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On-Board Imager PortalVision Advanced Imaging

DICOM Conformance Statement

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Abstract

This document provides information about the DICOM Conformance of the On Board Imager version 1.6/PortalVision Advanced Imaging product.

OBI and PV Advanced Imaging

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1. Introduction

1.1 Audience

This document is intended for the following groups of persons:

- Marketing and Sales
- System Integrators of medical equipment
- Other vendors interfacing using DICOM

It is assumed, that the reader is familiar with the DICOM standard.

The document is structured along the template definition as specified in Part 2 of the DICOM standard.

1.2 Overview

OBI Advanced Imaging and PortalVision Advanced Imaging are applications that are used to setup patients for treatment purposes. To support this function the following DICOM services for receiving and sending diagnostic imaging modalities are supported.

The following table lists network services supported by OBI

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
CT Image Storage	Yes	Yes
Spatial Registration Storage	Yes	No
RT Structure Set Storage	Yes	Yes
RT Image Storage	Yes	Yes
RT Plan Storage	No	Yes
Query/Retrieve		
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No

Table 1-1: Network Services used by OBI

The following table lists network services supported by PortalVision Advanced Imaging (PV AI)

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
CT Image Storage	No	Yes
Spatial Registration Storage	Yes	No
RT Structure Set Storage	Yes	Yes
RT Image Storage	Yes	Yes

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
RT Plan Storage	No	Yes
Query/Retrieve		
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No

Table 1-2: Network Services used by PV AI

The following table lists Media File SOP Classes supported for file based export and import. These SOP classes are only supported when the OBI application is operating in File mode.

SOP Classes	DICOM Media File Export	DICOM Media File Import
CT Image Storage	Yes	Yes
Spatial Registration Storage	Yes	No
RT Structure Set Storage	Yes	Yes
RT Image Storage	Yes	Yes
RT Plan Storage	No	Yes

Table 1-3: Media File SOP Classes OBI

The following table lists Media File SOP Classes supported for file based export and import. These SOP classes are only supported when the PV AI application is operating in File mode.

SOP Classes	DICOM Media File Export	DICOM Media File Import
CT Image Storage	No	Yes
Spatial Registration Storage	Yes	No
RT Structure Set Storage	Yes	Yes
RT Image Storage	Yes	Yes
RT Plan Storage	No	Yes

Table 1-4: Media File SOP Classes PV AI

1.3 Remarks

The scope of this Conformance Statement is to facilitate communication of the OBI/PV AI application and other vendor's medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM standard [1].

The DICOM standard in the current version evolved in 1993 with DICOM 3.0. The definition of the DICOM standard for radiotherapy data started in 1994 and has now reached a mature state. Nowadays DICOM is the primary choice for exchanging data with an open standard protocol for the majority of vendors and institutions. Varian Medical Systems is committed to this notion of standard-based cross-vendor interoperability as well as making use of the DICOM protocol among its own products.

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

Because the DICOM standard is subject to ongoing changes, enhancements and improvements, Varian Medical Systems reserves the right to advance their products by making use of upcoming DICOM features.

1.4 References

[1] Digital Imaging and Communications in Medicine (DICOM), Parts 1-18 (2011)
National Electrical Manufacturers Association (NEMA)
Rosslyn, VA
United States of America

[2] Varian System Server DICOM Conformance Statement (P/N VA11002D3CS)
Varian Medical Systems International AG
Baden, Switzerland

1.5 Abbreviations

This section provides the definitions of terms, acronyms and abbreviations that are used throughout the document

AE	Application Entity
DICOM	Digital Imaging and Communications in Medicine
NEMA	National Electrical Manufacturers Association
SCU	Service Class User
SCP	Service Class Provider
SOP	Service Object Pair
Treatment Management System	DICOM entity from which OBI/PV AI retrieves structure set data
OBI	Varian's On-Board Imager™ application to provide Image Guided RT features.
PV AI	PortalVision Advanced Imaging ™ application to provide Image Guided RT features for MV only machines.
UID	Unique Identifier used to identify an object by a worldwide unique identifier (→DICOM term)
VR	Value Representation, a data encoding method in →DICOM
PDU	Protocol Data Unit (→DICOM term)
IOD	Information Object Definition (→DICOM term)
DIMSE	DICOM Message Service element
TCP/IP	Transmission Control Protocol / Internet Protocol, a widely used computer networking protocol

2. Networking

2.1 Implementation Model

2.1.1 Application Data Flow

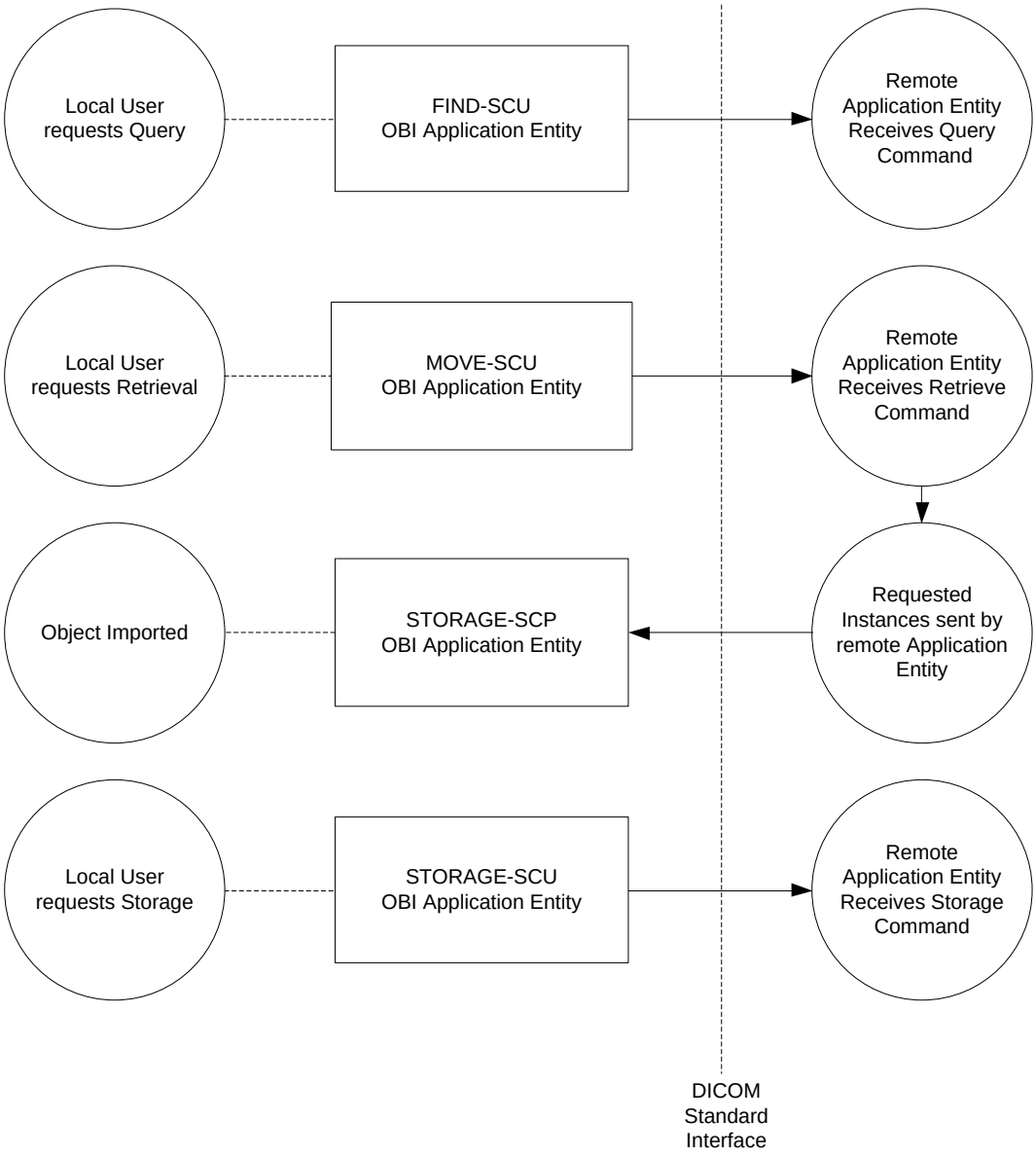

Figure 2-1 Implementation Model

Conceptually, the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title:

- STORAGE-SCP, receives incoming RT images, CT images, RT Plans and Structure Sets.

- STORAGE-SCU, sends outbound RT images, CT images, Structure Sets and Spatial Registrations.
- FIND-SCU, which queries remote AE's for lists of studies, series and instances.
- MOVE-SCU, which retrieves selected studies, series or instances.
- ECHO-SCU which sends outgoing echo request to Remote Application Entity

2.1.2 Functional Definition of AE's

Note that conceptually the network services may be modeled as the following separate AEs, though in fact all the AEs share a single (configurable) AE Title.

2.1.2.1 OBI/PV AI Client Storage SCU Application Entity

The Storage SCU Application Entity is invoked when

- A simple 2D, 2D/2D, marker or 3D matching (OBI only) has been performed and Spatial Registrations or Markers must be sent to the Remote AE.
- A 3Dmatching (OBI only) has been performed and the acquired CT set must be sent to the Remote AE
- Marker Detection has been performed and the markers must be sent to the Remote AE as Structure set linked to the current reference CT image. Each marker is defined as own point set with a single point in it.
- Marker Match has been performed, the markers are stored as curves in the image object and the image object must be sent to the Remote AE.
- When the user saves an acquired image through the UI, the image is then sent to the Remote AE.
- The treatment fraction is closed and all unsaved acquired images and other IODs are sent to the Remote AE.

2.1.2.2 OBI/PV AI Client FIND SCU, MOVE SCU Application Entity

The Query/Retrieve Application Entity is invoked when

- The patient is loaded in the 4DITC application, and reference images need to be loaded in OBI/PV AI
- Structure Set and CT images must be loaded in order to perform marker detection/matching or 3Dmatching (OBI only).

2.1.2.3 OBI/PV AI Client Storage SCP Application Entity

The Storage SCP Application Entity is invoked in order to receive objects requested from a remote Query/Retrieve SCP, such as:

- Reference Images/Historical Images
- Structure Sets
- RT Plan
- Reference CT image set

2.1.3 Sequencing of Real World Activities

When a patient is loaded into the OBI/PV AI application, it loads each reference image/historical image by requesting them from the remote AE.

CT images are loaded into the OBI/PV AI application typically after the user switches to marker matching or 3D matching state (OBI only). OBI/PV AI invokes a move command for each CT Image related to the structure set represented by the *CT Image Query/Retrieve SCU*. For this purpose, the OBI application provides the *CT Image Storage SCP*.

When a Marker Matching is performed, Storage SCU entity is invoked and the Marker Data (as Structure Set) are stored to the remote AE.

When either a Simple 2D, 2D/2D, 3D (OBI only) or marker matching is performed, the Storage SCU entity is invoked and stores a Spatial Registration to the remote AE

When loading from or saving to the Remote Application Entity, the ECHO-SCU entity is typically invoked to ensure that the remote AE is alive and responsive.

The loading of a reference CT set is described by the following sequence diagram, which illustrates, that the plan and the structure set is retrieved as well to follow the appropriate references:

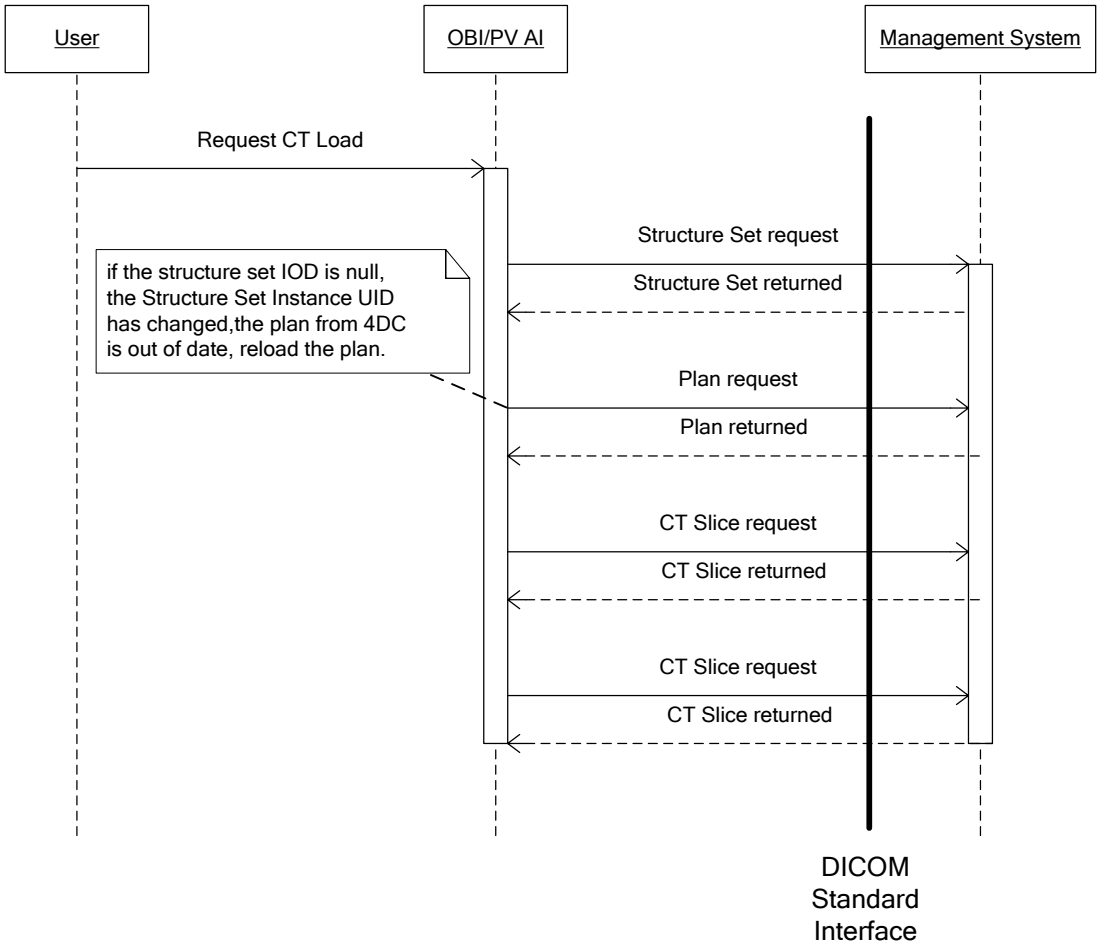

Figure 2-2 Sequence Diagram for CT Set loading

2.2 AE Specifications

2.2.1 OBI/PV AI Entity Specification

2.2.1.1 SOP Classes

The OBI/PV AI Entity provides standard conformance to the following DICOM SOP classes.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage (OBI only)	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
RT Plan Storage	1.2.840.10008.5.1.4.1.1.5	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve information model- FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/Retrieve information model- MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 2-1 Supported SCU/SCP SOP Classes for OBI/PV AI Entity

2.2.1.2 Association Policies

2.2.1.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed.

Application Context Name	1.2.840.10008.3.1.1.1

Table 2-2 DICOM Application Context for OBI/PV AI Client Application Entity

2.2.1.2.2 Number of Associations

The OBI/PV AI Client Application Entity can initiate (by default) up to three associations at a time. This value is configurable.

2.2.1.2.3 Asynchronous Nature

OBI/PV AI Client Application Entity does not support asynchronous communication.

2.2.1.2.4 Implementation Identifying Information

The following Implementation Class UIDs are used. Remote AE.

UID Value	UID Name	Implementation Version Name
1.2.246.352.70.2.1.9	VMS Console System 6.5 SCU (VMS Console Interface 1)	MergeCOM3_460
1.2.246.352.70.2.1.60.1	VMS OBI Interface 1	MergeCOM3_460
1.2.246.352.70.2.1.60.3	VMS OBI Interface 3	MergeCOM3_460

Table 2-3 Used implementation class UIDs

2.2.1.3 Association Initiation Policy

The OBI/PV AI Client Application Entity does initiate Associations.

2.2.1.3.1 Activity – Store (STORAGE-SCU)

2.2.1.3.1.1 Description and Sequencing of Activities

When the user performs a Simple 2D, 2D/2D, marker or 3D matching (OBI only), the match transformation will be stored as a Spatial Registration IOD. The OBI/PV AI administration tool can be configured to disable the storage of spatial registrations.

