Integrating the Healthcare Enterprise

IHE Radiation Oncology
Technical Framework Supplement

Treatment Delivery – Plan Content (TDPC)

Rev. 1.1 – Trial Implementation

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Please verify you have the most recent version of this document. See here for Trial Implementation and Final Text versions and here for Public Comment versions.

Foreword

This is a supplement to the IHE Radiation Oncology Technical Framework V1.8. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on November 16, 2016 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the Radiation Oncology Technical Framework. Comments are invited and can be submitted at http://www.ihe.net/Radiation_Oncology_Public_Comments.

This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend Section X.X by the following:

Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text **~~bold strikethrough~~**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

General information about IHE can be found at: www.ihe.net.

Information about the IHE Radiation Oncology domain can be found at: ihe.net/IHE_Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at: http://ihe.net/IHE_Process and http://ihe.net/Profiles.

The current version of the IHE Radiation Oncology Technical Framework can be found at: http://ihe.net/Technical_Frameworks.

CONTENTS

Introduction to this Supplement

This profile defines the content of the treatment plan being transferred from the Object Storage to the Delivery Device. This interface is the last interface in use before the radiation is actually delivered to the patient. Therefore it is essential to make sure, that all information is present, even if the profile itself maybe only a smaller extension to the Treatment Plan coming from the planning system.

History

Date	Rev.	Change Summary
2015-10-23	1.0	Initial Publication for Public Comment
2016-02-16	Prepub 1.1	(Note on numbering: While pre-PC versions have been numbered as 1.n already, revision number re-start now with 1.0 etc. following PC Versioning) Draft for Trial Implementation (No Review Comments received).
2016-05-12	Prepub 1.2	Comments from TC review
2016-11-16	1.1	Initial Publication for Trial Implementation

Open Issues and Questions

None

Closed Issues

#	Intr. in	Resp.	Description
1	Prepub 1.0	Ulrich Busch	Should the content definition already go to Volume 3 now, or do we keep in the Message Semantic section of Volume 2. The current template text is not clear about this. TC Meeting 2014-02-26: B. Curran will clarify with IHE, if a DICOM content profile is an option. This would allow us to avoid specifying the transaction and plainly to define content. If it is not possible to agree on a DICOM content format, we keep the transaction as a C-STORE. 2014-08-29 (U. Busch): Made a proposal – somehow following the Template for Volume 3 (of 2014-07-01) 2015-01-20 TC Meeting: Template Proposal will be provided to IHE: This profile will be based on that proposal and maybe re-structured if the DICOM Content Template maybe differently defined.
2	Prepub 1.0	Ulrich Busch (ulrich.busch@varian.com)	TC Meeting 2014-02-26: Re-named the actors to use generic names 2014-08-29 (U. Busch): Done in Version 1.1

#	Intr. in	Resp.	Description
3	Prepub 1.0	Ulrich Busch (ulrich.busch@varian.com)	TC Meeting 2014-02-26: How to define the display requirements, when we use abstract actors. 2015-01-20 TC Meeting: Proposal of section 7.1.4 reviewed and will be provided to IHE.
4	Prepub 1.0	Ulrich Busch (ulrich.busch@varian.com)	Re-write X.4.2 Use Cases descriptions. 2014-08-29 (U. Busch): Added a preamble to the use case to annotate, that this exemplifies the use of the content. A context-neutral use case is basically useless, since it will only talk about a consumer and a producer. 2015-01-22: Done by reducing the use case to plain storage.

General Introduction

Appendix A - Actor Summary Definitions

Add the following actors to the IHE Technical Frameworks General Introduction list of actors:

Actor	Definition
Treatment Delivery Plan Producer	The actor exposing the finalized treatment plan to the Delivery System for treatment.
Treatment Delivery Plan Consumer	A Delivery System consuming the finalized treatment plan to be delivered.

