.14.4. Enumerated Values: SHIELDING blocking material is inside contour APERTURE blocking material is outside contour
>>Block Divergence	(300A,00FA)	1	Indicates presence or otherwise of geometrical divergence. Enumerated Values: PRESENT block edges are shaped for beam divergence ABSENT block edges are not shaped for beam divergence
>>Block Mounting Position	(300A,00FB)	1	Indicates on which side of the Block Tray the block is mounted. Enumerated Values: PATIENT_SIDE the block is mounted on the side of the Block Tray that is towards the patient SOURCE_SIDE the block is mounted on the side of the Block Tray that is towards the radiation source
>>Block Number	(300A,00FC)	1	Identification number of the Block. The value of Block Number (300A,00FC) shall be unique within the Beam in which it is created.
>>Block Name	(300A,00FE)	3	User-defined name for block.
>>Material ID	(300A,00E1)	2	User-supplied identifier for material used to manufacture Block.
>>Block Thickness	(300A,0100)	1	Physical thickness of block (in mm) parallel to radiation beam axis. See Section C.8.8.14.4.
>>Block Number of Points	(300A,0104)	1	Number of (x,y) pairs defining the block edge.
>>Block Data	(300A,0106)	1	A data stream of (x,y) pairs that 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).

Attribute Name	Tag	Type	Description
>Snout Sequence	(300A,030C)	3	Sequence of Snouts associated with Beam. Only a single item is permitted in this Sequence.
>>Snout ID	(300A,030F)	1	User or machine supplied identifier for Snout.
>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader.
>Number of Range Shifters	(300A,0312)	1	Number of range shifters associated with current beam.
>Range Shifter Sequence	(300A,0314)	1C	Sequence of range shifters associated with Beam. Required if Number of Range Shifters (300A,0312) is non-zero. The number of items shall be identical to the value of Number of Range Shifters (300A,0312).
>>Range Shifter Number	(300A,0316)	1	Identification number of the Range Shifter. The value of Range Shifter Number (300A,0316) shall be unique within the Beam in which it is created.
>>Range Shifter ID	(300A,0318)	1	User or machine supplied identifier for Range Shifter.
>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader.
>>Range Shifter Type	(300A,0320)	1	Type of Range Shifter. Defined Terms: ANALOG Device is variable thickness and is composed of opposing sliding wedges, water column or similar mechanism. BINARY Device is composed of different thickness materials that can be moved in or out of the beam in various stepped combinations.
>Number of Lateral Spreading Device	(300A,0330)	1	Number of lateral spreading devices associated with current beam.
>Lateral Spreading Device Sequence	(300A,0332)	1C	Sequence of lateral spreading devices associated with Beam. Required if Number of Lateral Spreading Devices (300A,0330) is non-zero. The number of items shall be identical to the value of Number of Lateral Spreading Devices (300A,0330). <i>This tag is not supported</i>
>>Lateral Spreading Device Number	(300A,0334)	1	Identification number of the Lateral Spreading Device. The value of Lateral Spreading Device Number (300A,0334) shall be unique within the Beam in which it is created. <i>This tag is not supported</i>

Attribute Name	Tag	Type	Description
>>Lateral Spreading Device ID	(300A,0336)	1	User or machine supplied identifier for Lateral Spreading Device. <i>This tag is not supported</i>
>>Lateral Spreading Device Type	(300A,0338)	1	Type of Lateral Spreading Device. Defined Terms: SCATTERER metal placed into the beam path to scatter charged particles laterally. MAGNET nozzle configuration of magnet devices to expand beam laterally. <i>This tag is not supported</i>
>Number of Range Modulators	(300A,0340)	1	Number of range modulators associated with current beam.
>Range Modulator Sequence	(300A,0342)	1C	Sequence of range modulators associated with Beam. Required if Number of Range Modulators (300A,0340) is non-zero. The number of items shall be identical to the value of Number of Range Modulators (300A,0340). <i>This tag is not supported</i>
>>Range Modulator Number	(300A,0344)	1	Identification number of the Range Modulator. The value of Range Modulator Number (300A,0344) shall be unique within the Beam in which it is created. <i>This tag is not supported</i>
>>Range Modulator ID	(300A,0346)	1	User or machine supplied identifier for Range Modulator. <i>This tag is not supported</i>
>>Range Modulator Type	(300A,0348)	1	Type of Range Modulator. Defined Terms: FIXED fixed modulation width and weights using ridge filter or constant speed wheel with constant beam current WHL_FIXEDWEIGHTS selected wheel/track (Range Modulator ID) is spinning at constant speed. Modulation width is adjusted by switching constant beam current on and off at wheel steps indicated by Range Modulator Gating Values. WHL_MODWEIGHTS selected wheel/track (Range Modulator ID) is spinning at constant speed. Weight per wheel step is adjusted by modulating beam current according to selected Beam Current Modulation ID (300A,034C).