When the user performs a marker detection on the reference CT image, the positions of the detected markers will be stored in the Structure Set and linked to the current reference CT image. The OBI/PV AI administration tool can be configured to disable the storage of the marker data.

When the user performs a marker match, the positions of the matched markers will be stored in the acquired RT Image object as curves. The OBI/PV AI administration tool can be configured to disable the storage of the marker data. The Curve Dimensions (5002,0005) will be 2, the Number of Points (5002,0010) will be 1, Type of Data (5000,0020) will be POLY, Axis Units (5000,0030) will be PIXL\PIXL, Axis Labels (5000,0040) will be Marker\Marker and Data Value Representation (5000,0103) will be 3.

When the user acquires a verification CT set, each CT Image will be stored. Following isocenters are stored as Points in the Structure Set which is linked to the acquired verification CT set. The values of the RT ROI Interpreted Type (3006,00A4) will be as follows:

- Initial Laser Isocenter (position before acquisition): INITLASERISO
- Acquisition Isocenter (position during acquisition): ACQ_ISOCENTER
- Initial Match Isocenter (position after acquisition): INITMATCHISO

The OBI administration tool can be configured to disable the storage of CT images and isocenters.

The Storage SCU will be invoked and attempts to initiate a new Association. If multiple objects shall be transferred then multiple C-STORE requests will be issued over this Association.

Object Category	SOP Class Name	SOP Class UID
Structure Set	RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3
Spatial Registration	Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1
RT Image	RT Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image	CT Image Storage (OBI only)	1.2.840.10008.5.1.4.1.1.2

Table 2-4 Object Categories used by OBI/PV AI Client Storage SCU Application Entity

2.2.1.3.1.2 Proposed Presentation Contexts

OBI/PV AI Client Storage SCU is capable of proposing the Presentation Contexts shown in the following table.

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Spatial Registration Storage	1.2.840.10008.5.1.4.1.1.66.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
RT Image Storage	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
CT Image Storage (OBI only)	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 2-5 Presentation contexts used by OBI/PV AI Client Storage SCU Application Entity

2.2.1.3.1.3 SOP Specific Conformance for all Storage SOP Classes

The behavior of OBI/PV AI Client Storage SCU upon storage is summarized in table below

Service Status	Further Meaning	Error Code	Behavior
Refused	Out of Resources	A7xx	The user is informed that the C-STORE request has failed. Status Comment (0000,0902) is logged and displayed along with additional error information.
Failure	Data Set does not match SOP Class	A9xx	
	Cannot understand	Cxxx	
Warning	Coercion of Data Elements	B000	The SCP has successfully stored the SOP Instance. Because a warning status was received Status Comment (0000,0902) is logged .
	Data Set does not match SOP Class	B007	
	Elements Discarded	B006	
Success	Success	0000	The SCP has successfully stored the SOP Instance. No user feedback is received.
*	*	Any other status code.	Depending on the type of the Error Code it is either handled like a Failure or Warning. However, Error Codes other than listed above in this table should not occur, as they are not defined for C-STORE (see [1]), PS 3.4, Table B.2-1).

Table 2-6 OBI/PV AI Client C-STORE Response Status Handling Behavior

After sending all SOP Instances, either successfully or not, the Association is released using A-RELEASE and the results are presented to the user.

Exception	Behavior
Timeout	The Association is released using A-RELEASE and the whole task of sending SOP Instances is aborted. The user is informed about the timeout and available information about it is logged.
Association aborted by the SCP or network layers	The whole task of sending SOP Instances is aborted.

Table 2-7 OBI/PV AI Client Storage SCU Communication Failure Behavior

2.2.1.3.1.4 SOP Specific Conformance for RT Structure Set Storage

Detected marker positions will be saved to a new Structure Set. This structure set references the planning CT frame of reference and contains the detected marker positions as they are projected on the planning CT. The modified structure set gets a new UID and the private referenced structure set sequence (3263,1001) is used to denote the original structure set by its UID. This sequence maybe used by the Treatment Management System to combine the new structure set and the original one to add the markers as detected by OBI/PV AI.

The ROI Contour Sequence (3006, 0040) shall have the following definitions:

- Contour Geometric type (3006, 0042) = POINT
- Number of Contour Points (3006, 0046) = 1

The ROI observation module shall have the following definitions:

- RT ROI Interpreted Type (3006,00A4) = MARKER.

Marker position may be located between slice positions.

Before exporting modified volumetric structures, they get resampled onto the planes of the 3D patient model. The volumetric ROI Contours of an exported RT Structure Set will thus always reference an image slice.

All images used to construct the 3D patient model are referenced in Contour Image Sequence (3006,0016) of RT Structure Set Module, even if they do not have any contours defined on them.

2.2.1.3.1.5 SOP Specific Conformance for Spatial Registration Storage

If the application is configured to store spatial registration IODs according to the IHE Radiation Oncology format then spatial registration storage complies to IHE-RO_MMRO-II Supplement.

Otherwise (per default) the following SOP specific conformance applies:

The spatial registration of the 2D and 2D/2D Match will be used in the following way:

- The Registration Sequence (0070,0308) will include all images (the reference images and the acquired verification RT images) and the Frame of Reference UID of the frame of reference of the reference RT images.
- The frame of reference module of the spatial registration will belong to the frame of reference of the acquired verification RT images.
- The transformation matrix type will be RIGID.

The spatial registration of the 3D Match will be used in the following way:

- The Registration Sequence (0070,0308) will include all image slices (the reference CT slices and the acquired verification CT slices) and the Frame of Reference UID of the frame of reference of the reference CT slices.
- The frame of reference module of the spatial registration will belong to the frame of reference of the acquired verification CT image slices.
- The transformation matrix type will be RIGID.

The spatial registration of the Marker Match will be used in the following way:

- The Registration Sequence (0070,0308) will include all image slices (the reference CT slices and the acquired verification RT images) and the Frame of Reference UID of the frame of reference of the reference CT slices.
- The frame of reference module of the spatial registration will belong to the frame of reference of the acquired verification RT images.
- The transformation matrix type will be RIGID.

2.2.1.3.2 Activity – Query/Retrieve (FIND-SCU, MOVE-SCU)

2.2.1.3.2.1 Description and Sequencing of Activities

This function is typically used by the application to load the reference images (e.g., DRR's) and the historical images (Tx images from previous treatment sessions). This function is also used to load the reference CT and its structure set after the user switches to MarkerMatch (both PVAI and OBI) or 3D Match state (OBI only). At this time an Association is requested.

This application supports Query/Retrieve in the SCU role. The table below shows the supported values for the tag Query/Retrieve Level (0008,0052):

Query/Retrieve Level	Value in (0008,0052)
Composite Object Instance Information	IMAGE

Table 2-8 Supported Query/Retrieve Levels for Query/Retrieve SCU

2.2.1.3.2.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name	UID		
Study Root Query/Retrieve information model – FIND	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Study Root Query/Retrieve information model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

Table 2-9 Proposed Presentation Contexts for OBI/PV AI Client Q/R SCU Application Entity

2.2.1.3.2.3 SOP Specific Conformance for C-FIND SOP Classes

The behavior of OBI/PV AI Client Query/Retrieve SCU when encountering status codes in a C-FIND response is summarized in the table below.

Service Status	Further Meaning	Error Code	Behavior
Refused	Out of Resources	A7xx	The object is not found, the user is advised.
Failure	Data Set does not match SOP Class	A9xx	
	Cannot understand	Cxxx	
Cancel	Matching terminated due to Cancel Request	FE00	Cancel is handled like Failure, i.e. the object is not found and the user is advised.
Success	Matching is complete – No final Identifier is supplied	0000	The SCP has completed the match, the user is advised.
*	*	Any other status code.	Handled like failure.

Table 2-10 OBI/PV AI Client C-FIND Response Status Handling Behavior

No C-CANCEL-FIND requests are ever issued.

Relational-queries are not supported.

Specific Character Set is not supported. It is not included in a query and will be ignored when present in the response.

Exception	Behavior
Timeout	The user is informed that the operation (C-FIND or C-MOVE) has timed out.
Association aborted by the SCP or network layers	When the Association is aborted during a C-MOVE operation the user is informed.

Table 2-11 OBI/PV AI Client Q/R C-FIND SCU Communication Failure Behavior

The table below lists the Attributes supported by the C-FIND SCU.

Name	Tag	VR	Type
Query/Retrieve Level	(0008,0052)	CS	R
SOP Instance UID	(0008,0018)	UI	U
Study Instance UID	(0020,000D)	UI	U
Series Instance UID	(0020,000E)	UI	U

Table 2-12 Study Root Request Identifier for OBI/PV AI Client Q/R C-FIND SCU

The Types of Matching column in the above table should be read as follows:

S Single Value Matching

L List of UID Matching

U Universal Matching

W Wild Card Matching

R Range Matching

One or more matching types of the above list may be supported per Attribute.

2.2.1.3.2.4 SOP Specific Conformance for C-MOVE SOP Classes

The behavior of OBI/PV AI Client Query/Retrieve SCU when encountering status codes in a C-MOVE response is summarized in the following table.

Service Status	Further Meaning	Error Code	Behavior
Refused	Out of Resources – Unable to calculate number of matches	A701	None of the requested SOP Instances could be retrieved. The user will be informed about the failure.
	Out of Resources – Unable to perform sub-operations	A702	
	Move Destination unknown	A801	
Failure	Identifier does not match SOP Class	A900	
	Unable to Process	Cxxx	
Cancel	Sub-operations terminated due to Cancel Indication	FE00	Cancel is handled like Failure.
Warning	Sub-operations complete – One or more Failures	B000	Some or all SOP Instances have not been transmitted successfully. The user is informed.
Success	Sub-operations complete – No Failures	0000	All SOP Instances have successfully been transmitted.
Pending	Sub-operations are continuing	FF00	Transferring requested SOP Instances is continuing. This message is ignored.
*	*	Any other status code.	Any other status code is handled like Failure.

Table 2-13 OBI/PV AI Client C-MOVE Response Status Handling Behavior

After having received all requested SOP Instances or when the user aborts the operation the Association is released using A-RELEASE. All events occurring during querying and retrieving SOP Instances are logged. If any log entries are marked with internal category Error they will be shown to the user automatically.

No C-CANCEL-MOVE requests are ever issued.

Exception	Behavior
Timeout	The user is informed that the operation (C-FIND or C-MOVE) has timed out.
Association aborted by the SCP or network layers	When the Association is aborted during a C-MOVE operation the user is informed.

Table 2-14 OBI/PV AI Client Q/R C-MOVE SCU Communication Failure Behavior

The table below lists the Attributes that will be sent by the C-MOVE SCU.

Name	Tag	VR	Type
Query/Retrieve Level	(0008,0052)	CS	R
SOP Instance UID	(0008,0018)	UI	U
Study Instance UID	(0020,000D)	UI	U
Series Instance UID	(0020,000E)	UI	U

Table 2-15 Study Root Request Identifier for OBI/PV AI Client Q/R C-MOVE SCU

2.2.1.3.2.5 Supported Operations

This application performs only the operations listed in the table below. This table also shows which of the optional key values (see [1]) are used for a request.

Operation	Target IOD	Key value used for Request
C-FIND	RT Structure Set	SOP Instance UID
C-MOVE	RT Structure Set	SOP Instance UID
C-MOVE	RT Plan	SOP Instance UID
C-FIND	RT Image	SOP Instance UID
C-MOVE	RT Image	SOP Instance UID
C-MOVE	CT Image	SOP Instance UID

Table 2-16 Supported Operations

2.2.1.4 Association Acceptance Policy

The OBI/PV AI Client Application Entity does accept storage requests for those objects requested by the MOVE SCU

2.2.1.4.1 Activity – Receive Storage Request

2.2.1.4.1.1 Description and Sequencing of Activities

Received SOP Instances are received and cached on the file system, as well as being passed to the application.

2.2.1.4.1.2 General Preconditions

The following precondition for matching shall be fulfilled:

In a valid OBI/PV AI plan every treatment beam shall contain the same couch translation values (vertical, lateral, longitudinal). It is allowed to have different couch rotation values in the plan

Tolerances for couch values being interpreted as equal are: absolute 2 mm for longitudinal, lateral and vertical axes in space.

The plan should contain valid Imaging Device-Specific Acquisition Parameters (300A,00CC) to allow automatic initiation of imaging procedures. However, if no Verification Image Sequence items are present or they do not contain device-specific acquisition parameters as specified above, it is still possible to initiate imaging procedures manually.

OBI/PV AI differentiates between treatment and setup fields. Treatment fields and setup fields (kV and MV) can be used for OBI/PV AI use cases.

OBI/PV AI supports the “Treatment Delivery Type” (300A,00CE) “SETUP”. This attribute should be the preferred method.

For backwards compatibility, the parameter FieldType in the Extended Interface (3253,1000) can be used to indicate the field type for each beam in the plan as well (please note, that this is a deprecated approach):

```
<ExtendedVAPlanInterface>
  <Beams>
    <Beam>
      <ReferencedBeamNumber>1</ReferencedBeamNumber>
      <BeamExtension>
        <FieldType>SETUP</FieldType>
      </BeamExtension>
    </Beam>
    <Beam>
      <ReferencedBeamNumber>2</ReferencedBeamNumber>
      <BeamExtension>
        <FieldType>TREATMENT</FieldType>
      </BeamExtension>
    </Beam>
  </Beams>
</ExtendedVAPlanInterface>
```

Note that the aforementioned interface is only a portion of the entire interface, which is available in Section C.1.

If a beam is a setup field and planned verification image sequence contains a single item representing a kV image (see definition below), this beam is referred to as a ‘**kV beam’** in the following.

Tag	Description	T	Convention / Interpretation
Beam Sequence (300A,00B0)	Introduces sequence of treatment beams for current RT Plan. One or more items may be included in this sequence.	1	
>Planned Verification Image Sequence (300A,00CA)	Introduces sequence of planned verification images to be acquired during current beam. One or more items may be included in this sequence. See C.8.8.14.2.	3	Used to plan RT images (kV or MV) or (CB)CT images to be acquired with this beam.
>>Imaging Device-Specific Acquisition Parameters (300A,00CC)	User-specified device-specific parameters which describe how the imager will acquire the image.	3	This tag is multivalued, values are separated with a backslash character (\). If this tag is missing completely, the planned verification image is interpreted as film. The following values are currently used for portal (MV) imaging: PortImageHighQuality PortImageHighQuality\BeamOff PortImageLowDose PortImageLowDose\BeamOff PortImageIntegrated PortImageContinuous The following values are currently used for kV imaging: KV\<ImageType> Defined terms for ImageType: Image CBCT Examples: KV\Image KV\CBCT
>Beam Limiting Device Sequence (300A,00B6)	Introduces sequence of beam limiting device (jaw or leaf).	1	For kV beams, this sequence will not be interpreted.
>Number of Wedges (300A,00D0)	Number of wedges associated with current Beam.	1	For kV beams, this number shall be 0 (no accessories)
>Number of Compensators (300A,00E0)	Number of compensators associated with current Beam.	1	For kV beams, this number shall be 0 (no accessories)
>Number of Boli (300A,00ED)	Number of boli associated with current Beam.	1	For kV beams, this number shall be 0 (no accessories)

Tag	Description	T	Convention / Interpretation
>Number of Blocks (300A,00ED)	Number of shielding blocks associated with Beam.	1	For kV beams, this number shall be 0 (no accessories)
>Control Point Sequence (300A,0111)	Introduces sequence of machine configurations describing treatment beam. Two or more items may be included in this sequence. See C.8.8.14.5 and C.8.8.14.6.	1	For kV beams, this sequences shall always include exactly 2 items.
>>Beam Limiting Device Position Sequence (300A,011A)	Introduces sequence of beam limiting device (collimator) jaw or leaf (element) positions. Required for first item of Control Point Sequence, or if Beam Limiting Device changes during Beam. One or more items may be included in this sequence.	1C	For kV beams, this sequence will not be interpreted.
>>Beam Limiting Device Angle (300A,0120)	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.	1C	For kV beams, this number shall be 0.0

Tag	Description	T	Convention / Interpretation
>>Beam Limiting Device Rotation Direction (300A,0121)	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 C.8.8.14.8. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation	1C	For kV beams, this value shall be NONE.
>>Gantry Angle (300A,011E)	Gantry angle of radiation source, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees). Required for first item of Control Point Sequence, or if Gantry Angle changes during Beam.	1C	For kV beams, this value specifies the orientation of the kV radiation source with respect to IEC FIXED coordinate system. For MV beams, this value specifies the orientation of the MV radiation source (main gantry) with respect to IEC FIXED coordinate system.
>>Gantry Rotation Direction (300A,011F)	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 C.8.8.14.8. Enumerated Values: CW = clockwise CC = counter-clockwise NONE = no rotation	1C	For kV beams, this value shall be NONE.

