DICOM Conformance Statement

DIAMOND

Version 5.3 or higher

1 Conformance Statement Overview

DIAMOND is used as a secondary check for patient plan verification in radio therapy.

DIAMOND performs an independent calculation of radiation therapy treatment unit settings produced by treatment planning computer systems for a radiation oncology quality assurance program. The user can enter and perform calculations that are unique to the user's treatment machine. Calculation results are printed on summary or detailed reports that are suitable for the patient's chart. Quick calculations may also be made to check and analyze other calculations. Treatment plans can be transferred from radiation therapy treatment planning systems (RTPS) to DIAMOND via DICOM IODs.

For an independent calculation DIAMOND can import DICOM radiotherapy IODs RT Plan and RT Structure Set. Other IODs like CT can be stored but will not be imported by DIAMOND.

Other storage SOP Classes not listed in Table 1 may be stored but are not useful in the application.

The providing of service is implemented in a separated application called PTWDicomSCP. This application receives the DICOM objects and put them in a local directory, DIAMOND is able to import the data from.

Provided Network Services:

SOP Classes	Category	User of Service (SCU)	Provider of Service (SCP)
CT Image Storage	transfer	Yes	Yes
CR Image Storage	transfer	Yes	Yes
RT Dose Storage	transfer	Yes	Yes
RT Image Storage	transfer	Yes	Yes
RT Plan Storage	transfer	Yes	Yes
RT Structure Set Storage	transfer	Yes	Yes
RT Beams Treatment Record Storage	transfer	Yes	Yes

Table 1: Provided Network Services

Provided Media Services:

DIAMOND does not support Media Interchange.

2 Table of Contents

2.1 List of Tables

2.2 List of Figures

3 Introduction

3.1 Document Revision History

Version	Date	Description
1.0	2013-07	Initial Release of DICOM Conformance for DIAMOND 5.3

3.2 Audience

This document is intended for DIAMOND users or potential customer, system administrators and integrators of medical equipment, support and service personnel. It is assumed that the reader is familiar with the DICOM standard.

3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between DIAMOND and other application using DICOM in an environment of medical devices. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

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

DIAMOND has been carefully tested to assure the implementation of the actual DICOM Standard. Nevertheless the Conformance Statement does not guarantee successful interoperability with other vendors. It is the user's responsibility to specify and carry out validation tests to ensure full functionality after installation. Newer versions of the DICOM Standard could make changes necessary in the application to avoid incompatibility.

3.4 Terms and Definitions

DICOM terms and definitions which are used in this document are defined by the DICOM Standard, which is the authoritative source for formal definitions of these terms. (See NEMA PS 3.2 [1])

3.5 Basics of DICOM Communication

See NEMA PS 3.2 [1]

3.6 Abbreviations

The following symbols and abbreviations are used in this document.

Abbreviation	Description
AE	Application Entity
DICOM	Digital Imaging and Communications in Medicine
NEMA	National Electrical Manufacturers Association
FSC	File-Set Creator
FSR	File-Set Reader
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
TCP/IP	Transmission Control Protocol/Internet Protocol
UID	Unique Identifier
IOD	Information Object Definition
RT	Radio Therapy
PDU	Protocol Data Unit

Table 2: Abbreviations

3.7 References

Index	Reference
[1]	Digital Imaging and Communications in Medicine (DICOM), Parts 1-20 (2011), National Electrical Manufacturers Association (NEMA) 1300 N. 17th Street Rosslyn, VA 22209, United States of America http://medical.nema.org/