Appendix B - Transaction Summary Definitions

Transaction	Definition
Retrieve RT Plan [RO-TDPC-1]	The retrieval of the RT Plan by a Treatment Delivery Plan Consumer, typically for the purpose of delivering a Radiotherapy treatment to the patient. Could be also used for other purposes, e.g., for quality assurance prior to treatment.

Glossary

Add the following glossary terms to the IHE Technical Frameworks General Introduction Glossary:

None

Volume 1 – Profiles

Copyright Licenses

Add the following to the IHE Technical Frameworks General Introduction Copyright section:

Not applicable.

Domain-specific additions

Not applicable.

Add Section X

X Treatment Delivery Plan Content (TDPC) Profile

The Treatment Delivery Plan Content (TDPC) Profile specifies the content of the RT Plan being transferred from the Object Storage to the Delivery System for treatment.

This profile will ensure that the plan transferred from the Object Storage to the Delivery Device will contain all of the necessary information.

It will especially address the following:

1. This profile will make the therapists' workflow easier and faster, because it incorporates all information needed for treatment delivery.
2. This will enable Therapists to concentrate more on setting up the patient and taking care of the patient's condition rather dealing with technical issues.
3. Fewer uncertainties will also reduce the time physicists need to visit the treatment room to assist therapists in technical issues.

TDPC contributes to patient safety, because it will standardize the content which can be expected by the delivery device and will provide clear advice to implementers. The profile will not specify how to validate the treatment delivery parameters, but will ensure that they are available and well-formatted. The applications involved are Treatment Management Systems and Treatment Delivery Devices.

This profile is a content-focused profile. For further information on the context, see section (TDPC Cross Profile Considerations).

X.1 TDPC Actors, Transactions and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A at http://www.ihe.net/Technical_Framework/index.cfm.

Figure X.1-1 shows the actors directly involved in the TDPC Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes.

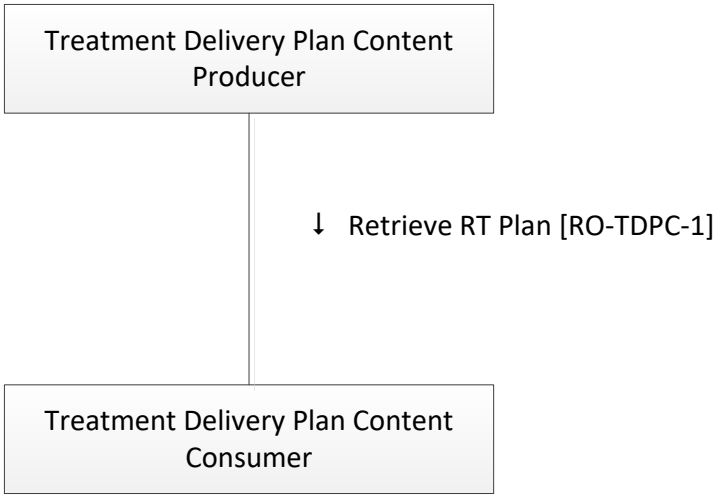


Figure X.1-1: TDPC Actor Diagram

Table X.1-1 lists the transactions for each actor directly involved in the TDPC Profile. To claim compliance with this profile, an actor shall support all required transactions (labeled "R") and may support the optional transactions (labeled "O").

Table X.1-1: TDPC Profile - Actors and Transactions

Actors	Transactions	Optionality	Reference
Treatment Delivery Plan Content Producer	Retrieve RT Plan for Delivery [RO-TDPC-1]	R	RO TF-2: 3.Y1
Treatment Delivery Plan Content Consumer	Retrieve RT Plan for Delivery [RO-TDPC-1]	R	RO TF-2: 3.Y1

X.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in Transactions (Volume 2) and Content Modules (Volume 3). This section documents any additional requirements on profile's actors.

The Treatment Delivery Plan Content Producer is the actor exposing the content in the treatment workflow. The content of what the Treatment Delivery Plan Content Producer exposes is managed, created and controlled by the Treatment Management System.