Table 2-17 Beam Setup kV extensions

When saving back on board images to the Treatment Management System, all images acquired for the same plan and session will share the same frame of reference UID, even if the couch position has been adjusted in between (under the assumption that the patient has not moved on the couch significantly).

2.2.1.4.1.3 Preconditions for RT Images

RT Images, which are used as reference images (for 2D, 2D/2D and Marker Match), must be scaled and contain all geometrical parameters needed to determine the position/orientation of the Image in IEC. They must contain a frame of reference UID and the isocenter position in their frame of reference.

The only geometrical parameter, which maybe missing is RT Image Position (3002,0012). If missing, the image is assumed as centered around the z-axis of the Image Receptor system.

2.2.1.4.1.4 Preconditions for 2D Match

Besides the General Preconditions, the following condition shall be fulfilled:

In a valid OBI/PV AI plan every treatment beam and every reference image shall contain the same Isocenter Position (300A, 012C). Tolerance for the “same” Isocenter Position is that isocenter positions of any pair of beams/reference images within the plan shall deviate less than 1.0 mm. If the plan contains multiple isocenters, the 2D match can be performed, but the couch shifts cannot be applied.

The plan shall contain at least one valid setup beam configured as a kV or MV image beam or one valid treatment beam configured as a MV image beam.

2.2.1.4.1.5 Preconditions for 2D/2D Match

Besides the General Preconditions, the following condition shall be fulfilled:

In a valid OBI/PV AI plan every treatment beam and every reference image shall contain no or the same Isocenter Position (300A, 012C). Tolerance for the “same” Isocenter Position is that isocenter positions of any pair of beams/reference images within the plan shall deviate less than 1.0 mm.

The plan shall contain two valid setup beams configured as a kV or MV image beam.

A delta of 90.0 degrees between the gantry/source angles (300A,011E) of the two beams is recommended for an optimal match.

2.2.1.4.1.6 Preconditions for Marker Match

Besides the General Preconditions, the following condition shall be fulfilled:

In a valid OBI/PV AI plan every treatment beam and every reference image shall contain the same Isocenter Position (300A, 012C). Tolerance for the “same” Isocenter Position is that isocenter positions of any pair of beams/reference images within the plan shall deviate less than 1.0 mm

The plan shall contain two valid setup beams configured as a kV or MV image beam.

A delta of 90.0 degrees between the gantry/source angles (300A,011E) of the two beams is recommended for an optimal match.

To load the slices of the reference CT image OBI/PV AI loads the plan’s structure set, which corresponds to the Referenced RT Structure Set (300C,0060), from the Treatment Management

System , and subsequently loads all CT slices referenced in the Contour Image Sequence (3006,0016).

Conditions for CT Slices:

- All CT slices shall have the same Frame of Reference.
- The spacing between CT slices positions in z-direction (DICOM Patient coordinate system) may vary, although it is recommended, that they are equal throughout all slices referenced by the Structure Set.
- The maximal difference in x-direction and in y-direction (DICOM Patient coordinate system) between all CT slices shall be less or equal 0.1 mm.

Conditions for Structure Set (except Structures of Contour Geometric type (3006, 0042) POINT):

- The contour points within a contour shall be positioned on the same contour plane within a maximal Epsilon of 10^{-6} mm in z direction (DICOM Patient coordinate system).
- Structures with contour(s) having contour points that are not positioned on the same contour plane (see point above, i.e. non-transversal structures) are ignored (they are not imported and a corresponding warning message is issued) and the import will continue with the other structures.
- Contour Geometric Type (3006, 0042) has to be either CLOSED_PLANAR or OPEN_PLANAR for all contours of the structure. Structures with mixed contour types are not supported.
- Contour Geometric type (3006, 0042) POINT don't need to fulfill the conditions mentioned above.

Conditions for Marker Point Structures:

- The markers shall be in the structure set referenced by the plan.
- Marker position may be located between slice positions.
- The ROI Contour Sequence (3006, 0040) shall have the following definitions:
  - Contour Geometric type (3006, 0042) = POINT
  - Number of Contour Points (3006, 0046) = 1
- The ROI observation module shall have the following definitions:
  - RT ROI Interpreted Type (3006,00A4) = MARKER.
  - Private tag: Marker Subtype (3271,1000) = MARKER

2.2.1.4.1.7 Preconditions for 3D Match (OBI only)

Besides the General Preconditions, the following condition shall be fulfilled:

In a valid OBI plan every treatment beam and every reference image shall contain the same Isocenter Position (300A, 012C). Tolerance for the "same" Isocenter Position is that isocenter positions of any pair of beams/reference images within the plan shall deviate less than 1.0 mm.

The plan shall contain a valid setup beam. The tag "Beam Type" (300A,00C4) shall have the value "STATIC" configured as a CBCT beam. The tag "Imaging Device Specific Acquisition Parameters" (300A,00CC) shall have the value "KV\CBCT".

To load the slices of the reference CT image OBI loads the plan's structure set, which corresponds to the Referenced RT Structure Set (300C,0060), from the Treatment Management System , and subsequently loads all CT slices referenced in the Contour Image Sequence (3006,0016).

Conditions for CT Slices:

- All CT slices shall have the same Frame of Reference.
- The spacing between CT slices positions in z-direction (DICOM Patient coordinate system) may vary, although it is recommended, that they are equal throughout all slices referenced by the Structure Set.
- The maximal difference in x-direction and in y-direction (DICOM Patient coordinate system) between all CT slices shall be less or equal 0.1 mm.

Conditions for Structure Set (except Structures of Contour Geometric type (3006, 0042) POINT):

- The contour points within a contour shall be positioned on the same contour plane within a maximal Epsilon of 10^{-6} in z direction (DICOM Patient coordinate system).
- Structures with contour(s) having contour points that are not positioned on the same contour plane (see point above, i.e. non-transversal structures) are ignored (they are not imported and a corresponding warning message is issued) and the import will continue with the other structures.
- Contour Geometric Type (3006, 0042) has to be either CLOSED_PLANAR or OPEN_PLANAR for all contours of the structure. Structures with mixed contour types are not supported.
- Contour Geometric type (3006, 0042) POINT don't need to fulfill the conditions mentioned above.

2.2.1.4.1.8 Accepted Presentation Contexts

OBI Client Storage SCP Application Entity accepts Presentation Contexts shown in the following table.

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name**	**UID**		
All Storage SOP Classes in Table 4-1	All Storage SOP Classes in Table 4-1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Little Endian	1.2.840.10008.1.2.1		

Table 2-18 Acceptable Presentation Contexts for OBI Client Storage SCP Application Entity and Receive Storage Request

2.2.1.4.1.9 SOP Specific Conformance for all Storage SOP Classes

2.2.1.4.1.9.1 Presentation Context Acceptance Criterion

OBI/PV AI Client Storage SCP will always accept any Presentation Context for the supported SOP Classes with the supported Transfer Syntaxes. More than one proposed Presentation Context will be accepted for the same Abstract Syntax if the Transfer Syntax is supported, whether or not it is the same as another Presentation Context.

2.2.1.4.1.9.2 **Transfer Syntax Selection Policies**

If offered a choice of Transfer Syntaxes in a Presentation Context, OBI/PV AI Client Storage SCP will select the first Transfer Syntax that is listed in the Presentation Context.

OBI/PV AI Client Storage SCP will accept duplicate Presentation Contexts, that is, if it is offered multiple Presentation Contexts, each of which offers acceptable Transfer Syntaxes, it will accept all Presentation Contexts, applying the same rule for selecting a Transfer Syntax for each as described above.

2.2.1.4.1.9.3 **Response Status**

OBI/PV AI Client Storage SCP will behave as described in the Table below when generating the C-STORE response command message.

Service Status	Further Meaning	Error Code	Behavior
Refused	Out of Resources	A700	Failed to receive incoming DICOM Stream. Problem is logged on the SCP side.
	Out of Resources	A7xx	
Failure	Invalid object instance	0117	
	Data Set does not match SOP Class	A9xx	
	Invalid C-STORE request	C000	
Warning	Coercion of Data Elements	B000	Image successfully stored in temporary file.
	Data Set does not match SOP Class	B007	
	Elements Discarded	B006	
Success		0000	Instance successfully stored in temporary file.

Table 2-19 Response Status of OBI/PV AI Client Storage SCP and Receive Storage Request

2.3 Network Interfaces

2.3.1 Physical Network Interfaces

The application is indifferent to the physical medium over which TCP/IP executes; which is dependent on the underlying operating system and hardware.

2.3.2 Additional Protocols

When host names rather than IP addresses are used in the configuration properties to specify presentation addresses for remote AEs, the application is dependent on the name resolution mechanism of the underlying operating system (e.g. DNS).

2.4 Configuration

2.4.1 AE Title/Presentation Address Mapping

2.4.1.1 Local AE Titles

The local OBI/PV AI Client Application Entity uses the AE Title and TCP/IP port number configured via the Daemon configuration option in the OBI/PV AI Admin tool. Note that conceptually the network services have been modeled as separate AEs, though in fact all the AEs share a single (configurable) AE Title.

Application Entity	Default AE Title	Default TCP/IP Port
OBI/PV AI Client Application Entity	StreamService (configurable)	58051 (configurable)
OBI/PV AI Client Storage SCU	See above	See above
OBI/PV AI Client Query/Retrieve SCU	See above	See above

Table 2-20 AE Title Configuration Table

2.4.1.2 Remote AE Title/Presentation Address Mapping

2.4.1.2.1 OBI/PV AI Client Storage SCU

For the Storage service class SCU, TCP/IP address, called AE title and port number of the destination are configurable as well as the calling AE title used by OBI/PV AI.

2.4.1.2.2 OBI/PV AI Client Query/Retrieve SCU

For the OBI/PV AI Client Query/Retrieve SCU, TCP/IP address, called AE title and port number of the provider are configurable. The calling AE title of the local application, which is also the Move Destination AE title, is configurable too. The local port is the port of the Storage SCP for receiving the data. The Storage SCP will accept only connection requests from the configured remote AE Title and IP Address.

2.4.2 Parameters

The following table shows DICOM relevant configuration parameters. While some of them may be configured directly via a configuration dialog or a configuration application, other values can only be accessed via the Registry or cannot be configured at all.

Parameter	Configurable (Yes/No)	Default Value
General Parameters		
Max PDU Receive Size	No	Unlimited
Max PDU Send Size	No	32768 Bytes (32kB)
Time-out waiting for an acceptance or rejection response to an Association request or Association Release request (Application Level Timeout)	Yes	300s
Spatial Registration formatted along IHE-RO specification 2008	Yes	No
OBI/PV AI Client Storage SCU Specific Parameters **OBI/PV AI Client Query/Retrieve SCU Specific Parameters**		
Time-out awaiting a Response to a DIMSE Request (Low-Level Timeout)	Yes	300s
Maximum number of simultaneously initiated Associations	No	1

Table 2-21 Configuration Parameters Table

3. Media Interchange

OBI/PV AI Client Application Entity allows importing and exporting DICOM Media Files. Various import and export filters are available in the OBI/PV AI Client application to read and create DICOM Media Files. This functionality is only available when the OBI/PV AI Application is operating in file mode.

The files fully conform to the Part 10 format. However, the Basic Directory IOD as defined in Media Interchange Application Profiles is not present.

All IODs are stored using the Transfer Syntax "DICOM Implicit VR Little Endian" 1.2.840.10008.1.2.

4. Support of Character Sets

4.1 Character Sets

The default character set can be configured in the Administration tool.

4.1.1 Standard Support

4.1.1.1 Encoding / Decoding

The character sets listed in Table 4-1 below are supported for encoding data to DICOM and decoding data from DICOM.

Encoding of a data set fails with an error, if any of the affected text attributes cannot be encoded completely with the selected character set.

Character Set Description	Defined Term
Single-Byte Character Sets Without Code Extensions	
Latin alphabet No. 1	ISO_IR 100
Multi-Byte Character Sets Without Code Extensions	
Unicode in UTF-8	ISO_IR 192

Table 4-1: Character sets supported for decoding from DICOM

4.1.2 Legacy Support

For maintaining connectivity with legacy applications that do not support the Specific Character Set (0008,0005) attribute it is possible to configure the Application Entities described in this conformance statement to use one of the Windows® code pages listed in Table 4-2 below.

Character Set Description	Windows® Code Page
ANSI/OEM Japanese; Japanese (Shift-JIS)	932
ANSI/OEM Simplified Chinese (PRC, Singapore); Chinese Simplified (GB2312)	936

Table 4-2: Windows code pages supported for decoding from and encoding to DICOM

5. Security

5.1 Security Profiles

No Security Profiles are supported.

5.2 Association Level Security

5.2.1 OBI/PV AI Client

Storage SCU does not support Association Level Security.

The Storage SCP instantiated to receive Instances requested by Query/Retrieve SCU checks the following additional values when determining whether to accept Association Open Requests:

- Called AE Title

5.3 Application Level Security

5.3.1 OBI/PV AI Application

In order to load patient information into the OBI/PV AI application, the user opens the patient in the 4DITC application, which requires the user identification in the form of a user name and password.

Appendix A Specialization

A.1 IOD Contents

A.1.1 Created SOP Instances

IODs created by the OBI/PV AI Application Entity are listed in IOD Details.

A.1.2 Usage of Attributes from received IOD's

The OBI/PV AI Application Entity require all Type 1 Attributes to be present.

A.2 Data Dictionary of Private Attributes

The following table contains a list of private Attributes that are used throughout all Application Entities. The OBI/PV AI application does not use any private attributes that are not outlined in this document or [2].

Tag	Name	VR	VM
(300B,ee01)	Distal Target Distance Tolerance	FL	1
(300B,ee02)	Maximum Collimated Field Diameter (Field Size)	FL	1
(300B,ee04)	Range (Planned Distal Target Distance)	FL	1
(300B,ee08)	Beam Line Data Table Version	SH	1
(300B,ee0E)	Nominal SOBP Width	FL	1
(300B,ee11)	Nominal SOBP Width Tolerance	FL	1
(300B,ee17)	Peek Range	FL	1
(3241,ee00)	Internal Image Id	LO	
(3241,ee02)	Internal Pixel Offset	IS	
(3241,ee03)	Not Calibrated	US	
(3241,ee04)	Image Orientation (Patient)	DS	6
(3241,ee05)	Image Position (Patient)	DS	6
(3241,ee06)	Pixel Spacing	DS	2
(3243,ee09)	Beam Secondary Name	SH	1
(3243,ee28)	Related Referenced Beam Number	IS	1
(3247,ee00)	Session Termination Status	SH	1
(3249,ee00)	Maximum Treatment Time	DS	1
(3249,ee10)	Referenced Primary Dose Reference UID	UI	1
(3251,ee00)	Treatment Machine Note	LO	1
(3253,ee00)	Extended Interface Data	OB	1
(3253,ee01)	Extended Interface Length	IS	1

Tag	Name	VR	VM
(3253,ee02)	Extended Interface Format	LO	1
(3257,ee01)	Plan Type Enumerated Values: ALL_PLANS PREDECESSOR NOT_ PREDECESSOR	CS	1
(3257,ee10)	Reference Image Type Enumerated Values: ALL PRIMARY	CS	1
(3259,ee00)	Additional Dose Value Sequence	SQ	0..n
(3259,ee02)	Actual Session Dose	DS	1
(3259,ee04)	Daily Dose	DS	1
(3259,ee06)	Life Time Total Dose	DS	1
(3261,ee2A)	Treatment Session Beam Data	OB	1
(3263,ee00)	Overlap Type Enumerated Values: OVERLAPPING NONOVERLAPPING	CS	1
(3263,ee01)	Referenced Structure Set Relationship Sequence	SQ	1
(3263,ee02)	Structure Set Relationship Defined Terms: PREDECESSOR ADDITION	CS	1
(3265,ee00)	Total Number of Fractions	SL	1
(3265,ee01)	Last treated Fraction	SL	1
(3267,ee00)	Referenced Patient Volume Id	SH	1
(3271,ee00)	Marker Subtype Enumerated Values: MARKER POINT_MATCH REFERENCE_LINE	CS	1
(3273,ee00)	RT Image Isocenter Position	DS	3
(3273,ee01)	RT Image Patient Position	CS	1
(3275,ee00)	Registration Sub Type	LO	1
(3277,ee00)	RT Motion Synchronization Sequence	SQ	1
(3285,ee00)	Primary Fluence Mode Sequence	SQ	1
(3285,ee01)	Fluence Mode	CS	1

Tag	Name	VR	VM
(3285,ee02)	Fluence Mode ID	SH	1
(3287,ee00)	Plan Integrity Sequence	SQ	1
(3287,ee01)	Plan Integrity Hash	LO	1
(3287,ee02)	Plan Integrity Hash Version	SH	1

Table A-1 Private Creator Identification Strings

A.3 Coded Terminology and Templates

A.3.1 Context Groups

Information will be published in a future version of this document.