Table 3: References

4 Networking

4.1 Implementation Model

4.1.1 Application Data Flow

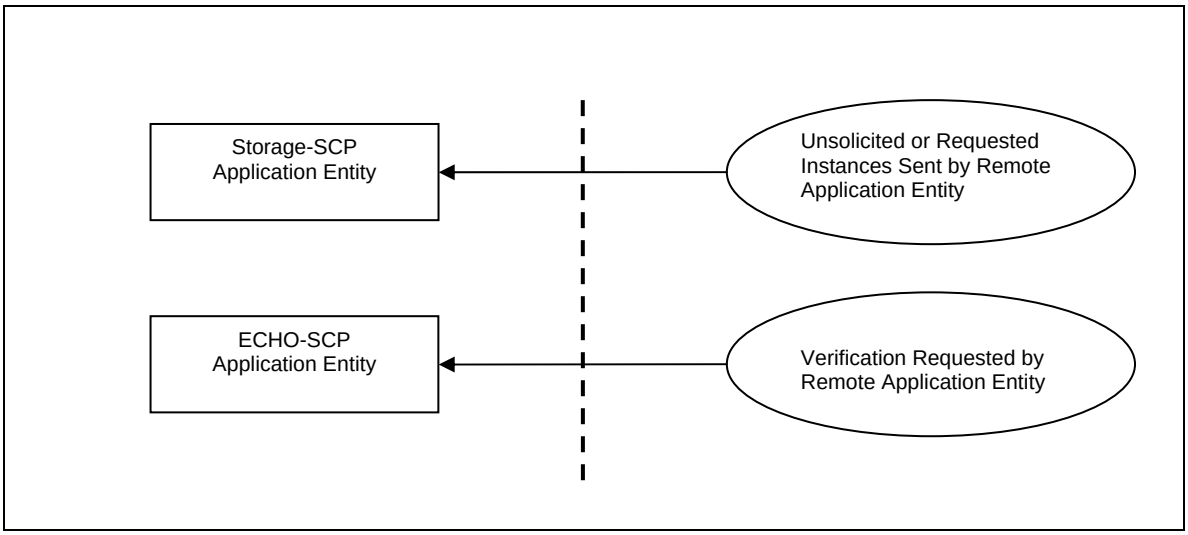

Figure 1: Network Implementation Model

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

– ECHO-SCP, which responds to verification requests
– STORAGE-SCP, which receives incoming images and other composite instances

4.1.2 Functional Definitions of AE's

4.1.2.1 ECHO-SCP

ECHO-SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Class of the Verification Service Class, and will respond successfully to echo requests.

4.1.2.2 STORAGE-SCP

STORAGE-SCP waits in the background for connections, will accept associations with Presentation Contexts for SOP Classes of the Storage Service Class, and will store the received instances to the local database where they may subsequently be listed and viewed through the user interface.

4.1.3 Sequencing of Real-World Activities

All SCP activities are performed asynchronously in the background and not dependent on any sequencing.

4.2 AE Specifications

4.2.1 ECHO-SCP

4.2.1.1 SOP Classes

ECHO-SCP provide Standard Conformance to the following SOP Class

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes

Table 4: SOP classes supported by ECHO-SCP

4.2.1.2 Association Policies

4.2.1.2.1 General

ECHO-SCP accepts but never initiates associations.

Maximum PDU size received	16384

Table 5: Maximum PDU size received as a SCP for ECHO-SCP

4.2.1.2.2 Number of Associations

Maximum number of simultaneous associations	1

Table 6: Number of associations for ECHO-SCP

4.2.1.2.3 Asynchronous Nature

ECHO-SCP will only allow a single outstanding operation on an Association. Therefore, ECHO-SCP will not perform asynchronous operations window negotiation.

4.2.1.3 Association Initiation Policy

ECHO-SCP does not initiate associations.

4.2.1.4 Association Acceptance Policy

When ECHO-SCP accepts an association, it will respond to echo requests. If the Called AE Title does not match the pre-configured AE Title shared by all the SCPs of the application, the association will be accepted, too.

4.2.1.4.1 Activity – Receive Echo Request

4.2.1.4.1.1 Description and Sequencing of Activities

The association gets established when the peer DICOM entity accepts the Verification related presentation context. In a sub-sequent step a C-ECHO message is exchanged.