X.2 TDPC Actor Options

Options that may be selected for each actor in this profile, if any, are listed in the Table X.2-1. Dependencies between options when applicable are specified in notes.

Table X.2-1: Treatment Delivery Plan Content - Actors and Options

Actor	Option Name	Reference
Treatment Delivery Plan Content Producer	No options defined	--
Treatment Delivery Plan Content Consumer	No options defined	--

X.3 TDPC Required Actor Groupings

None

X.4 TDPC Overview

X.4.1 Concepts

The Treatment Delivery Plan Content Consumer retrieves the Radiotherapy Plan for treatment from a Treatment Delivery Plan Content Producer, which holds the plan readily prepared.

The identification of the plan to be treated (DICOM®[1] instance UID) has been communicated prior to retrieval. The method to communicate this identifier is outside the scope of this profile (see also Section X.6.1 Workflow Aspects).

X.4.2 Use Cases

X.4.2.1 Use Case #1: Transfer of Treatment Plan to Delivery System

A patient is going to be treated with Radiation Therapy at a RT Delivery System. The RT Plan specifying the relation of the Patient to the Delivery Device, the Delivery Parameters etc., needs to be transferred from the treatment management system to the delivery device.

[1] DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

X.4.2.1.1 Transfer of Treatment Plan to Delivery System Use Case Description

The user wants to treat a patient. The treatment plan to be used for treatment shall contain the complete information regarding the delivery device needs. This includes the definition of all beam parameters (including machine, energies, SSD, beam anatomical names, couch, wedge, bolus details, meters values, collimation, gantry start/ stop, block/ MLC, cutout for electrons, accessories etc.), and should also for example include additional information, for example patient identification - barcodes that incorporates MR # and date of birth treatment setup photos, set up parameters, patient face photo, a screen shot of CT isocenter placement for reference etc.

X.4.2.1.2 Transfer of Treatment Plan to Delivery System Process Flow

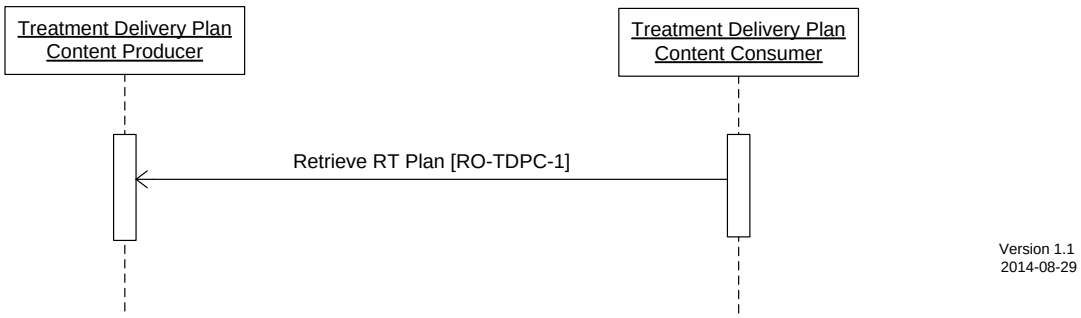


Figure X.4.2.1.2-1: Basic Process Flow in TDPC Profile

Pre-conditions:

The RT Plan is prepared in a Treatment Management System, which acts as a Treatment Delivery Plan Content Producer.

Main Flow:

The RT plan is retrieved by the Treatment Delivery System, which acts as a Treatment Delivery Plan Content Consumer from the Treatment Delivery Plan Content Producer.

Post-conditions:

The RT plan is completely received and available at the Treatment Delivery System.

X.5 TDPC Security Considerations

At a minimum, the consistency checks specified in the TDW Security Considerations of Treatment Delivery II Profile (TDW II) must be performed. Vendors are expected to handle inconsistencies according to their hazard analysis. The relevant hazard analysis information shall be made available upon request.

X.6 TDPC Cross Profile Considerations

X.6.1 Workflow Aspects

The transaction messages of the TDPC Profile use the DICOM C-STORE DIMSE Service only to store the plan object to the Delivery Device. Workflow-oriented aspects are not handled in that profile.