A.3.2 Template Specifications

No standard templates are extended and no private templates are used.

A.3.3 Private Code Definitions

There are no private code definitions.

A.4 Grayscale Image Consistency

Not supported.

A.5 Standard Extended/Specialized/Private SOP Classes

Not Used.

A.6 Private Transfer Syntaxes

No private Transfer Syntaxes are used.

Appendix B IOD Details

B.1 Supported IODs

For better reference with DICOM Standard ([1], section titles of the following sub-sections are listed with section number of DICOM Standard Part 3 where the corresponding IOD Module table can be found.

B.1.1 Computed Tomography Image – A.3.3

IE	Module	Reference	Usage	Presence
Patient	Patient	C.7.1.1	M	
	Clinical Trial Subject	C.7.1.3	U	Not supported
Study	General Study	C.7.2.1	M	
	Patient Study	C.7.2.2	U	Not supported
	Clinical Trial Study	C.7.2.3	U	Not supported
Series	General Series	C.7.3.1	M	
	Clinical Trial Series	C.7.3.2	U	Not supported
Frame of Reference	Frame of Reference	C.7.4.1	M	
Equipment	General Equipment	C.7.5.1	M	
Image	General Image	C.7.6.1	M	
	Image Plane	C.7.6.2	M	
	Image Pixel	C.7.6.3	M	
	Contrast/Bolus	C.7.6.4	C	Not supported
	CT Image	C.8.2.1	M	
	Overlay Plane	C.9.2	U	Not supported
	VOI LUT	C.11.2	U	
	SOP Common	C.12.1	M	

Table B-1 Computed Tomography Image IOD Modules Support

B.1.2 Spatial Registration – A.39.1.3

IE	Module	Reference	Usage	Presence
Patient	Patient	C.7.1.1	M	
	Clinical Trial Subject	C.7.1.3	U	Not supported
Study	General Study	C.7.2.1	M	
	Patient Study	C.7.2.2	U	Not supported
	Clinical Trial Study	C.7.2.3	U	Not supported

IE	Module	Reference	Usage	Presence
Series	General Series	C.7.3.1	M	
	Clinical Trial Series	C.7.3.2	U	Not supported
	Spatial Registration Series	C.20.1	M	
Frame of Reference	Frame of Reference	C.7.4.1	M	
Equipment	General Equipment	C.7.5.1	M	
Spatial Registration	Spatial Registration	C.20.2	M	
	Common Instance Reference	C.12.2	M	
	SOP Common	C.12.1	M	

Table B-2 Spatial Registration Image IOD Modules Support

B.1.3 RT Structure Set – A.19.3

IE	Module	Reference	Usage	Presence
Patient	Patient	C.7.1.1	M	
	Clinical Trial Subject	C.7.1.3	U	Not supported
Study	General Study	C.7.2.1	M	
	Patient Study	C.7.2.2	U	Not supported
	Clinical Trial Study	C.7.2.3	U	Not supported
Series	RT Series	C.8.8.1	M	
	Clinical Trial Series	C.7.3.2	U	Not supported
Equipment	General Equipment	C.7.5.1	M	
Structure Set	Structure Set	C.8.8.5	M	
	ROI Contour	C.8.8.6	M	
	RT ROI Observations	C.8.8.8	M	
	Approval	C.8.8.16	U	Not supported
	SOP Common	C.12.1	M	

Table B-3 RT Structure Set IOD Modules Support

B.1.4 RT Image – A.17.3

IE	Module	Reference	Usage	Presence
Patient	Patient	C.7.1.1	M	
	Clinical Trial Subject	C.7.1.3	U	Not supported
Study	General Study	C.7.2.1	M	

IE	Module	Reference	Usage	Presence
	Patient Study	C.7.2.2	U	Not supported
	Clinical Trial Study	C.7.2.3	U	Not supported
Series	RT Series	C.8.8.1	M	
	Clinical Trial Series	C.7.3.2	U	Not supported
Frame of Reference	Frame of Reference	C.7.4.1	U	Supported and required for Import
Equipment	General Equipment	C.7.5.1	M	
Image	General Image	C.7.6.1	M	
	Image Pixel	C.7.6.3	M	
	Contrast/Bolus	C.7.6.4	C	Not supported
	Cine	C.7.6.5	C	Not supported
	Multi Frame	C.7.6.6	C	Not supported
	RT Image	C.8.8.2	M	
	Modality LUT	C.11.1	U	
	VOI LUT	C.11.2	U	
	Approval	C.8.8.16	U	
	Curve (Retired)	C.10.2	U	
	SOP Common	C.12.1	M	
Extended Interface	Extended Interface	N/A	U	Private

Table B-4 RT Image IOD Modules Support

B.2 Modules and Attributes

For better reference with DICOM Standard ([1]section titles of the following sub-sections are decorated with section number of DICOM Standard Part 3 where the corresponding Module Attribute table can be found.

The first four columns in the following tables contain definitions from the DICOM standard. References in those columns refer to the DICOM standard and not to this document.

The “Handling” column describes for each attribute whether it is supported and to which value in the OBI system it maps. A value of “*** export not supported” indicates that an attribute is unknown and therefore ignored by the application.

The application creates objects of the type RT Image, CT Image, RT Structure Set and Spatial Registration. These objects are exported through DICOM. Therefore only the export is described in the following tables.

B.2.1 Patient – C.7.1.1

Attribute Name	Tag	T	Description	Handling
Patient’s Name	(0010,0010)	2	Patient's full name.	Export supported for: All
Patient ID	(0010,0020)	2	Primary hospital identification number or code for the patient.	Export supported for: All
Issuer of Patient ID	(0010,0021)	3	Identifier of the Assigning Authority that issued the Patient ID.	*** export not supported
Patient's Birth Date	(0010,0030)	2	Birth date of the patient.	Export supported for: All
Patient's Sex	(0010,0040)	2	Sex of the named patient. Enumerated Values: M = male F = female O = other	Export supported for: All ‘Female’: F, ‘Male’: M, anything else: O
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.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Referenced SOP Class UID	(0008,1150)	1C	Uniquely identifies the referenced SOP Class. Required if Referenced Patient Sequence (0008,1120) is sent.	*** export not supported
> Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance. Required if Referenced Patient Sequence (0008,1120) is sent.	*** export not supported
Patient's Birth Time	(0010,0032)	3	Birth time of the Patient.	Export supported for: All
Other Patient IDs	(0010,1000)	3	Other identification numbers or codes used to identify the patient.	*** export not supported
Other Patient Names	(0010,1001)	3	Other names used to identify the patient.	*** export not supported
Ethnic Group	(0010,2160)	3	Ethnic group or race of the patient.	*** export not supported
Patient Comments	(0010,4000)	3	User-defined additional information about the patient.	*** export not supported
Patient Identify Removed	(0012,0062)	3	The true identity of the patient has been removed from the Attributes and the Pixel Data Enumerated Values: YES NO	*** export not supported
De-identification Method	(0012,0063)	1C	A description or label of the mechanism or method use to remove the patient's identity. May be multi-valued if successive de-identification steps have been performed. Note: This may be used to describe the extent or thoroughness of the de- identification, for example whether or not the de-identification is for a "Limited Data Set" (as per HIPAA Privacy Rule). Required if Patient Identity Removed (0012,0062) is present and has a value of YES and De-identification Method Code Sequence (0012,0064) is not present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
De-identification Method Code Sequence	(0012,0064)	1C	A code describing the mechanism or method use to remove the patient's identity. One or more Items shall be present. Multiple items are used if successive de-identification steps have been performed Required if Patient Identity Removed (0012,0062) is present and has a value of YES and De-identification Method (0012,0063) is not present.	*** export not supported
> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported

B.2.2 General Study - C.7.2.1

Attribute Name	Tag	T	Description	Handling
Study Instance UID	(0020,000D)	1	Unique identifier for the Study.	Export supported for: All
Study Date	(0008,0020)	2	Date the Study started.	Export supported for: All
Study Time	(0008,0030)	2	Time the Study started.	Export supported for: All

Attribute Name	Tag	T	Description	Handling
Referring Physician's Name	(0008,0090)	2	Name of the patient's referring physician	*** export not supported
Referring Physician Identification Sequence	(0008,0096)	3	Identification of the patient's referring physician. Only a single item shall be permitted in this sequence.	*** export not supported
> Person Identification Code Sequence	(0040,1101)	1	A coded entry which identifies a person. The Code Meaning attribute, though it will be encoded with a VR of LO, may be encoded according to the rules of the PN VR (e.g. caret '^' delimiters shall separate name components), except that a single component (i.e. the whole name unseparated by caret delimiters) is not permitted. Name component groups for use with multi-byte character sets are permitted, as long as they fit within the 64 characters (the length of the LO VR). One or more Items may be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Person's Address	(0040,1102)	3	Person's mailing address	*** export not supported
> Person's Telephone Numbers	(0040,1103)	3	Person's telephone number(s)	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Institution Name	(0008,0080)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Code Sequence (0008,0082) is present.	*** export not supported
> Institution Address	(0008,0081)	3	Mailing address of the institution or organization to which the identified individual is responsible or accountable.	*** export not supported
> Institution Code Sequence	(0008,0082)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Name (0008,0080) is present. Only a single Item shall be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Study ID	(0020,0010)	2	User or equipment generated Study identifier.	Export supported for: All
Accession Number	(0008,0050)	2	A RIS generated number that identifies the order for the Study.	Export supported for: All
Study Description	(0008,1030)	3	Institution-generated description or classification of the Study (component) performed.	*** export not supported
Physician(s) of Record	(0008,1048)	3	Names of the physician(s) who are responsible for overall patient care at time of Study (see Section C.7.3.1 for Performing Physician)	*** export not supported

Attribute Name	Tag	T	Description	Handling
Physician(s) of Record Identification Sequence	(0008,1049)	3	Identification of the physician(s) who are responsible for overall patient care at time of Study. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Physician(s) of Record (0008,1048), if present.	*** export not supported
> Person Identification Code Sequence	(0040,1101)	1	A coded entry which identifies a person. The Code Meaning attribute, though it will be encoded with a VR of LO, may be encoded according to the rules of the PN VR (e.g. caret '^' delimiters shall separate name components), except that a single component (i.e. the whole name unseparated by caret delimiters) is not permitted. Name component groups for use with multi-byte character sets are permitted, as long as they fit within the 64 characters (the length of the LO VR). One or more Items may be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Person’s Address	(0040,1102)	3	Person's mailing address	*** export not supported
> Person’s Telephone Numbers	(0040,1103)	3	Person's telephone number(s)	*** export not supported
> Institution Name	(0008,0080)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Code Sequence (0008,0082) is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Institution Address	(0008,0081)	3	Mailing address of the institution or organization to which the identified individual is responsible or accountable.	*** export not supported
> Institution Code Sequence	(0008,0082)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Name (0008,0080) is present. Only a single Item shall be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Name of Physician(s) Reading Study	(0008,1060)	3	Names of the physician(s) reading the Study.	*** export not supported
Physician(s) Reading Study Identification Sequence	(0008,1062)	3	Identification of the physician(s) reading the Study. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Name of Physician(s) Reading Study (0008,1060), if present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Person Identification Code Sequence	(0040,1101)	1	A coded entry which identifies a person. The Code Meaning attribute, though it will be encoded with a VR of LO, may be encoded according to the rules of the PN VR (e.g. caret '^' delimiters shall separate name components), except that a single component (i.e. the whole name unseparated by caret delimiters) is not permitted. Name component groups for use with multi-byte character sets are permitted, as long as they fit within the 64 characters (the length of the LO VR). One or more Items may be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Person’s Address	(0040,1102)	3	Person's mailing address	*** export not supported
> Person’s Telephone Numbers	(0040,1103)	3	Person's telephone number(s)	*** export not supported
> Institution Name	(0008,0080)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Code Sequence (0008,0082) is present.	*** export not supported
> Institution Address	(0008,0081)	3	Mailing address of the institution or organization to which the identified individual is responsible or accountable.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Institution Code Sequence	(0008,0082)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Name (0008,0080) is present. Only a single Item shall be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
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.	*** export not supported
> Referenced SOP Class UID	(0008,1150)	1C	Uniquely identifies the referenced SOP Class. Required if Referenced Study Sequence (0008,1110) is sent.	*** export not supported
> Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance. Required if Referenced Study Sequence (0008,1110) is sent.	*** export not supported
Procedure Code Sequence	(0008,1032)	3	A Sequence that conveys the type of procedure performed. One or more Items may be included in this Sequence.	*** export not supported
> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported

B.2.3 General Series – C.7.3.1

Attribute Name	Tag	T	Description	Handling
Modality	(0008,0060)	1	Type of equipment that originally acquired the data used to create the images in this Series. See C.7.3.1.1.1 for Defined Terms.	Export supported for: All
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.	Export supported for: All
Series Number	(0020,0011)	2	A number that identifies this Series.	Export supported for: All The value is set to 0 for all objects