The results of the “Verify Communication” activity are shown to the user as success or failure. For example, a Storage Provider not only the Verification information is evaluated, but also the response regarding the proposed Storage SOP Classes.

4.2.1.4.1.2 Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

Table 7: acceptable presentation contexts for ECHO-SCP and receive ECHO request

4.2.1.4.1.2.1 Extended Negotiation

No extended negotiation is performed.

4.2.1.4.1.3 SOP Specific Conformance

4.2.1.4.1.3.1 SOP Specific Conformance to Verification SOP Class

ECHO-SCP provides standard conformance to the Verification Service Class.

4.2.1.4.1.3.2 Presentation Context Acceptance Criterion

ECHO-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.

4.2.1.4.1.3.3 Transfer Syntax Selection Policies

ECHO-SCP prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:
– first encountered explicit Transfer Syntax,
– default Transfer Syntax.

ECHO-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 priority for selecting a Transfer Syntax for each.

4.2.2 STORAGE-SCP

4.2.2.1 SOP Classes

STORAGE-SCP provide Standard Conformance to the following SOP Class(es):

SOP Class Name	SOP Class UID	SCU	SCP
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	No	Yes
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	No	Yes
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	No	Yes
RT Beams Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.4	No	Yes
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	No	Yes
RT Brachy Treatment Record Storage	1.2.840.10008.5.1.4.1.1.481.6	No	Yes
RT Treatment Summary Record Storage	1.2.840.10008.5.1.4.1.1.481.7	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes

Table 8: SOP Classes supported by STORAGE-SCP

4.2.2.2 Association Policies

4.2.2.2.1 General

STORAGE-SCP accepts but never initiates associations.

Maximum PDU size received	16384

Table 9: Maximum PDU size received as a SCP for STORAGE-SCP

4.2.2.2.2 Number of Associations

Maximum number of simultaneous associations	1

Table 10: Number of Associations as a SCP for STORAGE-SCP

4.2.2.2.3 Asynchronous Nature

STORAGE-SCP will only allow a single outstanding operation on an Association. Therefore, STORAGE-SCP will not perform asynchronous operations window negotiation.

4.2.2.3 Association Initiation Policy

STORAGE-SCP does not initiate associations.

4.2.2.4 Association Acceptance Policy

When STORAGE-SCP accepts an association, it will respond to storage requests. If the Called AE Title does not match the pre-configured AE Title shared by all the SCPs of the application, the association will be rejected.

4.2.2.4.1 Activity – Receive Storage Request

4.2.2.4.1.1 Description and Sequencing of Activities

As instances are received they are copied to the local file system (in a DICOM DIR structure) and a record inserted into the local storage folder. If the received instance is a duplicate of a previously received instance, the new file will be ignored.

4.2.2.4.1.2 Accepted Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
See Table 10	See Table 10	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None

Table 11: Acceptable Presentation Contexts for STORAGE-SCP and Receive Storage Request

4.2.2.4.1.2.1 Extended Negotiation

No extended negotiation is performed, though STORAGE-SCP:

- is a Level 2 Storage SCP (Full – does not discard any data elements)
- does not support digital signatures
- does not coerce any received data elements

4.2.2.4.1.3 SOP Specific Conformance

4.2.2.4.1.3.1 SOP Specific Conformance to Storage SOP Classes

STORAGE-SCP provides standard conformance to the Storage Service Class.

4.2.2.4.1.3.2 Presentation Context Acceptance Criterion

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.

4.2.2.4.1.3.3 Transfer Syntax Selection Policies

STORAGE-SCP prefers explicit Transfer Syntaxes. If offered a choice of Transfer Syntaxes in a Presentation Context, it will apply the following priority to the choice of Transfer Syntax:

- first encountered explicit Transfer Syntax,
- default Transfer Syntax.

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 priority for selecting a Transfer Syntax for each.

4.2.2.4.1.3.4 Response Status

STORAGE-SCP will behave as described in the Table below when generating the C-STORE response command message.