Attribute Name	Tag	Type	Description
			<p>Only one item in the Range Modulator Sequence (300A,0342) can have a Range Modulator Type (300A,0348) of WHL_MODWEIGHTS. Only one item in the Range Modulator Sequence (300A,0342) can have a Range Modulator Type (300A,0348) of WHL_MODWEIGHTS.</p> <p><i>This tag is not supported</i></p>
>Final Cumulative Meterset Weight	(300A,010E)	1C	Value of Cumulative Meterset Weight (300A,0134) for final Control Point in Ion Control Point Sequence (300A,03A8). Required if Cumulative Meterset Weight is non-null in Control Points specified within Ion Control Point Sequence. See Section C.8.8.14.1.
>Number of Control Points	(300A,0110)	1	Number of control points in Beam. Value shall be greater than or equal to 2.
>Ion Control Point Sequence	(300A,03A8)	1	<p>Sequence of machine configurations describing Ion treatment beam.</p> <p>The number of items shall be identical to the value of Number of Control Points (300A,0110).</p> <p>See Section C.8.8.25.7.</p>
>>Control Point Index	(300A,0112)	1	Index of current Control Point, starting at 0 for first Control Point.
>>Cumulative Meterset Weight	(300A,0134)	2	Cumulative weight to current control point. Cumulative Meterset Weight for the first item in Control Point Sequence shall always be zero. Cumulative Meterset Weight for the final item in Ion Control Point Sequence shall always be equal to Final Cumulative Meterset Weight.
>>Nominal Beam Energy	(300A,0114)	1C	Nominal Beam Energy at control point in MeV per nucleon. Defined at nozzle entrance before all Beam Modifiers. Required for first item of Control Point Sequence, or if Nominal Beam Energy changes during Beam, and KVP (0018,0060) is not present.
>>Nominal Beam Energy Unit	(300A,0015)	1C	<p>Units used for Nominal Beam Energy (300A,0114). Required if Nominal Beam Energy (300A,0114) is sent.</p> <p>Defined Terms: MV Megavolt MEV Mega electron-Volt</p> <p>If Radiation Type (300A,00C6) is PHOTON, Nominal Beam Energy Unit (300A,0015) shall be MV. If Radiation Type (300A,00C6) is ELECTRON, Nominal Beam Energy Unit (300A,0015) shall be MEV.</p>
>>Meterset Rate	(300A,035A)	3	Specifies the speed of delivery of the specified dose in units specified by Primary Dosimeter Unit (300A,00B3) per minute.
>>Gantry Angle	(300A,011E)	1C	Gantry angle of radiation source, i.e., orientation of IEC GANTRY coordinate system with respect to IEC FIXED