Attribute Name	Tag	T	Description	Handling
Laterality	(0020,0060)	2C	Laterality of (paired) body part examined. Required if the body part examined is a paired structure and Image Laterality (0020,0062) or Frame Laterality (0020,9072) are not sent. Enumerated Values: R = right L = left Note: Some IODs support Image Laterality (0020,0062) at the Image level or Frame Laterality(0020,9072) at the Frame level in the Frame Anatomy functional group macro, which can provide a more comprehensive mechanism for specifying the laterality of the body part(s) being examined.	*** export not supported
Series Date	(0008,0021)	3	Date the Series started.	Export supported for: Computed Tomography Image RT Structure Set Spatial Registration
Series Time	(0008,0031)	3	Time the Series started.	Export supported for: Computed Tomography Image RT Structure Set Spatial Registration
Performing Physician's Name	(0008,1050)	3	Name of the physician(s) administering the Series.	*** export not supported
Performing Physician Identification Sequence	(0008,1052)	3	Identification of the physician(s) administering the Series. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Performing Physicians' Name (0008,1050), if present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Person Identification Code Sequence	(0040,1101)	1	A coded entry which identifies a person. The Code Meaning attribute, though it will be encoded with a VR of LO, may be encoded according to the rules of the PN VR (e.g. caret '^' delimiters shall separate name components), except that a single component (i.e. the whole name unseparated by caret delimiters) is not permitted. Name component groups for use with multi-byte character sets are permitted, as long as they fit within the 64 characters (the length of the LO VR). One or more Items may be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Person's Address	(0040,1102)	3	Person's mailing address	*** export not supported
> Person's Telephone Numbers	(0040,1103)	3	Person's telephone number(s)	*** export not supported
> Institution Name	(0008,0080)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Code Sequence (0008,0082) is present.	*** export not supported
> Institution Address	(0008,0081)	3	Mailing address of the institution or organization to which the identified individual is responsible or accountable.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Institution Code Sequence	(0008,0082)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Name (0008,0080) is present. Only a single Item shall be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Protocol Name	(0018,1030)	3	User-defined description of the conditions under which the Series was performed. Note: This attribute conveys series-specific protocol identification and may or may not be identical to the one presented in the Performed Protocol Code Sequence (0040,0260).	*** export not supported
Series Description	(0008,103E)	3	User provided description of the Series	*** export not supported
Operators' Name	(0008,1070)	3	Name(s) of the operator(s) supporting the Series.	*** export not supported
Operator Identification Sequence	(0008,1072)	3	Identification of the operator(s) supporting the Series. One or more items shall be included in this sequence. If more than one Item, the number and order shall correspond to the value of Operators' Name (0008,1070), if present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Person Identification Code Sequence	(0040,1101)	1	A coded entry which identifies a person. The Code Meaning attribute, though it will be encoded with a VR of LO, may be encoded according to the rules of the PN VR (e.g. caret '^' delimiters shall separate name components), except that a single component (i.e. the whole name unseparated by caret delimiters) is not permitted. Name component groups for use with multi-byte character sets are permitted, as long as they fit within the 64 characters (the length of the LO VR). One or more Items may be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Person's Address	(0040,1102)	3	Person's mailing address	*** export not supported
> Person's Telephone Numbers	(0040,1103)	3	Person's telephone number(s)	*** export not supported
> Institution Name	(0008,0080)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Code Sequence (0008,0082) is present.	*** export not supported
> Institution Address	(0008,0081)	3	Mailing address of the institution or organization to which the identified individual is responsible or accountable.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Institution Code Sequence	(0008,0082)	1C	Institution or organization to which the identified individual is responsible or accountable. Shall not be present if Institution Name (0008,0080) is present. Only a single Item shall be permitted in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
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.	*** export not supported
> Referenced SOP Class UID	(0008,1150)	1C	Uniquely identifies the referenced SOP Class. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.	*** export not supported
> Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance. Required if Referenced Performed Procedure Step Sequence (0008,1111) is sent.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Related Series Sequence	(0008,1250)	3	Identification of Series significantly related to this Series. Zero or more Items may be present. Notes: 1. For example, for a combined CT and PET acquisition, the CT images and PET images would be in separate series that could cross- reference each other with multiple purpose of reference codes meaning same anatomy, simultaneously acquired and same indication. 2. The related series may have different Frames of Reference and hence require some sort of registration before spatial coordinates can be directly compared. 3. This attribute is not intended for conveying localizer reference information, for which Referenced Image Sequence (0008,1140) should be used.	*** export not supported
> Study Instance UID	(0020,000D)	1	Instance UID of Study to which the related Series belongs	*** export not supported
> Series Instance UID	(0020,000E)	1	Instance UID of Related Series	*** export not supported
> Purpose of Reference Code Sequence	(0040,A170)	2	Describes the purpose for which the reference is made. Zero or more Items may be present. When absent, implies that the reason for the reference is unknown.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Body Part Examined	(0018,0015)	3	Text description of the part of the body examined. Defined Terms: SKULL, CSPINE, TSPINE, LSPINE, SSPINE, COCCYX, CHEST, CLAVICLE, BREAST, ABDOMEN, PELVIS, HIP, SHOULDER, ELBOW, KNEE, ANKLE, HAND, FOOT, EXTREMITY, HEAD, HEART, NECK, LEG, ARM, JAW Note: Some IODs support the Anatomic Region Sequence (0008,2218), which can provide a more comprehensive mechanism for specifying the body part being examined.	*** export not supported
Patient Position	(0018,5100)	2C	Patient position descriptor relative to the equipment. Required for CT and MR images; shall not be present if Patient Orientation Code Sequence (0054,0410) is present; may be present otherwise. See C.7.3.1.1.2 for Defined Terms and further explanation.	Export supported for: RT Image Computed Tomography Image
Smallest Pixel Value in Series	(0028,0108)	3	The minimum value of all images in this Series.	*** export not supported
Largest Pixel Value in Series	(0028,0109)	3	The maximum value of all images in this Series.	*** export not supported
Request Attributes Sequence	(0040,0275)	3	Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.	*** export not supported
> Requested Procedure ID	(0040,1001)	1	Identifier that identifies the Requested Procedure in the Imaging Service Request.	*** export not supported
> Reason for the Requested Procedure	(0040,1002)	3	Reason for requesting this procedure.	*** export not supported
> Reason for Requested Procedure Code Sequence	(0040,100A)	3	Coded Reason for requesting this procedure.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Scheduled Procedure Step ID	(0040,0009)	1	Identifier that identifies the Scheduled Procedure Step.	*** export not supported
> Scheduled Procedure Step Description	(0040,0007)	3	Institution-generated description or classification of the Scheduled Procedure Step to be performed.	*** export not supported
> Scheduled Protocol Code Sequence	(0040,0008)	3	Sequence describing the Scheduled Protocol following a specific coding scheme. This sequence contains one or more Items.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Protocol Context Sequence	(0040,0440)	3	Sequence that specifies the context for the Scheduled Protocol Code Sequence Item. One or more items may be included in this sequence.	*** export not supported
>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
>>> Content Item Modifier Sequence	(0040,0441)	3	Sequence that specifies modifiers for a Protocol Context Content Item. One or more items may be included in this sequence. See Section C.4.10.1.	*** export not supported
>>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Performed Procedure Step ID	(0040,0253)	3	User or equipment generated identifier of that part of a Procedure that has been carried out within this step.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Performed Procedure Step Start Date	(0040,0244)	3	Date on which the Performed Procedure Step started.	*** export not supported
Performed Procedure Step Start Time	(0040,0245)	3	Time on which the Performed Procedure Step started.	*** export not supported
Performed Procedure Step Description	(0040,0254)	3	Institution-generated description or classification of the Procedure Step that was performed.	*** export not supported
Performed Protocol Code Sequence	(0040,0260)	3	Sequence describing the Protocol performed for this Procedure Step. One or more Items may be included in this Sequence.	*** export not supported
> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Protocol Context Sequence	(0040,0440)	3	Sequence that specifies the context for the Performed Protocol Code Sequence Item. One or more items may be included in this sequence.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Value Type	(0040,A040)	1	The type of the value encoded in this name-value Item. Defined Terms: DATETIME DATE TIME PNAME UIDREF TEXT CODE NUMERIC.	*** export not supported
>> Concept Name Code Sequence	(0040,A043)	1	Coded concept name of this name-value Item.	*** export not supported
>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
>> DateTime	(0040,A120)	1C	Datetime value for this name-value Item. Required if Value Type (0040,A040) is DATETIME.	*** export not supported
>> Date	(0040,A121)	1C	Date value for this name-value Item. Required if Value Type (0040,A040) is DATE.	*** export not supported
>> Time	(0040,A122)	1C	Time value for this name-value Item. Required if Value Type (0040,A040) is TIME.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Person Name	(0040,A123)	1C	Person name value for this name-value Item. Required if Value Type (0040,A040) is PNAME.	*** export not supported
>> UID	(0040,A124)	1C	UID value for this name-value Item. Required if Value Type (0040,A040) is UIDREF.	*** export not supported
>> Text Value	(0040,A160)	1C	Text value for this name-value Item. Required if Value Type (0040,A040) is TEXT.	*** export not supported
>> Concept Code Sequence	(0040,A168)	1C	Coded concept value of this name-value Item. Required if Value Type (0040,A040) is CODE.	*** export not supported
>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
>> Numeric Value	(0040,A30A)	1C	Numeric value for this name-value Item. Required if Value Type (0040,A040) is NUMERIC.	*** export not supported
>> Measurement Units Code Sequence	(0040,08EA)	1C	Units of measurement for a numeric value in this namevalue Item. Required if Value Type (0040,A040) is NUMERIC.	*** export not supported
>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
>> Content Item Modifier Sequence	(0040,0441)	3	Sequence that specifies modifiers for a Protocol Context Content Item. One or more items may be included in this sequence. See Section C.4.10.1.	*** export not supported
>>> Value Type	(0040,A040)	1	The type of the value encoded in this name-value Item. Defined Terms: DATETIME DATE TIME PNAME UIDREF TEXT CODE NUMERIC.	*** export not supported
>>> Concept Name Code Sequence	(0040,A043)	1	Coded concept name of this name-value Item.	*** export not supported
>>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
>>> DateTime	(0040,A120)	1C	Datetime value for this name-value Item. Required if Value Type (0040,A040) is DATETIME.	*** export not supported
>>> Date	(0040,A121)	1C	Date value for this name-value Item. Required if Value Type (0040,A040) is DATE.	*** export not supported
>>> Time	(0040,A122)	1C	Time value for this name-value Item. Required if Value Type (0040,A040) is TIME.	*** export not supported
>>> Person Name	(0040,A123)	1C	Person name value for this name-value Item. Required if Value Type (0040,A040) is PNAME.	*** export not supported
>>> UID	(0040,A124)	1C	UID value for this name-value Item. Required if Value Type (0040,A040) is UIDREF.	*** export not supported
>>> Text Value	(0040,A160)	1C	Text value for this name-value Item. Required if Value Type (0040,A040) is TEXT.	*** export not supported
>>> Concept Code Sequence	(0040,A168)	1C	Coded concept value of this name-value Item. Required if Value Type (0040,A040) is CODE.	*** export not supported
>>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
>>> Numeric Value	(0040,A30A)	1C	Numeric value for this name-value Item. Required if Value Type (0040,A040) is NUMERIC.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>>> Measurement Units Code Sequence	(0040,08EA)	1C	Units of measurement for a numeric value in this namevalue Item. Required if Value Type (0040,A040) is NUMERIC.	*** export not supported
>>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Comments on the Performed Procedure Step	(0040,0280)	3	User-defined comments on the Performed Procedure Step.	*** export not supported

B.2.4 Frame of Reference – C.7.4.1

Attribute Name	Tag	T	Description	Handling
Frame of Reference UID	(0020,0052)	1	Uniquely identifies the frame of reference for a Series. See C.7.4.1.1.1 for further explanation.	Export supported for: All
Position Reference Indicator	(0020,1040)	2	Part of the patient's anatomy used as a reference, such as the iliac crest, orbital- medial, sternal notch, symphysis pubis, xiphoid, lower coastal margin, external auditory meatus. See C.7.4.1.1.2 for further explanation.	*** export not supported

B.2.5 General Equipment – C.7.5.1

Attribute Name	Tag	T	Description	Handling
Manufacturer	(0008,0070)	2	Manufacturer of the equipment that produced the composite instances.	Export supported for: RT Image Computed Tomography Image Spatial Registration Structure Set
Institution Name	(0008,0080)	3	Institution where the equipment that produced the composite instances is located.	Export supported for: RT Image Computed Tomography Image Spatial Registration Structure Set
Institution Address	(0008,0081)	3	Mailing address of the institution where the equipment that produced the composite instances is located.	*** export not supported
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the composite instances.	Export supported for: RT Image Computed Tomography Image Spatial Registration Structure Set
Institutional Department Name	(0008,1040)	3	Department in the institution where the equipment that produced the composite instances is located.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Manufacturer's Model Name	(0008,1090)	3	Manufacturer's model name of the equipment that produced the composite instances.	Export supported for: RT Image Computed Tomography Image Spatial Registration Structure Set Value depends on application configuration: OBI: On-Board Imager PV AI: PortalVision AI
Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the composite instances.	Export supported for: RT Image Computed Tomography Image Spatial Registration Structure Set
Software Version(s)	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the composite instances.	Export supported for: RT Image Computed Tomography Image Spatial Registration Structure Set
Spatial Resolution	(0018,1050)	3	The inherent limiting resolution in mm of the acquisition equipment for high contrast objects for the data gathering and reconstruction technique chosen. If variable across the images of the series, the value at the image center.	*** export not supported
Date of Last Calibration	(0018,1200)	3	Date when the image acquisition device calibration was last changed in any way. Multiple entries may be used for additional calibrations at other times. See C.7.5.1.1.1 for further explanation.	*** export not supported
Time of Last Calibration	(0018,1201)	3	Time when the image acquisition device calibration was last changed in any way. Multiple entries may be used. See C.7.5.1.1.1 for further explanation.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Pixel Padding Value	(0028,0120)	1C	Single pixel value or one limit (inclusive) of a range of pixel values used in animage to pad to rectangular format or to signal background that may be suppressed. See C.7.5.1.1.2 for further explanation. Required if Pixel Padding Range Limit (0028,0121) is present. May be present otherwise. Note: The Value Representation of this Attribute is determined by the value of Pixel Representation (0028,0103).	*** export not supported

B.2.6 General Image – C.7.6.1

Attribute Name	Tag	T	Description	Handling
Instance Number	(0020,0013)	2	A number that identifies this image. Note: This Attribute was named Image Number in earlier versions of this Standard.	Export supported for: RT Image Computed Tomography Image Value is set to 0.
Patient Orientation	(0020,0020)	2C	Patient direction of the rows and columns of the image. Required if image does not require Image Orientation (Patient) (0020,0037) and Image Position (Patient) (0020,0032). See C.7.6.1.1.1 for further explanation. Note: IOD's may have attributes other than Patient Orientation, Image Orientation, or Image Position (Patient) to describe orientation in which case this attribute will be zero length.	*** export not supported
Content Date	(0008,0023)	2C	The date the image pixel data creation started. Required if image is part of a series in which the images are temporally related. Note: This Attribute was formerly known as Image Date.	Export supported for: RT Image Computed Tomography Image

Attribute Name	Tag	T	Description	Handling
Content Time	(0008,0033)	2C	The time the image pixel data creation started. Required if image is part of a series in which the images are temporally related.	Export supported for: RT Image Computed Tomography Image
Image Type	(0008,0008)	3	Image identification characteristics. See C.7.6.1.1.2 for Defined Terms and further explanation.	Export supported for: RT Image kV: ORIGINAL\PRIMARY\PORTAL\OBI MV: ORIGINAL\PRIMARY\PORTAL Computed Tomography Image: ORIGINAL\PRIMARY\AXIAL ORIGINAL\PRIMARY\LOCALIZER
Acquisition Number	(0020,0012)	3	A number identifying the single continuous gathering of data over a period of time that resulted in this image.	Export supported for: Computed Tomography Image
Acquisition Date	(0008,0022)	3	The date the acquisition of data that resulted in this image started	*** export not supported
Acquisition Time	(0008,0032)	3	The time the acquisition of data that resulted in this image started	*** export not supported
Acquisition Datetime	(0008,002A)	3	The date and time that the acquisition of data that resulted in this image started. Note: The synchronization of this time with an external clock is specified in the Synchronization Module in Acquisition Time Synchronized (0018,1800).	*** export not supported
Referenced Image Sequence	(0008,1140)	3	A sequence that references other images significantly related to this image (e.g. post-localizer CT image or Mammographic biopsy or partial view images). One or more Items may be included in this sequence.	*** export not supported
> Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.	*** export not supported
> Referenced Frame Number	(0008,1160)	1	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note: This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames.	*** export not supported
> Purpose of Reference Code Sequence	(0040,A170)	3	Describes the purpose for which the reference is made. Only a single Item shall be permitted in this sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Derivation Description	(0008,2111)	3	A text description of how this image was derived. See C.7.6.1.1.3 for further explanation.	*** export not supported
Derivation Code Sequence	(0008,9215)	3	A coded description of how this image was derived. See C.7.6.1.1.3 for further explanation. One or more Items may be included in this Sequence. More than one Item indicates that successive derivation steps have been applied.	*** export not supported
> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Source Image Sequence	(0008,2112)	3	A Sequence that identifies the set of Image SOP Class/Instance pairs of the Images that were used to derive this Image. Zero or more Items may be included in this Sequence. See C.7.6.1.1.4 for further explanation.	*** export not supported
> Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.	*** export not supported
> Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.	*** export not supported
> Referenced Frame Number	(0008,1160)	1	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note: This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames.	*** export not supported
> Purpose of Reference Code Sequence	(0040,A170)	3	Describes the purpose for which the reference is made, that is what role the source image or frame(s) played in the derivation of this image. Only a single Item shall be permitted in this sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Spatial Locations Preserved	(0028,135A)	3	Whether or not the spatial locations of all pixels are preserved during the processing of the source image that resulted in the current image Enumerated Values: YES NO Note: This applies not only to images with a known relationship to a 3D space, but also to projection images. For example, a projection radiograph such as a mammogram that is processed by a point image processing operation such as contrast enhancement, or a smoothing or edge enhancing convolution, would have a value of YES for this attribute. A projection radiograph that had been magnified or warped geometrically would have a value of NO for this attribute. This attribute is typically of importance in relating images with Presentation Intent Type (0008,0068) values of FOR PROCESSING and FOR PRESENTATION.	*** export not supported
Referenced Instance Sequence	(0008,114A)	3	A sequence which provides reference to a set of non-image SOP Class/Instance pairs significantly related to this Image, including waveforms that may or may not be temporally synchronized with this image . One or more Items may be included in this sequence.	*** export not supported
> Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.	*** export not supported
> Purpose of Reference Code Sequence	(0040,A170)	1	Code describing the purpose of the reference to the Instance(s). Only a single Item shall be permitted in this sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Images in Acquisition	(0020,1002)	3	Number of images that resulted from this acquisition of data	*** export not supported
Image Comments	(0020,4000)	3	User-defined comments about the image	*** export not supported
Quality Control Image	(0028,0300)	3	Indicates whether or not this image is a quality control or phantom image. Enumerated Values: YES NO If this Attribute is absent, then the image may or may not be a quality control or phantom image.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Burned In Annotation	(0028,0301)	3	Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired. Enumerated Values: YES NO If this Attribute is absent, then the image may or may not contain burned in annotation.	*** export not supported
Lossy Image Compression	(0028,2110)	3	Specifies whether an Image has undergone lossy compression. Enumerated Values: 00 = Image has NOT been subjected to lossy compression. 01 = Image has been subjected to lossy compression. See C.7.6.1.1.5	*** export not supported
Lossy Image Compression Ratio	(0028,2112)	3	Describes the approximate lossy compression ratio(s) that have been applied to this image. See C.7.6.1.1.5 for further explanation. May be multivalued if successive lossy compression steps have been applied. Notes: 1. For example, a compression ratio of 30:1 would be described in this Attribute with a single value of 30. 2. For historical reasons, the lossy compression ratio may also be described in Derivation Description (0008,2111).	*** export not supported
Lossy Image Compression Method	(0028,2114)	3	A label for the lossy compression method(s) that have been applied to this image. See C.7.6.1.1.5 for further explanation. May be multivalued if successive lossy compression steps have been applied; the value order shall correspond to the values of Lossy Image Compression Ratio (0028,2112). Note: For historical reasons, the lossy compression method may also be described in Derivation Description (0008,2111).	*** export not supported