Service Status	Further Meaning	Status Codes	Reason
Refused	Out of Resources	A700	The capacity of the DICOM Dir has come to an end. (Try to store more than 99999 files of one modality)
Error	Data Set does not match SOP Class	A9xx	Never sent – data set is not checked prior to storage
	Cannot understand	Cxxx	Never sent
Warning	Coercion of Data Elements	B000	Never sent - no coercion is ever performed
	Data Set does not match SOP Class	B007	Never sent - data set is not checked prior to storage
	Elements Discarded	B006	Never sent – all elements are always stored
Success		0000	

Table 12: Response Status for STORAGE-SCP and Receive Storage Request

4.3 Network Interfaces

4.3.1 Physical Network Interface

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

4.3.2 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.

4.3.3 IPv4 and IPv6 Support

This product supports both IPv4 and IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

4.4 Configuration

Local application entity and remote application entity information can be configured with the Configuration Dialogs and are described in the application user manual and online help.

5 MEDIA Interchange

Media Interchange is not scope of this document since it is not supported.

5.1 Real World Activities

5.1.1 Activity – Load Directory or File

The path to the DICOMDIR is set by a configuration dialog.

If the directory contains a DICOMDIR, a browser will be displayed, from which instances may be selected and in turn loaded for display, imported into the local database.

5.1.2 Application Profile Specific Conformance

There are no extensions or specializations.

5.2 Augmented and Private Profiles

5.2.1 Augmented Profiles

None

5.2.2 Private Profiles

None

5.3 MEDIA Configuration

None

6 Support of Character Sets

Extended character sets are not directly supported.

7 Security

The DICOM capabilities of DIAMOND do not support any specific security measures

8 Annexes

8.1 IOD contents

8.1.1 Created SOP Instance(s)

None

8.1.2 RT Plan IOD Module Table

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
	Patient Study	U
Series	RT Series	M
Equipment	General Equipment	M
Plan	RT General Plan	M
	RT Prescription	U
	RT Tolerance Tables	U
	RT Patient Setup	M
	RT Fraction Scheme	U
	RT Beams	C – Required if RT Fraction Scheme Module exists and Number of Beams (300A, 0080) is greater than zero for one or more fraction groups.
	RT Brachy Application Setups	C – Required if RT Fraction Scheme Module exists and Number of Brachy Application Setups (300A,00A0) is greater than zero for one or more fraction groups.
	Approval	U
	Audio	U
	SOP Common	M

Table 13: RT Plan IOD Module Table

8.1.3 RT Structure Set IOD Module Table

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
	Patient Study	U
Series	RT Series	M
Equipment	General Equipment	M
Structre Set	Structure Set	M
	ROI Contour	M
	RT ROI Observations	M
	Approval	U
	Audio	U
	SOP Common	M

Table 14: RT Structure Set IOD Module Table

8.1.4 Usage of Attributes from Received IODs by Modules

8.1.4.1 Patient Module

Attribute name	Tag	Descriptions/Notes
Patient Name	(0010,0010)	Patient's full legal name plus initials.
Patient ID	(0010,0020)	Patient identification. Import as MRN
Patient's Birth Date	(0010,0030)	Date of birth of the named patient. Used for display in import dialog only
Patient's Sex	(0010,0040)	Gender of the named patient. Used for display in import dialog only

Table 15: Usage of attributes in Patient Module

8.1.4.2 General Study Module

Attribute name	Tag	Descriptions/Notes
Study Instance UID	(0020,000D)	Unique identifier for the Study. Used for display in import dialog only
Study ID	(0020,0010)	User of equipment generated study identifier.
Study Date	(0008,0020)	Date of Study started Used for display in import dialog only
Study Time	(0008,0030)	Time of Study started Used for display in import dialog only
Study Description	(0008,1030)	Institution generated description or classification of the study (component) performed Used for display in import dialog only