Attribute Name	Tag	Type	Description
			REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Gantry Angle changes during Beam.
>>Gantry Rotation Direction	(300A,011F)	1C	Direction of Gantry Rotation when viewing gantry from isocenter, for segment following Control Point. Required for first item of Control Point Sequence, or if Gantry Rotation Direction changes during Beam. See Section C.8.8.14.8. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation
>>Gantry Pitch Angle	(300A,014A)	2C	Gantry Pitch Angle of the radiation source, i.e., the rotation of the IEC GANTRY coordinate system about the X-axis of the IEC GANTRY coordinate system (degrees). Required for first item of Control Point Sequence, or if Gantry Pitch Rotation Angle changes during Beam. See Section C.8.8.25.6.5.
>>Gantry Pitch Rotation Direction	(300A,014C)	2C	Direction of Gantry Pitch Angle when viewing along the positive X-axis of the IEC GANTRY coordinate system, for segment following Control Point. Required for first item of Control Point Sequence, or if Gantry Pitch Rotation Direction changes during Beam. See Section C.8.8.14.8 and Section C.8.8.25.6.5. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation
>>Beam Limiting Device Angle	(300A,0120)	1C	Beam Limiting Device angle, i.e., orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees). Required for first item of Control Point Sequence, or if Beam Limiting Device Angle changes during Beam.
>>Beam Limiting Device Rotation Direction	(300A,0121)	1C	Direction of Beam Limiting Device Rotation when viewing beam limiting device (collimator) from radiation source, for segment following Control Point. Required for first item of Control Point Sequence, or if Beam Limiting Device Rotation Direction changes during Beam. See Section C.8.8.14.8. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation
>>Scan Spot Tune ID	(300A,0390)	1C	User-supplied or machine code identifier for machine configuration to produce beam spot. This may be the nominal spot size or some other machine specific value. Required if Scan Mode (300A,0308) is MODULATED.
>>Number of Scan Spot Positions	(300A,0392)	1C	Number of spot positions used to specify scanning pattern for current segment beginning at control point. Required if Scan Mode (300A,0308) is MODULATED.

Attribute Name	Tag	Type	Description
>>Scan Spot Position Map	(300A,0394)	1C	The x and y coordinates of the scan spots are defined as projected onto the machine isocentric plane in the IEC GANTRY coordinate system (mm). Required if Scan Mode (300A,0308) is MODULATED. Contains 2N values where N is the Number of Scan Spot Positions (300A,0392).
>>Scan Spot Meterset Weights	(300A,0396)	1C	A data set of Meterset weights corresponding to scan spot positions. The order of weights matches the positions in Scan Spot Positions (300A,0394). The sum contained in all Meterset weights shall match the difference of the cumulative Meterset weight of the current control point to the following control point. Required if Scan Mode (300A,0308) is MODULATED.
>>Scanning Spot Size	(300A,0398)	3	The Scanning Spot Size as calculated using the Full Width Half Maximum (FWHM). Specified by a numeric pair - the size measured in air at isocenter in IEC GANTRY X direction followed by the size in the IEC GANTRY Y direction (mm).
>>Number of Paintings	(300A,039A)	1C	The number of times the scan pattern given by Scan Spot Position Map (300A,0394) and Scan Spot Meterset Weights (300A,0396) shall be applied at the current control point. To obtain the Meterset weight per painting, the values in the Scan Spot Meterset Weights (300A,0396) should be divided by the value of this attribute. Required if Scan Mode (300A,0308) is MODULATED.
>>Patient Support Angle	(300A,0122)	1C	Patient Support angle, i.e., orientation of IEC PATIENT SUPPORT (turntable) coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Patient Support Angle changes during Beam.
>>Patient Support Rotation Direction	(300A,0123)	1C	Direction of Patient Support Rotation when viewing table from above, for segment following Control Point. Required for first item of Control Point Sequence, or if Patient Support Rotation Direction changes during Beam. See Section C.8.8.14.8. Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation
>>Snout Position	(300A,030D)	2C	Axial position of the snout (in mm) measured from isocenter to the downstream side of the snout (without consideration of variable length elements such as blocks, MLC and/or compensators). Required for first item in Control Point Sequence, or if Snout Position changes during Beam.
>>Table Top Pitch Angle	(300A,0140)	1C	Table Top Pitch Angle, i.e., the rotation of the IEC TABLE TOP coordinate system about the X-axis of the IEC TABLE TOP coordinate system (degrees). If required by treatment delivery device, shall be present for first item of Control Point Sequence. If required by treatment delivery device and if Table Top Pitch Angle changes during Beam, shall be present in all subsequent items of Control Point Sequence. See Section C.8.8.14.12 and Section C.8.8.14.13.