Attribute Name	Tag	T	Description	Handling
Icon Image Sequence	(0088,0200)	3	This icon image is representative of the Image.	*** export not supported
> Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. See C.7.6.3.1.1 for further explanation.	*** export not supported
> Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data. See C.7.6.3.1.2 for further explanation.	*** export not supported
> Rows	(0028,0010)	1	Number of rows in the image.	*** export not supported
> Columns	(0028,0011)	1	Number of columns in the image.	*** export not supported
> Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.5 for further explanation.	*** export not supported
> Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.5 for further explanation.	*** export not supported
> High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See PS 3.5 for further explanation.	*** export not supported
> Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values: 0000H = unsigned integer. 0001H = 2's complement	*** export not supported
> Pixel Data	(7FE0,0010)	1C	A data stream of the pixel samples that comprise the Image. See C.7.6.3.1.4 for further explanation. Required if Pixel Data Provider URL (0028,7FE0) is not present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Planar Configuration	(0028,0006)	1C	Indicates whether the pixel data are sent color-by-plane or color-by-pixel. Required if Samples per Pixel (0028,0002) has a value greater than 1. See C.7.6.3.1.3 for further explanation.	*** export not supported
> Pixel Aspect Ratio	(0028,0034)	1C	Ratio of the vertical size and horizontal size of the pixels in the image specified by a pair of integer values where the first value is the vertical pixel size, and the second value is the horizontal pixel size. Required if the aspect ratio is not 1 and the Image Plane Module or the Pixel Measures Macro is not applicable to this Image. See C.7.6.3.1.7.	*** export not supported
> Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.	*** export not supported
> Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.	*** export not supported
> Red Palette Color Lookup Table Descriptor US or	(0028,1101)	1C	Specifies the format of the Red Palette Color Lookup Table Data (0028,1201) Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.5 for further explanation.	*** export not supported
> Green Palette Color Lookup Table Descriptor US or	(0028,1102)	1C	Specifies the format of the Green Palette Color Lookup Table Data (0028,1202) Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.5 for further explanation.	*** export not supported
> Blue Palette Color Lookup Table Descriptor US or	(0028,1103)	1C	Specifies the format of the Blue Palette Color Lookup Table Data (0028,1203) Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.5 for further explanation.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Red Palette Color Lookup Table Data	(0028,1201)	1C	Red Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.6 for further explanation.	*** export not supported
> Green Palette Color Lookup Table Data	(0028,1202)	1C	Green Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.6 for further explanation.	*** export not supported
> Blue Palette Color Lookup Table Data	(0028,1203)	1C	Blue Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.6 for further explanation.	*** export not supported
> ICC Profile	(0028,2000)	3	An ICC Profile encoding the transformation of device-dependent color stored pixel values into PCS-Values. See Section C.11.15.1.1.1. When present, defines the color space of color Pixel Data (7FE0,0010) values, and the output of Palette Color Lookup Table. Data (0028,1201-1203). Note: The profile applies only to the Pixel Data (7FE0,0010) attribute at the same level of the dataset and not to any icons nested within sequences, which may or may not have their own ICC profile specified.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Presentation LUT Shape	(2050,0020)	3	When present, specifies an identity transformation for the Presentation LUT such that the output of all grayscale transformations, if any, are defined to be in P-Values. Enumerated Values are: IDENTITY = output is in P-Values - shall be used if Photometric Interpretation (0028,0004) is MONOCHROME2 or any color photometric interpretation. INVERSE = output after inversion is in P- Values - shall be used if Photometric Interpretation (0028,0004) is MONOCHROME1. When this attribute is used with a color photometric interpretation then the luminance component is in P-Values.	*** export not supported
Irradiation Event UID	(0008,3010)	3	Unique identification of the irradiation event(s) associated with the acquisition of this image. See C.7.6.1.1.7.	*** export not supported
Image Remarks	(3281,XX00)	3		

B.2.7 Image Plane – C.7.6.2

Attribute Name	Tag	T	Description	Handling
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.	Export supported for: Computed Tomography Image
Image Orientation (Patient)	(0020,0037)	1	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.	Export supported for: Computed Tomography Image
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 C.7.6.2.1.1 for further explanation.	Export supported for: Computed Tomography Image
Slice Thickness	(0018,0050)	2	Nominal slice thickness, in mm.	Export supported for: Computed Tomography Image

Attribute Name	Tag	T	Description	Handling
Slice Location	(0020,1041)	3	Relative position of exposure expressed in mm. C.7.6.2.1.2 for further explanation.	*** export not supported

B.2.8 Image Pixel – C.7.6.3

Attribute Name	Tag	T	Description	Handling
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. See C.7.6.3.1.1 for further explanation.	Export supported for: RT Image Computed Tomography Image Value set to 1.
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data. See C.7.6.3.1.2 for further explanation.	Export supported for: RT Image Computed Tomography Image Value set to MONOCHROME2
Rows	(0028,0010)	1	Number of rows in the image.	Export supported for: RT Image Computed Tomography Image
Columns	(0028,0011)	1	Number of columns in the image.	Export supported for: RT Image Computed Tomography Image
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.5 for further explanation.	Export supported for: RT Image Computed Tomography Image
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.5 for further explanation.	Export supported for: RT Image Computed Tomography Image

Attribute Name	Tag	T	Description	Handling
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See PS 3.5 for further explanation.	Export supported for: RT Image Computed Tomography Image
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values: 0000H = unsigned integer. 0001H = 2's complement	Export supported for: RT Image Computed Tomography Image
Pixel Data	(7FE0,0010)	1C	A data stream of the pixel samples that comprise the Image. See C.7.6.3.1.4 for further explanation. Required if Pixel Data Provider URL (0028,7FE0) is not present.	Export supported for: RT Image Computed Tomography Image
Planar Configuration	(0028,0006)	1C	Indicates whether the pixel data are sent color-by-plane or color-by-pixel. Required if Samples per Pixel (0028,0002) has a value greater than 1. See C.7.6.3.1.3 for further explanation.	*** export not supported
Pixel Aspect Ratio	(0028,0034)	1C	Ratio of the vertical size and horizontal size of the pixels in the image specified by a pair of integer values where the first value is the vertical pixel size, and the second value is the horizontal pixel size. Required if the aspect ratio is not 1 and the Image Plane Module or the Pixel Measures Macro is not applicable to this Image. See C.7.6.3.1.7.	*** export not supported
Smallest Image Pixel Value	(0028,0106)	3	The minimum actual pixel value encountered in this image.	*** export not supported
Largest Image Pixel Value	(0028,0107)	3	The maximum actual pixel value encountered in this image.	*** export not supported
Red Palette Color Lookup Table Descriptor US or	(0028,1101)	1C	Specifies the format of the Red Palette Color Lookup Table Data (0028,1201) Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.5 for further explanation.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Green Palette Color Lookup Table Descriptor US or	(0028,1102)	1C	Specifies the format of the Green Palette Color Lookup Table Data (0028,1202) Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.5 for further explanation.	*** export not supported
Blue Palette Color Lookup Table Descriptor US or	(0028,1103)	1C	Specifies the format of the Blue Palette Color Lookup Table Data (0028,1203) Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.5 for further explanation.	*** export not supported
Red Palette Color Lookup Table Data	(0028,1201)	1C	Red Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.6 for further explanation.	*** export not supported
Green Palette Color Lookup Table Data	(0028,1202)	1C	Green Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.6 for further explanation.	*** export not supported
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Blue Palette Color Lookup Table Data. Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR or Pixel Presentation (0008,9205) at the image level equals COLOR or MIXED. See C.7.6.3.1.6 for further explanation.	*** export not supported

Attribute Name	Tag	T	Description	Handling
ICC Profile	(0028,2000)	3	An ICC Profile encoding the transformation of device-dependent color stored pixel values into PCS-Values. See Section C.11.15.1.1.1. When present, defines the color space of color Pixel Data (7FE0,0010) values, and the output of Palette Color Lookup Table. Data (0028,1201-1203). Note: The profile applies only to the Pixel Data (7FE0,0010) attribute at the same level of the dataset and not to any icons nested within sequences, which may or may not have their own ICC profile specified.	*** export not supported
Pixel Data Provider URL	(0028,7FE0)	1C	A URL of a provider service that supplies the pixel data of the Image. Required if the image is to be transferred in one of the following presentation contexts identified by Transfer Syntax UID: 1.2.840.10008.1.2.4.94 (DICOM JPIP Referenced Transfer Syntax) 1.2.840.10008.1.2.4.95 (DICOM JPIP Referenced Deflate Transfer Syntax)	*** export not supported

B.2.9 CT Image – C.8.2.1

Attribute Name	Tag	T	Description	Handling
Image Type	(0008,0008)	1	Image identification characteristics. See C.8.2.1.1.1 for specialization.	Export supported ORIGINAL\PRIMARY\ AXIAL ORIGINAL\PRIMARY\ LOCALIZER
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. See C.8.2.1.1.2 for specialization.	Export supported Value set to 1
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data. See C.8.2.1.1.3 for specialization.	Export supported Value set to MONOCHROME2

Attribute Name	Tag	T	Description	Handling
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See C.8.2.1.1.4 for specialization.	Export supported
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See C.8.2.1.1.5 for specialization.	Export supported
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See C.8.2.1.1.6 for specialization.	Export supported
Rescale Intercept	(0028,1052)	1	The value b in relationship between stored values (SV) and Hounsfield (HU). HU = m*SV+b	Export supported
Rescale Slope	(0028,1053)	1	m in the equation specified in Rescale Intercept (0028,1052).	Export supported
KVP	(0018,0060)	2	Peak kilo voltage output of the x-ray generator used	*** export not supported
Acquisition Number	(0020,0012)	2	A number identifying the single continuous gathering of data over a period of time which resulted in this image	Export supported
Scan Options	(0018,0022)	3	Parameters of scanning sequence.	Export supported Value set to TOMO
Data Collection Diameter	(0018,0090)	3	The diameter in mm of the region over which data were collected	Export supported
Reconstruction Diameter	(0018,1100)	3	Diameter in mm of the region from within which data were used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region.	Export supported
Distance Source to Detector	(0018,1110)	3	Distance in mm from source to detector center. Note: This value is traditionally referred to as Source Image Receptor Distance (SID).	Export supported

Attribute Name	Tag	T	Description	Handling
Distance Source to Patient	(0018,1111)	3	Distance in mm from source to isocenter (center of field of view). Note: This value is traditionally referred to as Source Object Distance (SOD).	Export supported Value set to 0.
Gantry/Detector Tilt	(0018,1120)	3	Nominal angle of tilt in degrees of the scanning gantry. Not intended for mathematical computations.	Export supported Value set to 0.
Table Height	(0018,1130)	3	The distance in mm of the top of the patient table to the center of rotation; below the center is positive.	Export supported
Table Top Longitudinal Position	(300A,0129)	3		Export supported
Table Top Lateral Position	(300A,012A)	3		Export supported
Patient Support Angle	(300A,0122)	3		Export supported
Rotation Direction	(0018,1140)	3	Direction of rotation of the source when relevant, about nearest principal axis of equipment. Enumerated Values: CW = clockwise CC = counter clockwise	*** export not supported
Exposure Time	(0018,1150)	3	Time of x-ray exposure in msec	Export supported
X-ray Tube Current	(0018,1151)	3	X-ray Tube Current in mA.	Export supported
Exposure	(0018,1152)	3	The exposure expressed in mAs, for example calculated from Exposure Time and X-ray Tube Current.	Export supported
Exposure in uAs	(0018,1153)	3	The exposure expressed in ≠ As, for example calculated from Exposure Time and X-ray Tube Current.	*** export not supported
Filter Type	(0018,1160)	3	Label for the type of filter inserted into the x-ray beam.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Generator Power	(0018,1170)	3	Power in kW to the x-ray generator.	Export supported
Focal Spot(s)	(0018,1190)	3	Size of the focal spot in mm. For devices with variable focal spot or multiple focal spots, small dimension followed by large dimension.	Export supported
Convolution Kernel	(0018,1210)	3	A label describing the convolution kernel or algorithm used to reconstruct the data	Export supported
Revolution Time	(0018,9305)	3	The time in seconds of a complete revolution of the source around the gantry orbit.	*** export not supported
Single Collimation Width	(0018,9306)	3	The width of a single row of acquired data (in mm). Note: Adjacent physical detector rows may have been combined to form a single effective acquisition row.	*** export not supported
Total Collimation Width	(0018,9307)	3	The width of the total collimation (in mm) over the area of active x-ray detection. Note: This will be equal the number of effective detector rows multiplied by single collimation width.	*** export not supported
Table Speed	(0018,9309)	3	The distance in mm that the table moves in one second during the gathering of data that resulted in this image.	*** export not supported
Table Feed per Rotation	(0018,9310)	3	Motion of the table (in mm) during a complete revolution of the source around the gantry orbit.	*** export not supported
Spiral Pitch Factor	(0018,9311)	3	Ratio of the Table Feed per Rotation (0018,9310) to the Total Collimation Width (0018,9307).	*** export not supported
Exposure Modulation Type	(0018,9323)	3	A label describing the type of exposure modulation used for the purpose of limiting the dose. Defined Terms: NONE	*** export not supported

Attribute Name	Tag	T	Description	Handling
Estimated Dose Saving	(0018,9324)	3	A percent value of dose saving due to the use of Exposure Modulation Type (0018,9323). A negative percent value of dose savings reflects an increase of exposure.	*** export not supported
CTDIvol	(0018,9345)	3	Computed Tomography Dose Index (CTDIvol), im mGy according to IEC 60601-2-44, Ed.2.1 (Clause 29.1.103.4), The Volume CTDIvol. It describes the average dose for this image for the selected CT conditions of operation.	*** export not supported
Anatomic Region Sequence	(0008,2218)	3	Sequence that identifies the anatomic region of interest in this Instance (i.e. external anatomy, surface anatomy, or general region of the body). Only a single Item shall be permitted in this sequence.	*** export not supported
> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Anatomic Region Modifier Sequence	(0008,2220)	3	Sequence of Items that modifies the anatomic region of interest of this Instance One or more Items may be included in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Primary Anatomic Structure Sequence	(0008,2228)	3	Sequence of Items that identifies the primary anatomic structure(s) of interest in this Instance. One or more Items may be included in this Sequence.	*** export not supported
> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported
> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
> Primary Anatomic Structure Modifier Sequence	(0008,2230)	3	Sequence of Items that modifies the primary anatomic structure of interest in this Instance. One or more Items may be included in this Sequence.	*** export not supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	*** export not supported
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	*** export not supported
Referenced Instance Sequence	(0008,114a)	3	Sequence specifying SOP Instances significantly related to the current SOP Instance.	Export supported Reference to the plan in which context the CT Image was acquired.
> Referenced SOP Class UID	(0008,1150)	3	Uniquely identifies the referenced SOP Class.	Export supported RT Plan Storage
> Referenced SOP Instance UID	(0008,1155)	3	Uniquely identifies the referenced SOP Instance.	Export supported UID of the plan
> Purpose of Reference Code Sequence	(0040,a170)	3	Describes the purpose for which the reference is made. Only a single Item shall be permitted in this sequence.	Export supported
>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	Export supported Value set to 1000
>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	Export supported Value set to 99VMS_PURPREFOBJ
>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	Export supported Value set to 1.0
>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	Export supported Value set to "RT Plan or RT Ion Plan or Radiation Set to be verified"