Table 16: Usage of attributes in General Study Module

8.1.4.3 RT Series Module

Attribute name	Tag	Descriptions/Notes
Modality	(0008,0060)	Type of equipment that originally acquired the data. Enumerated values: RTSTRUCT = RT Structure set RTPLAN = RT Plan IOD
Series Instance UID	(0020,000E)	Unique identifier of the series Used for display in import dialog
Series Number	(0020,0011)	A number that identifies this series
Series Description	(0008,103E)	User provided description of this series. Used for display in import dialog

Table 17: Usage of attributes in RT Series Module

8.1.4.4 General Equipment Module

Attribute name	Tag	Descriptions/Notes
Manufacturer	(0008,0070)	Manufacturer of the equipment that produced the digital images
Manufacturer's Model Name	(0008,1090)	Manufacturer's model number of the equipment that produced the digital images.
Software Versions	(0018,1020)	Manufacturer's designation of software version of the equipment that produced the digital images.

Table 18: Usage of attributes in General Equipment Module

8.1.4.5 RT General Plan Module

Attribute name	Tag	Descriptions/Notes
RT Plan Label	(300A,0002)	Used for display in import dialog
RT Plan Name	(300A,0003)	User-defined name for treatment plan Used for display in import dialog
RT Plan Description	(300A,0004)	User-defined description of treatment plan Used for display in import dialog
Operators' Name	(0008,1070)	Used for display only
RT Plan Date	(300A,0006)	Used for display in import dialog
RT Plan Time	(300A,0007)	Used for display in import dialog
RT Plan Geometry	(300A,000C)	Only Patient Geometry is supported.
Referenced SOP Instance UID	(0008,1155)	Used for display in import dialog

Table 19: Usage of attributes in RT General Plan Module

8.1.4.6 RT Prescription Module

Not used

8.1.4.7 RT Tolerance Tables Module

Not used

8.1.4.8 RT Patient Setup Module

Attribute name	Tag	Descriptions/Notes
Patient Setup Sequence	(300A,0180)	Introduces sequence of patient setup data for current plan.
Patient Setup Number	(300A,0182)	Identification number of the Patient Setup. The value of Patient Setup Number (300A,0182) shall be unique within the RT Plan in which it is created.
Patient Position	(0018,5100)	Patient position descriptor relative to the equipment. Required if Patient Additional Position (300A,0184) is not present.
Setup Technique	(300A,01B0)	Setup Technique used in Patient Setup. Defined Terms: ISOCENTRIC FIXED_SSD TBI BREAST_BRIDGE SKIN_APPOSITION
Setup Technique Description	(300A,01B2)	User-defined description of Setup Technique.

Table 20: Usage of attributes in RT Patient Setup Module

8.1.4.9 RT Fraction Scheme Module

Attribute name	Tag	Descriptions/Notes
Fraction Group Sequence	(300A,0070)	Only single item is supported
Referenced Patient Setup Number	(300C,006A)	Uniquely identifies Patient Setup specified by Patient Setup Number (300A,0182) within Patient Setup Sequence (300A,0180) in RT Patient Setup Module.
Number of Fractions Planned	(300A,0078)	Must be specified (non-null)
Number of Fraction Pattern Digits Per Day	(300A,0079)	Number of digits in Fraction Pattern (300A,007B) used to represent one day.
Repeat Fraction Cycle Length	(300A,007A)	Number of weeks needed to describe treatment pattern
Fraction Pattern	(300A,007B)	String of 0's (no treatment) and 1's (treatment) describing treatment pattern. Length of string is 7 x Number of Fraction Pattern Digits Per Day x Repeat Fraction Cycle Length. Pattern shall start on a Monday.
Number of Beams	(300A,0080)	Number of Beams in current Fraction Group
Referenced Beam Sequence	(300C,0004)	Introduces sequence of treatment beams in current Fraction Group. Required if Number of Beams (300A,0080) is greater than zero.
Referenced Beam Number	(300C,0006)	Uniquely identifies Beam specified by Beam Number (300A,00C0) within Beam Sequence (300A,00B0) in RT Beams Module
Beam Dose Specification Point	(300A,0082)	Coordinates (x,y,z) of point at which Beam Dose is specified in the patient based coordinate system
Beam Dose	(300A,0084)	Beam Dose in Gy (per fraction).
Beam Meterset	(300A,0086)	Machine setting to be delivered for current Beam, specified in Monitor Units (MU) or minutes
Number of Brachy Application Setups	(300A,00A0)	Number of Brachy Application Setups in current Fraction Group. If Number of Brachy Application Setups is greater then zero, Number of Beams (300A,0080) shall equal zero