Attribute Name	Tag	Type	Description
>>Table Top Pitch Rotation Direction	(300A,0142)	1C	<p>Direction of Table Top Pitch Rotation when viewing the table along the positive X-axis of the IEC TABLE TOP coordinate system, for segment following Control Point. If required by treatment delivery device, shall be present for first item of Control Point Sequence. If required by treatment delivery device and if Table Top Pitch Rotation Direction changes during Beam, shall be present in all subsequent items of Control Point Sequence. See Section C.8.8.14.8 and Section C.8.8.14.12.</p> <p>Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation</p>
>>Table Top Roll Angle	(300A,0144)	1C	<p>Table Top Roll Angle, i.e., the rotation of the IEC TABLE TOP coordinate system about the IEC Y-axis of the IEC TABLE TOP coordinate system (degrees). If required by treatment delivery device, shall be present for first item of Control Point Sequence. If required by treatment delivery device and if Table Top Roll Angle changes during Beam, shall be present in all subsequent items of Control Point Sequence. See Section C.8.8.14.12 and Section C.8.8.14.13.</p>
>>Table Top Roll Rotation Direction	(300A,0146)	1C	<p>Direction of Table Top Roll Rotation when viewing the table along the positive Y-axis of the IEC TABLE TOP coordinate system, for segment following Control Point. If required by treatment delivery device, shall be present for first item of Control Point Sequence. If required by treatment delivery device and if Table Top Roll Rotation Direction changes during Beam, shall be present in all subsequent items of Control Point Sequence. See Section C.8.8.14.8 and Section C.8.8.14.12.</p> <p>Enumerated Values: CW clockwise CC counter-clockwise NONE no rotation</p>
>>Isocenter Position	(300A,012C)	2C	<p>Isocenter coordinates (x,y,z) in the patient based coordinate system described in Section C.7.6.2.1.1 (mm). Required for first item of Segment Control Point Sequence, or if Segment Isocenter Position changes during Beam.</p>
>>Source to Surface Distance	(300A,0130)	3	<p>Source to Patient Surface (skin) distance (mm).</p>
>>Surface Entry Point	(300A,012E)	3	<p>Patient surface entry point coordinates (x,y,z), along the central axis of the beam, in the patient based coordinate system described in Section C.7.6.2.1.1 (mm).</p>

4.24 SOP Common Module - C.12.1

Used for DICOM RT Plan, RT Structure Set, CT Image, and RT Dose file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Uniquely identifies the SOP Class. See Section C.12.1.1.1 for further explanation. See also PS3.4.
SOP Instance UID	(0008,0018)	1	Uniquely identifies the SOP Instance. See Section C.12.1.1.1 for further explanation. See also PS3.4.
Instance Creation Date	(0008,0012)	3	Date the SOP Instance was created. This is the date that the SOP Instance UID was assigned, and does not change during subsequent coercion of the instance.
Instance Creation Time	(0008,0013)	3	Time the SOP Instance was created. This is the time that the SOP Instance UID was assigned, and does not change during subsequent coercion of the instance.

4.25 RT ROI Observations Module

Used for DICOM RT Structure Set file parsing and writing.

Attribute Name	Tag	Type	Attribute Description
RT ROI Interpreted Type	(3006,00A4)	2	Type of ROI. See Section C.8.8.8.1. Defined Terms: EXTERNAL external patient contour PTV Planning Target Volume (as defined in ICRU50) CTV Clinical Target Volume (as defined in ICRU50) GTV Gross Tumor Volume (as defined in ICRU50) TREATED_VOLUME Treated Volume (as defined in ICRU50) IRRAD_VOLUME Irradiated Volume (as defined in ICRU50) BOLUS patient bolus to be used for external beam therapy AVOIDANCE region in which dose is to be minimized ORGAN patient organ MARKER patient marker or marker on a localizer REGISTRATION registration ROI ISOCENTER treatment isocenter to be used for external beam therapy CONTRAST_AGENT volume into which a contrast agent has been injected CAVITY patient anatomical cavity BRACHY_CHANNEL brachytherapy channel BRACHY_ACCESSORY brachytherapy accessory device BRACHY_SRC_APP brachytherapy source applicator BRACHY_CHNL_SHLD brachytherapy channel shield

Attribute Name	Tag	Type	Attribute Description
			SUPPORT external patient support device FIXATION external patient fixation or immobilization device DOSE_REGION ROI to be used as a dose reference CONTROL ROI to be used in control of dose optimization and calculation