B.2.10 RT Image – C.8.8.2

Attribute Name	Tag	T	Description	Handling
Samples per Pixel	(0028,0002)	1	Number of samples (planes) in this image. See C.8.8.2.6.1 for specialization.	Export supported
Photometric Interpretation	(0028,0004)	1	Specifies the intended interpretation of the pixel data. See C.7.6.3.1.2 for further explanation.	Export supported Value set to MONOCHROME2
Bits Allocated	(0028,0100)	1	Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated. See PS 3.5 for further explanation.	Export supported
Bits Stored	(0028,0101)	1	Number of bits stored for each pixel sample. Each sample shall have the same number of bits stored. See PS 3.5 for further explanation.	Export supported
High Bit	(0028,0102)	1	Most significant bit for pixel sample data. Each sample shall have the same high bit. See PS 3.5 for further explanation.	Export supported
Pixel Representation	(0028,0103)	1	Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values: 0000H = unsigned integer. 0001H = 2's complement	Export supported
Pixel Intensity Relationship	(0028,1040)	3	The relationship between the Pixel sample values and the X-Ray beam intensity. Enumerated Values: LIN = Linearly proportional to X-Ray beam intensity LOG = Logarithmically proportional to X- Ray beam intensity See C.8.11.3.1.2 for further explanation.	*** export not supported

Attribute Name	Tag	T	Description	Handling
Pixel Intensity Relationship Sign	(0028,1041)	1C	The sign of the relationship between the Pixel sample values stored in Pixel Data (7FE0,0010) and the X-Ray beam intensity. Required if Pixel Intensity Relationship (0028,1040) is present. Enumerated Values; 1 = Lower pixel values correspond to less X-Ray beam intensity -1 = Higher pixel values correspond to less X-Ray beam intensity See C.8.11.3.1.2 for further explanation.	*** export not supported
RT Image Label	(3002,0002)	1	User-defined label for RT Image.	Export supported Used as Image ID.
RT Image Name	(3002,0003)	3	User-defined name for RT Image.	*** export not supported
RT Image Description	(3002,0004)	3	User-defined description of RT Image.	Export supported for MV image only
Operators' Name	(0008,1070)	2	Name of operator(s) acquiring or creating RT Image.	*** export not supported
Image Type	(0008,0008)	1	Image identification characteristics (see Section C.7.6.1.1.2). RT Images shall use one of the following Defined Terms for Value 3: DRR = digitally reconstructed radiograph PORTAL = digital portal image or portal film image SIMULATOR = conventional simulator image RADIOGRAPH = radiographic image BLANK = image pixels set to background value FLUENCE = fluence map	Export supported kV: ORIGINAL\PRIMARY\PORTAL\OBI MV: ORIGINAL\PRIMARY\PORTAL Value for acquired portal dose: ORIGINAL\PRIMARY\PORTAL\ACQUIRED_DOSE
Conversion Type	(0008,0064)	2	Describes the kind of image conversion. Defined Terms: DV = Digitized Video DI = Digital Interface DF = Digitized Film WSD = Workstation	Export supported Value set to DI

Attribute Name	Tag	T	Description	Handling
Reported Values Origin	(3002,000A)	2C	Describes the origin of the parameter values reported in the image. Required if Value 3 of Image Type (0008,0008) is SIMULATOR or PORTAL. Enumerated Values: OPERATOR = manually entered by operator PLAN = planned parameter values ACTUAL = electronically recorded	Export supported Value set to ACTUAL
RT Image Plane	(3002,000C)	1	Describes whether or not image plane is normal to beam axis. Enumerated Values: NORMAL = image plane normal to beam axis NON_NORMAL = image plane non-normal to beam axis	Export supported Value set to NORMAL
X-Ray Image Receptor Translation	(3002,000D)	3	Position in (x,y,z) coordinates of origin of IEC X-RAY IMAGE RECEPTOR System in the IEC GANTRY coordinate system (mm). See Note 2.	Export supported
X-Ray Image Receptor Angle	(3002,000E)	2	X-Ray Image Receptor Angle i.e. orientation of IEC X-RAY IMAGE RECEPTOR coordinate system with respect to IEC GANTRY coordinate system (degrees). See C.8.8.2.2.	Export supported
RT Image Orientation	(3002,0010)	2C	The direction cosines of the first row and the first column with respect to the IEC XRAY IMAGE RECEPTOR coordinate system. Required if RT Image Plane (3002,000C) is NON_NORMAL. May be present otherwise.	Export supported
Image Plane Pixel Spacing	(3002,0011)	2	Physical distance (in mm) between the center of each image pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing. See C.8.8.2.3.	Export supported
RT Image Position	(3002,0012)	2	The x and y coordinates (in mm) of the upper left hand corner of the image, in the IEC X-RAY IMAGE RECEPTOR coordinate system. This is the center of the first pixel transmitted. See C.8.8.2.7.	Export supported

Attribute Name	Tag	T	Description	Handling
Radiation Machine Name	(3002,0020)	2	User-defined name identifying radiation machine used in acquiring or computing image (i.e. name of conventional simulator, electron accelerator, X-ray device, or machine modeled when calculating DRR).	Export supported
Primary Dosimeter Unit	(300A,00B3)	2	Measurement unit of machine dosimeter. Enumerated Values: MU = Monitor Unit MINUTE = minute	Export supported Value for MV Image: MU Value for kV Image: MINUTE
Radiation Machine SAD	(3002,0022)	2	Radiation source to Gantry rotation axis distance of radiation machine used in acquiring or computing image (mm).	Export supported
Radiation Machine SSD	(3002,0024)	3	Source to patient surface distance (in mm) of radiation machine used in acquiring or computing image.	*** export not supported
RT Image SID	(3002,0026)	2	Distance from radiation machine source to image plane (in mm) along radiation beam axis. See C.8.8.2.3.	Export supported
Source to Reference Object Distance	(3002,0028)	3	Source to reference object distance (in mm), as used for magnification calculation of RADIOGRAPH and SIMULATOR images.	*** export not supported
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.	Export supported
> Referenced SOP Class UID	(0008,1150)	1C	Uniquely identifies the referenced SOP Class. Required if Referenced RT Plan Sequence (300C,0002) is sent.	Export supported Supported values: SOP Class UID of RT Plan and RT Ion Plan.
> Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance. Required if Referenced RT Plan Sequence (300C,0002) is sent.	Export supported Plan UID of the plan where this image is a field image.

Attribute Name	Tag	T	Description	Handling
Referenced Beam Number	(300C,0006)	3	Uniquely identifies the corresponding N- segment treatment beam specified by Beam Number (300A,00C0) within Beam Sequence in RT Beams Module within the RT Plan referenced in Referenced RT Plan Sequence (300C,0002).	Export supported
Referenced Fraction Group Number	(300C,0022)	3	Identifier of Fraction Group within RT Plan referenced in Referenced RT Plan Sequence (300C,0002).	*** export not supported
Fraction Number	(3002,0029)	3	Fraction Number of fraction during which image was acquired, within Fraction Group referenced by Referenced Fraction Group Number (300C,0022) within RT Plan referenced in Referenced RT Plan Sequence (300C,0002).	Export supported Value set to 1.
Start Cumulative Meterset Weight	(300C,0008)	3	Cumulative Meterset Weight within Beam referenced by Referenced Beam Number (300C,0006) at which image acquisition starts.	Export supported for MV Image only
End Cumulative Meterset Weight	(300C,0009)	3	Cumulative Meterset Weight within Beam referenced by Referenced Beam Number (300C,0006) at which image acquisition ends.	*** export not supported
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.	Export supported. Only 1 item supported
> 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.	*** export not supported
> 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.	Export supported

Attribute Name	Tag	T	Description	Handling
> 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.	Export supported for kV Image
> 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.	Export supported for kV Image
> 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.	Export supported
> Diaphragm Position	(3002,0034)	3	Positions of diaphragm jaw pairs (in mm) in IEC BEAM LIMITING DEVICE coordinate axis in the IEC order X1, X2, Y1, Y2.	*** export not supported
> 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.	Export supported
>> RT Beam Limiting Device Type	(300A,00B8)	1C	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	Export supported for MV Image only Supported values: X, Y, ASYMX, ASYMY.

Attribute Name	Tag	T	Description	Handling
>> Source to Beam Limiting Device Distance	(300A,00BA)	3	Radiation source to beam limiting device (collimator) distance (mm).	*** export not supported
>> Number of Leaf/Jaw Pairs	(300A,00BC)	1C	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.	Export supported for MV Image only Value set to 1.
>> Leaf Position Boundaries	(300A,00BE)	2C	Boundaries (in mm) of beam limiting device (collimator) leaves (elements) in IEC BEAM LIMITING DEVICE coordinate axis appropriate to RT Beam Limiting Device Type (300A,00B8), i.e. X-axis for MLCY, Y- axis for MLCX. Contains N+1 values, where N is the Number of Leaf/Jaw Pairs (300A,00BC), starting from Leaf (Element) Pair 1. Required if RT Beam Limiting Device Type (300A,00B8) is MLCX or MLCY.	*** export not supported
>> Leaf/Jaw Positions	(300A,011C)	1C	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.	Export supported for MV Image only
> Applicator Sequence	(300A,0107)	3	Introduces sequence of Applicators associated with Beam. Only a single item shall be permitted in this sequence.	*** export not supported
>> Applicator ID	(300A,0108)	1C	User or machine supplied identifier for Applicator. Required if Applicator Sequence (300A,0107) is sent.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Applicator Type	(300A,0109)	1C	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	*** export not supported
>> Applicator Description	(300A,010A)	3	User-defined description for Applicator.	*** export not supported
> Number of Blocks	(300A,00F0)	1C	Number of shielding blocks associated with Beam. Required if Exposure Sequence (3002,0030) is sent.	Export supported Value always 0.
> 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.	*** export not supported
>> Block Tray ID	(300A,00F5)	3	User-supplied identifier for block tray.	*** export not supported
>> Source to Block Tray Distance	(300A,00F6)	2C	Radiation Source to attachment edge of block tray assembly (mm). Required if Block Sequence (300A,00F4) is sent.	*** export not supported
>> Block Type	(300A,00F8)	1C	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	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Block Divergence	(300A,00FA)	2C	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	*** export not supported
>> Block Mounting Position	(300A,00FB)	3	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 which is towards the patient. SOURCE_SIDE = the block is mounted on the side of the Block Tray which is towards the radiation source.	*** export not supported
>> Block Number	(300A,00FC)	1C	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.	*** export not supported
>> Block Name	(300A,00FE)	3	User-defined name for block.	*** export not supported
>> Material ID	(300A,00E1)	2C	User-supplied identifier for material used to manufacture Block. Required if Block Sequence (300A,00F4) is sent.	*** export not supported
>> Block Thickness	(300A,0100)	3	Physical thickness of block (in mm) parallel to radiation beam axis.	*** export not supported
>> Block Number of Points	(300A,0104)	2C	Number of (x,y) pairs defining the block edge. Required if Block Sequence (300A,00F4) is sent.	*** export not supported

Attribute Name	Tag	T	Description	Handling
>> Block Data	(300A,0106)	2C	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.	*** export not supported
> Primary Fluence Mode Sequence	(3285,XX00)	3	Sequence defining whether the primary fluence of the treatment beam uses a non-standard fluence-shaping. Only a single Item shall be permitted in this sequence.	*** export not supported
>> Fluence Mode	(3285,XX01)	1	Describes whether the fluence shaping is the standard mode for the beam or an alternate. Enumerated Values: STANDARD = Uses standard fluence-shaping NON_STANDARD = Uses a non-standard fluence-shaping mode	*** export not supported
>> Fluence Mode ID	(3285,XX02)	1C	Identifier for the specific fluence-shaping mode. Required if Fluence Mode (3285,xx01) has value NON_STANDARD.	*** export not supported
Fluence Map Sequence	(3002,0040)	1C	A Sequence of data describing the fluence map attributes for a radiotherapy beam. Only one item may be included in this sequence. Required if the third value of Image Type (0008,0008) is FLUENCE.	*** export not supported
> Fluence Data Source	(3002,0041)	1	Source of fluence data. Enumerated Values: CALCULATED = Calculated by a workstation MEASURED = Measured by exposure to a film or detector.	*** export not supported

Attribute Name	Tag	T	Description	Handling
> Fluence Data Scale	(3002,0042)	3	The meterset corresponding with a fluence map cell value of 1.0 expressed in units specified by Primary Dosimeter Units (300A,00B3). This is the meterset value used for treatment, not the meterset used to expose the film as defined by Meterset Exposure (3002,0032).	*** export not supported
Gantry Angle	(300A,011E)	3	Treatment machine gantry angle, i.e. orientation of IEC GANTRY coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees).	Export
Beam Limiting Device Angle	(300A,0120)	3	Treatment machine beam limiting device (collimator) angle, i.e. orientation of IEC BEAM LIMITING DEVICE coordinate system with respect to IEC GANTRY coordinate system (degrees).	Export supported
Patient Support Angle	(300A,0122)	3	Patient Support angle, i.e. orientation of IEC PATIENT SUPPORT coordinate system with respect to IEC FIXED REFERENCE coordinate system (degrees).	Export supported
Table Top Eccentric Axis Distance	(300A,0124)	3	Distance (positive) from the IEC PATIENT SUPPORT vertical axis to the IEC TABLE TOP ECCENTRIC vertical axis (mm).	*** export not supported
Table Top Eccentric Angle	(300A,0125)	3	Table Top (non-isocentric) angle, i.e. orientation of IEC TABLE TOP ECCENTRIC coordinate system with respect to IEC PATIENT SUPPORT system (degrees).	*** export not supported
Table Top Vertical Position	(300A,0128)	3	Table Top Vertical position in IEC TABLE TOP coordinate system (mm).	Export supported
Table Top Longitudinal Position	(300A,0129)	3	Table Top Longitudinal position in IEC TABLE TOP coordinate system (mm).	Export supported
Table Top Lateral Position	(300A,012A)	3	Table Top Lateral position in IEC TABLE TOP coordinate system (mm).	Export supported

Attribute Name	Tag	T	Description	Handling
Isocenter Position	(300A,012C)	3	Isocenter coordinates (x,y,z), in mm. Specifies the location of the machine isocenter in the patient-based coordinate system associated with the Frame of Reference. It allows transformation from the equipment-based IEC coordinate system to the patient-based coordinate system.	Export supported
Patient Position	(0018,5100)	1C	Patient position descriptor relative to the patient support device. Required if Isocenter Position (300A,012C) is present. May be present otherwise. See Section C.7.3.1.1.2 for Defined Terms and further explanation. Note: 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 the Isocenter Position (300A,012C) allows the RT 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.	Export supported
RT Image Isocenter Position	(3273,XX00)	3	The isocenter position in the FOR as defined in the FOR module. For DRRs, this is typically the FOR of the diagnostic image and the isocenter coordinate correspond to those of the associated beam. For treatment / simulator images, the acquisition systems create the FOR and define it's origin (typically the isocenter position of the first image acquired).	Export supported
RT Image Patient Position	(3273,XX01)	3	The patient position at the time, when the image was taken (or created in case of DRRs).	Export supported

Attribute Name	Tag	T	Description	Handling
LT Archive Primary Reference Image Flag	(3279,XX00)	3	If present indicates if image is primary reference image of beam referenced by Referenced RT Plan Sequence (300C,0002) and Referenced Beam Number (300C,0006). If absent then it is not a primary reference image. Enumerated Values: PRIMARY NOT_PRIMARY	*** export not supported