Table 21: Usage of attributes in RT Fraction Scheme Module

8.1.4.10 RT Beams Module

Attribute name	Tag	Descriptions/Notes
Beam Sequence	(300A,00B0)	Introduces the sequence of treatment beams for this RT Plan. 1 entry per beam.
Beam Number	(300A,00C0)	Associates the beam with other aspects of the plan, including the Fraction scheme.
Beam Name	(300A,00C2)	The name of the beam. Used as the 'Point Label'.
Beam Description	(300A,00C3)	User-defined description for Beam.
Beam Type	(300A,00C4)	Motion characteristic of Beam.(STATIC/DYNAMIC)
Radiation Type	(300A,00C6)	The modality of the beam.
Treatment Machine Name	(300A,00B2)	The name of the machine assigned to the beam.
Primary Dosimeter Unit	(300A,00B3)	Measurement unit of machine dosimeter.
Source to Axis Distance	(300A,00B4)	The SAD of the machine assigned to this beam.
Beam Limiting Device Sequence	(300A,00B6)	Introduces the sequence of beam limiting devices (collimator) jaw or leaf (element) sets.
RT Beam Limiting Device Type	(300A,00B8)	Type of beam limiting device (collimator).
Number of Leaf/Jaw Pairs	(300A,00BC)	1 signifies a jaw pair, others signify the number of leaf pairs for the MLC assigned to the machine.
Referenced Patient Setup Number	(300C,006A)	Associates the patient setup and the beam.
Treatment Delivery Type	(300A,00CE)	Delivery Type of treatment.
Number of Wedges	(300A,00D0)	Number of wedges delivered Beam.
Wedge Sequence	(300A,00D1)	Introduces sequence of treatment wedges present during delivered Beam.
Wedge Number	(300A,00D2)	Identification number of the Wedge.
Wedge Type	(300A,00D3)	Type of wedge defined for delivered Beam.
Wedge ID	(300A,00D4)	User-supplied identifier for wedge.
Wedge Angle	(300A,00D5)	The angle of the wedge.
Wedge Factor	(300A,00D6)	Nominal wedge factor under machine calibration conditions at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A,0111).
Wedge Orientation	(300A,00D8)	The orientation of the wedge.
Number of Compensators	(300A,00E0)	Indicates the presence of a compensator.

Total Compensator Tray Factor	(300A,00E2)	Compensator Tray transmission factor (between 0 and 1), at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A, 0111).
Compensator Sequence	(300A,00E3)	Introduces sequence of treatment compensators.
Compensator Number	(300A,00E4)	Identification number of the Compensator.
Compensator Type	(3004,00EE)	Type of compensator (if any). Defined Terms: STANDARD = physical (static) compensator DYNAMIC = moving Beam Limiting Device (collimator) simulating physical compensator
Material ID	(300A,00E1)	User-supplied identifier for material used to manufacture Compensator.
Compensator ID	(300A,00E5)	User-supplied identifier for compensator.
Source to Compensator Tray Distance	(300A,00E6)	The source to compensator distance of the beam.
Compensator Rows	(300A,00E7)	The number of rows in the compensator definition.
Compensator Columns	(300A,00E8)	The number of columns in the compensator definition.
Compensator Pixel Spacing	(300A,00E9)	The resolution of the compensator in mm.
Compensator Position	(300A,00EA)	The x and y coordinates of the compensator.
Compensator Transmission Data	(300A,00EB)	The data defining the transmission characteristics of the compensator. The number of samples equals rows * columns.
Compensator Thickness Data	(300A,00EC)	The data defining the thickness of the compensator in mm. The number of samples equals rows * columns.
Number of Boli	(300A,00ED)	Indicates the presence of a bolus in the beam.
Number of Blocks	(300A,00F0)	The number of contours required describing the block.
Block Sequence	(300A,00F4)	Introduces sequence of blocks associated with Beam.
Block Tray ID	(300A,00F5)	Not used.
Source to Block Tray Distance	(300A,00F6)	The Source to Tray Distance of the machine.
Block Type	(300A,00F8)	Type of block. Required if Block Sequence (300A, 00F4) is sent. See C.8.8.14.4. Enumerated Values: SHIELDING = blocking material is inside contour APERTURE = blocking material is outside contour