B.2.11 Structure Set – C.8.8.5

Attribute Name	Tag	T	Description	Handling
Structure Set Label	(3006,0002)	1	User-defined label for Structure Set.	Export supported
Structure Set Name	(3006,0004)	3	User-defined name for Structure Set.	*** export not supported
Structure Set Description	(3006,0006)	3	User-defined description for Structure Set.	*** export not supported
Instance Number	(0020,0013)	3	A number that identifies this object instance.	*** export not supported
Structure Set Date	(3006,0008)	2	Date at which Structure Set was last modified.	Export supported
Structure Set Time	(3006,0009)	2	Time at which Structure Set was last modified.	Export supported
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.	Export supported
> Frame of Reference UID	(0020,0052)	1C	Uniquely identifies Frame of Reference within Structure Set. Required if Referenced Frame of Reference Sequence (3006,0010) is sent.	Export supported

Attribute Name	Tag	T	Description	Handling
> Frame of Reference Relationship Sequence	(3006,00C0)	3	Introduces sequence of transforms that relate other Frames of Reference to this Frame of Reference.	*** export not supported
>> Related Frame of Reference UID	(3006,00C2)	1C	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.	*** export not supported
>> Frame of Reference Transformation Type	(3006,00C4)	1C	Type of Transformation. Required if Frame of Reference Relationship Sequence (3006,00C0) is sent. Defined Terms: HOMOGENEOUS	*** export not supported
>> Frame of Reference Transformation Matrix	(3006,00C6)	1C	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.	*** export not supported
>> Frame of Reference Transformation Comment	(3006,00C8)	3	Comment regarding the transformation between the related and current Frames of Reference.	*** export not supported
> 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.	Export supported
>> Referenced SOP Class UID	(0008,1150)	1C	Uniquely identifies the referenced SOP Class. Required if RT Referenced Study Sequence (3006,0012) is sent.	Export supported
>> Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance. Required if RT Referenced Study Sequence (3006,0012) is sent.	Export supported

Attribute Name	Tag	T	Description	Handling
>> RT Referenced Series Sequence	(3006,0014)	1C	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.	Export supported
>>> Series Instance UID	(0020,000E)	1C	Unique identifier for the series containing the images. Required if RT Referenced Series Sequence (3006,0014) is sent.	Export supported
>>> Contour Image Sequence	(3006,0016)	1C	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.	Export supported
>>>> Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.	Export supported
>>>> Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.	Export supported
>>>> Referenced Frame Number	(0008,1160)	1	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note: This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames.	*** export not supported
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.	Export supported
> ROI Number	(3006,0022)	1C	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.	Export supported

Attribute Name	Tag	T	Description	Handling
> Referenced Frame of Reference UID	(3006,0024)	1C	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.	Export supported
> ROI Name	(3006,0026)	2C	User-defined name for ROI. Required if Structure Set ROI Sequence (3006,0020) is sent.	Export supported
> ROI Description	(3006,0028)	3	User-defined description for ROI.	*** export not supported
> ROI Volume	(3006,002C)	3	Volume of ROI (cubic centimeters).	*** export not supported
> ROI Generation Algorithm	(3006,0036)	2C	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	Export supported
> ROI Generation Description	(3006,0038)	3	User-defined description of technique used to generate ROI.	*** export not supported
ROI Contour Sequence	(3006,0039)	1	Introduces sequence of Contour Sequences defining ROIs. One or more items may be included in this sequence.	Export supported
> Referenced ROI Number	(3006,0084)	1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).	Export supported
> ROI Display Color	(3006,002A)	3	RGB triplet color representation for ROI, specified using the range 0-255.	Export supported
> Contour Sequence	(3006,0040)	3	Introduces sequence of Contours defining ROI. One or more items may be included in this sequence.	Export supported

Attribute Name	Tag	T	Description	Handling
>> Contour Geometric Type	(3006,0042)	1	Geometric type of contour. Enumerated Values: POINT = single point	Export supported
>> Number of Contour Points	(3006,0046)	1	Number of points (triplets) in Contour Data (3006,0050).	Export supported
>> Contour Number	(3006,0048)	3	Identification number of the contour. The value of Contour Number (3006,0048) shall be unique within the Contour Sequence (3006,0040) in which it is defined. No semantics or ordering shall be inferred from this attribute.	Export supported
>> Contour Data	(3006,0050)	1	Sequence of (x,y,z) triplets defining a contour in the patient based coordinate system (mm). Note: Contour Data may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.	Export supported
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.	Export supported
> Observation Number	(3006,0082)	1	Identification number of the Observation. The value of Observation Number (3006,0082) shall be unique within the RT ROI Observations Sequence (3006,0080).	Export supported
> Referenced ROI Number	(3006,0084)	1	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).	Export supported
> ROI Observation Label	(3006,0085)	3	User-defined label for ROI Observation. Defined Terms: InitLaserIso InitMatchIso AcqIsocenter	Export supported

Attribute Name	Tag	T	Description	Handling
> RT ROI Interpreted Type	(3006,00A4)	2	Type of ROI. Defined Terms: INITLASERISO INITMATCHISO ACQ_ISOCENTER	Export supported
> ROI Interpreter	(3006,00A6)	2	Name of person performing the interpretation.	Export supported
> 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.	Export supported
>> ROI Physical Property	(3006,00B2)	1	Physical property specified by ROI Physical Property Value (3006,00B4). Defined Terms: PATSUPPORT_ANGLE	Export supported
>> ROI Physical Property Value	(3006,00B4	1	User-assigned value for physical property.	Export supported
Referenced Structure Set Relationship Sequence	(3263,XX01)	3	Introduces sequence of related SOP Class/Instance pairs describing related instances of structure sets. One or more items may be included in this sequence.	Export supported
> Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.	Export supported
> Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.	Export supported
> Structure Set Relationship	(3263,XX02)	3	Relationship of referenced structure set with respect to current structure set. Required if Referenced Structure Set Sequence (3263,1002) is sent. Defined Terms: PREDECESSOR = structure set used in derivation of current structure set ADDITION = structure set, for which the current structure set is an addition	Export supported ADDITION is used for new marker structures defined during marker detection

B.2.12 Modality LUT – C.11.1

Attribute Name	Tag	T	Description	Handling
Modality LUT Sequence	(0028,3000)	1C	Defines a sequence of Modality LUTs. Only one Item may be present. Shall not be present if Rescale Intercept (0028,1052) is present.	*** export not supported
> LUT Descriptor US or	(0028,3002)	1C	Specifies the format of the LUT Data in this Sequence. See C.11.1.1 for further explanation. Required if the Modality LUT Sequence (0028,3000) is sent.	*** export not supported
> LUT Explanation	(0028,3003)	3	Free form text explanation of the meaning of the LUT.	*** export not supported
> Modality LUT Type	(0028,3004)	1C	Specifies the output values of this Modality LUT. See C.11.1.1.2 for further explanation. Required if the Modality LUT Sequence (0028,3000) is sent.	*** export not supported
> LUT Data US or	(0028,3006)	1C	LUT Data in this Sequence. Required if the Modality LUT Sequence (0028,3000) is sent.	*** export not supported
Rescale Intercept	(0028,1052)	1C	The value b in relationship between stored values (SV) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. Required if Modality LUT Sequence (0028,3000) is not present. Shall not be present otherwise.	Export supported for: RT Image
Rescale Slope	(0028,1053)	1C	m in the equation specified by Rescale Intercept (0028,1052). Required if Rescale Intercept is present.	Export supported for: RT Image

Attribute Name	Tag	T	Description	Handling
Rescale Type	(0028,1054)	1C	Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). See C.11.1.1.2 for further explanation. Required if Rescale Intercept is present.	Export supported for: RT Image Defined Terms supported additionally: CU = Calibration Units Gy/MU = Gray per MU RD = Relative Dose For portal dose images roundtrip is supported for CU, Gy/MU and RD. All other values are mapped to US. For all other images all values are supported.

B.2.13 Spatial Registration – C.20.2

Attribute Name	Tag	T	Description	Handling
Content Date	(0008,0023)	1	The date the content creation started.	Export supported
Content Time	(0008,0033)	1	The time the content creation started.	Export supported
Instance Number	(0020,0013)	1	A number that identifies this instance	Export supported Value is set to 0.
Content Label	(0070,0080)	1	A label that is used to identify this registration.	Export supported
Content Description	(0070,0081)	2	A description of this registration.	Export supported
Content Creator's Name	(0070,0084)	2	Name of operator performing the registration (such as a technologist or physician).	*** export not supported
Registration Sequence	(0070,0308)	1	A sequence of one or more registration items. Each item defines a spatial registration to the referenced images in that item. All referenced images are in the same spatial frame of reference or atlas.	Export supported

Attribute Name	Tag	T	Description	Handling
> Frame of Reference UID	(0020,0052)	1C	Identifies a Frame of Reference that may or may not be an image set (e.g. atlas or physical space). See C.7.4.1.1.1 for further explanation. Required if Referenced Image Sequence (0008,1140) is absent. May be present otherwise.	Export supported
> Referenced Image Sequence	(0008,1140)	1C	Identifies the set of images registered in this sequence item. One or more items shall be present. Required if Frame of Reference UID (0020,0052) is absent. May be present otherwise.	Export supported
>> Referenced SOP Class UID	(0008,1150)	1	Uniquely identifies the referenced SOP Class.	Export supported
>> Referenced SOP Instance UID	(0008,1155)	1	Uniquely identifies the referenced SOP Instance.	Export supported
>> Referenced Frame Number	(0008,1160)	1	Identifies the frame numbers within the Referenced SOP Instance to which the reference applies. The first frame shall be denoted as frame number 1. Note: This Attribute may be multi-valued. Required if the Referenced SOP Instance is a multi-frame image and the reference does not apply to all frames.	*** export not supported
> Matrix Registration Sequence	(0070,0309)	1	A sequence that specifies one spatial registration. Exactly one item shall be present	Export supported
>> Frame of Reference Transformation Comment	(3006,00C8)	3	User description or comments about the Transformation Comment registration.	*** export not supported
>> Registration Type Code Sequence	(0070,030D)	2	Describes the information input into the registration process. Only one item may be present.	Export supported
>>> Code Value	(0008,0100)	1C	See Section 8.1. Required if a sequence item is present.	Export supported
>>> Coding Scheme Designator	(0008,0102)	1C	See Section 8.2. Required if a sequence item is present.	Export supported

Attribute Name	Tag	T	Description	Handling
>>> Coding Scheme Version	(0008,0103)	1C	See Section 8.2. Required if a sequence item is present and the value of Coding Scheme Designator (0008,0102) is not sufficient to identify the Code Value (0008,0100) unambiguously.	Export supported
>>> Code Meaning	(0008,0104)	1C	See Section 8.3. Required if a sequence item is present.	Export supported
>> Matrix Sequence	(0070,030A)	1	One or more items shall be present. Each item specifies a transformation. The item order is significant and corresponds to matrix multiplication order. See C.20.2.1.1.	Export supported Always one item is exported which incorporates the combination of all matrices of the original sequence.
>>> Frame of Reference Transformation Matrix	(3006,00C6)	1	A 4x4 homogeneous transformation matrix that registers the referenced images to the local RCS. Matrix elements shall be listed in row-major order. See C.20.2.1.1.	Export supported
>>> Frame of Reference Transformation Matrix Type	(0070,030C)	1	Type of Frame of Reference Transformation Matrix (3006,00C6). Defined terms: RIGID RIGID_SCALE AFFINE See C.20.2.1.2	Export supported Value set to RIGID
>> Registration Sub Type	(3275,XX00)	3	Identifies the application or application context in which this registration object has been created.	Export supported
> Used Fiducials Sequence	(0070,0314)	3	The fiducials used to determine the Frame of Reference Transformation Matrix. One or more Items may be present.	*** export not supported
>> Fiducial UID	(0070,031A)	1	The UID that identifies the fiducial used as registration input.	*** export not supported

Appendix C Extended Interface

The following IODs have private Attributes containing an XML data structure for transporting structured non-DICOM data:

- RT Plan
- CR/CT/MR/SC/RT Image

The following sections specify Attributes containing the XML data and describe the structure of the XML data.

C.1 RT Plan / RT Ion Plan

Node Name	Min occurs	Max occurs	Data Type	Node Description
ExtendedVAPlanInterface	0	1		
> Beams	0	1		
>> Beam	0	Unbounded		
>>> ReferencedBeamNumber	1	1	int	Beam identifier
>>> BeamExtension	1	1		Additional items provided from Vision to expand the features of RT Beams.
>>>> FieldType	1	1	string	TREATMENT or SETUP
>>>> RelatedTreatBeamNumber	0	1	int	Relation from the image beams to the treatment and/or setup beams.
>>>> FieldOrder	1	1	int	Order in which the fields are shown
>>>> GantryRtnExtendedStart	0	1	int	When true, gantry angle position is in the extended range, which means it has an over travel (a Gantry can move most typical 400' and not only 360').
>>>> GantryRtnExtendedStop	0	1	int	When true, gantry angle position is in the extended range, which means it has an over travel (a Gantry can move most typical 400' and not only 360').

Node Name	Min occurs	Max occurs	Data Type	Node Description
>>>> MUSubtraction	0	1	int	MUSubtraction defines whether some MUs have to be subtracted from the related treatment beam to take images in the before phase and/or after phase.
>>>> FieldSetupPhotos	0	1		
>>>>> FieldSetupPhoto	0	2		Two setup photos max
>>>>>> SetupPhotoNumber	1	1	int	Increasing number of setup photos. The value has to start from 1 and up.
>>>>>> SetupPhotoFormat	1	1	string	The format of the pixel information. Supported values are 'JPG' and 'BMP'
>>>>>> SetupPhotoPicture	1	1	hex binary	Pixel information of the photo in the corresponding format.
>>>>>> PhotoModified	1	1	string	Photo has been modified. PhotoModified may have ‘true’ or ‘false’
>>> CustomAddOns	0	1		
>>>> CustomAddOn	0	4		
>>>>> CustomAddOnType	1	1	string	Three Add On Type to choose from: BLOCK COMPENSATOR TRAY
>>>>> CustomCode	0	1	int	Codes for accessory which may be custom made or factory made (in that case the internal code in equal the custom code.)
>>>>> ReferencedAddOnNumber	0	1	int	Reference to the identification number of the Block or Compensator.
>>>>> TraySpecification	0	1		In case the CustomAddOn is a tray, it gets reported back through this node
>>>>>> TrayID	1	1	string	User-supplied identifier for tray. Max length is 16 characters.
>>>>>> SourceTrayDistance	0	1	int	The distance from source to slot. This information is needed to distinguish the slot
> ToleranceTables	0	1		

Node Name	Min occurs	Max occurs	Data Type	Node Description
>> ToleranceTable	0	Unbounded		Additional items provided from Vision to expand the features of Tolerance Tables with AutoSetup capabilities
>>> ReferencedToleranceTableNumber	1	1	int	Refers to the tolerance table in RT Tolerance Table module
>>> ToleranceTableExtension	1	1		
>>>> GantryRtnSetup	0	1	string	Setup attributes may have following type: Automatic Manual Remote
>>>> CollRtnSetup	0	1	string	
>>>> CollXSetup	0	1	string	
>>>> CollYSetup	0	1	string	
>>>> PatientSupportAngleSetup	0	1	string	
>>>> CouchLngSetup	0	1	string	
>>>> CouchVrtSetup	0	1	string	
>>>> CouchLatSetup	0	1	string	
>>>> TableTopEccentricAngleSetup	0	1	string	
> DoseReferences	0	1		
>> DoseReference	0	Unbounded		

Node Name	Min occurs	Max occurs	Data Type	Node Description
>>> ReferencedDoseReference Number	1	1	int	Reference to the identification number of the Dose Reference (300A,0012) in the RT Prescription module which is a representation of our reference point
>>> DoseReferenceExtension	1	1		Additional items provided from Vision to expand the features of reference points.
>>>> DailyDoseLimit	0	1	decimal	Unit is [Gy]
>>>> SessionDoseLimit	0	1	decimal	Unit is [Gy]
>>>> Breakpoints	0	1		
>>>>> Breakpoint	0	Unbounded		Breakpoint extensions, since DICOM has just one DeliveryWarningDose without a description this is needed.
>>>>>> BreakpointDose	1	1	decimal	Unit is [Gy]
>>>>>> BreakpointWarning	1	1	string	Text which describes the breakpoint. Max length is 254 characters

Table C-1 RT Plan Extended Interface