Block Divergence	(300A,00FA)	Indicates presence or otherwise of geometrical divergence. Required if Block Sequence (300A,00F4) is sent. Enumerated Values: PRESENT = block edges are shaped for beam divergence ABSENT = block edges are not shaped for beam divergence
Block Number	(300A,00FC)	Identification number of the Block. The value of Block Number (300A,00FC) shall be unique within the Beam in which it is created
Block Name	(300A,00FE)	User-defined name for block.
Material ID	(300A,00E1)	User-supplied identifier for material used to manufacture Block. Required if Block Sequence (300A, 00F4) is sent.
Block Thickness	(300A,0100)	Physical thickness of block (in mm) parallel to radiation beam axis. Required if Block Sequence (300A,00F4) is sent and Material ID (300A, 00E1) is non-zero length.
Block Transmission	(300A,0102)	Transmission through the block (between 0 and 1) at the beam energy specified by the Nominal Beam Energy (300A,0114) of the first Control Point of the Control Point Sequence (300A, 0111).
Block Number of Points	(300A,0104)	Number of (x,y) pairs defining the block edge.
Block Data	(300A,0106)	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).
Final Cumulative Meterset Weight	(300A,010E)	Value of Cumulative Meterset Weight of last Control Point Sequence of the current beam
Number of Control Points	(300A,0110)	Defines the number of control points for the beam.
Control Point Sequence	(300A,0111)	Introduces the sequence of machine configurations describing this treatment beam.
Control Point Index	(300A,0112)	Index of current Control Point, starting at 0 for first Control Point.
Cumulative Meterset Weight	(300A,0134)	Specifies the treatment weight for this control point.
Nominal Beam Energy	(300A,0114)	The machine energy for this machine.

Dose Rate Set	(300A,0115)	Dose Rate to be set on treatment machine for segment beginning at current control point
Wedge Position Sequence	(300A,0116)	Introduces sequence of wedge positions and identities for this control point.
Wedge Position	(300A,0118)	IN or OUT.
Beam Limiting Device Position Sequence	(300A,011A)	Introduces the sequence of beam limiting device (collimator) jaw or leaf (element) positions.
RT Beam Limiting Device Type	(300A,00B8)	Specifies the type of beam limiting device for this control point.
Leaf/Jaw Positions	(300A,011C)	The jaw or MLC leaf positions for this control point.
Gantry Angle	(300A,011E)	The gantry angle of the beam at this control point.
Gantry Rotation Direction	(300A,011F)	Specifies the direction of rotation of the gantry.
Beam Limiting Device Angle	(300A,0120)	The collimator angle for the beam.
Beam Limiting Device Rotation Direction	(300A,0121)	Direction of Beam Limiting Device Rotation when viewing beam limiting device (collimator) from radiation source.
Patient Support Angle	(300A,0122)	The couch angle for the beam.
Patient Support Rotation Direction	(300A,0123)	Direction of Patient Support Rotation when viewing table from above, for segment following Control Point.
Table Top Eccentric Angle	(300A,0125)	Table Top (non-isocentric) angle.
Table Top Eccentric Rotation Direction	(300A,0126)	Direction of Table Top Eccentric Rotation when viewing table from above, for segment following Control Point.
Table Top Vertical Position	(300A,0128)	Optionally Used to position the lasers.
Table Top Longitudinal Position	(300A,0129)	Optionally Used to position the lasers.
Table Top Lateral Position	(300A,012A)	Optionally Used to position the lasers.
Isocenter Position	(300A,012C)	Isocenter for the beam. Optionally Used to position the lasers.
Source to Surface Distance	(300A,0130)	SSD of the beam.

Table 22: Usage of attributes in RT Beams Module

8.1.4.11 RT Brachytherapy Application Setups Module

Not used

8.1.4.12 Structure Set

Attribute name	Tag	Descriptions/Notes
Referenced SOP Instance UID	(0008,1155)	Uniquely identifies the referenced image SOP Instance. Required if Contour Image Sequence (3006,0016) is sent.
ROI Number	(3006,0022)	Identification number of the ROI. The value of ROI Number (3006,0022) shall be unique within the Structure Set in which it is created. Required if Structure Set ROI Sequence (3006,0020) is sent.
Referenced Frame of Reference UID	(3006,0024)	Uniquely identifies Frame of Reference in which ROI is defined, specified by Frame of Reference UID (0020,0052) in Referenced Frame of Reference Sequence (3006,0010). Required if Structure Set ROI Sequence (3006,0020) is sent.
ROI Name	(3006,0026)	User-defined name for ROI. Required if Structure Set ROI Sequence (3006,0020) is sent.

Table 23: Usage of attributes in Structure Set

8.1.4.13 ROI Contour

Attribute name	Tag	Descriptions/Notes
ROI Display Color	(3006,002A)	RGB triplet color representation for ROI, specified using the range 0-255.
Contour Geometric Type	(3006,0042)	Geometric type of contour. Required if Contour Sequence (3006,0040) is sent. Enumerated Values: POINT = single point OPEN_PLANAR = open contour containing coplanar points OPEN_NONPLANAR = open contour containing non-coplanar points CLOSED_PLANAR = closed contour (polygon) containing coplanar points
Number of Contour Points	(3006,0046)	Number of points (triplets) in Contour Data (3006,0050). Required if Contour Sequence (3006,0040) is sent.
Contour Data	(3006,0050)	Sequence of (x,y,z) triplets defining a contour in the patient based coordinate system described in (mm). Required if Contour Sequence (3006,0040) is sent..

Table 24: Usage of attributes in ROI Contour

8.1.4.14 RT ROI Observations

Attribute name	Tag	Descriptions/Notes
Referenced ROI Number	(3006,0084)	Uniquely identifies the referenced ROI described in the Structure Set ROI Sequence (3006,0020).
Referenced ROI Number	(3006,0084)	Uniquely identifies the related ROI described in the Structure Set ROI Sequence (3006,0020). Required if RT Related ROI Sequence (3006,0030) is sent.

Table 25: Usage of attributes in RT ROI Observations

8.1.4.15 Approval

Not used

8.1.4.16 Audio

Not used

8.1.4.17 SOP Common

Attribute name	Tag	Descriptions/Notes
SOP Class UID	(0008,0016)	Uniquely identifies the SOP Class.
SOP Instance UID	(0008,0018)	Uniquely identifies the SOP Instance.

Table 26: Usage of attributes in SOP Common

8.1.5 Attribute Mapping

None

8.1.6 Coerced/Modified Files

None

8.1.7 Data Dictionary of Private Attributes

The Software AE does not define Private Attributes of interest.

8.1.8 Coded Terminology and Templates

The Software AE does not specify a custom coded terminology

8.1.9 Grayscale Image Consistency

Not applicable.

8.1.10 Standard Extended / Specialized/ Private SOP Classes

Neither Specialized nor Private SOP Classes are supported.

8.1.11 Private Transfer Syntaxes

No Private Transfer Syntaxes are supported.

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