Especially it is assumed, that the C-STORE is embedded in the DICOM Query-Retrieve Service, following a C-MOVE request by the Treatment Delivery Device. This request in turn is based on a communication between the OST and TDD to get the RT Plan UIDs for treatment. This communication is typically following the workflow specification in the following profiles:

Those workflow aspects are handled by, but not limited to the following IHE-RO Profiles:

- Treatment Delivery Workflow II (TDW II)
- Integrated Positioning and Delivery Workflow Profile (IPDW)
- Discrete Positioning and Delivery Workflow ((DPDW).

In those profiles, the RT Plan UIDs will be exposed in the Input Information Sequence of a DICOM Unified Procedure Step object.

However, those UIDs may also be communicated in another way, e.g., in private interfaces.

The approach how the TDD gets the UIDs in question does not affect the content of this profile, unless otherwise stated.

Appendices

Not applicable.

Volume 2 – Transactions

Add Section 3.Y1

3.Y1 Retrieve RT Plan for Delivery [RO-TDPC-1]

3.Y1.1 Scope

In the Retrieve RT Plan for Delivery transaction, a Treatment Delivery Plan Content Consumer receives RT Plan SOP Instances required to perform the desired treatment from the Treatment Delivery Plan Content Producer.

3.Y1.2 Actor Roles

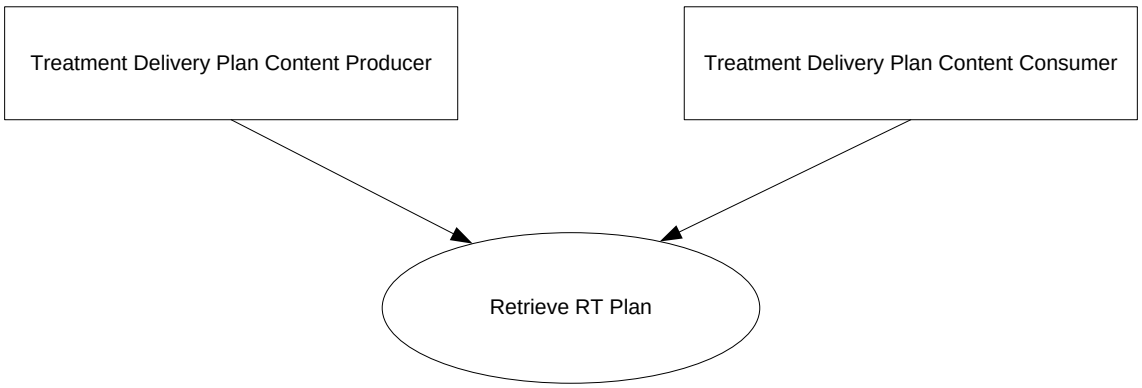


Figure 3.Y1.2-1: Use Case Diagram

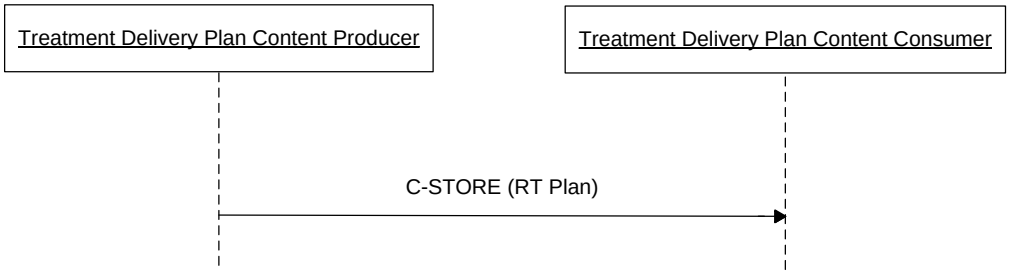
Table 3.Y1.2-1: Actor Roles

Actor:	Treatment Delivery Plan Content Producer
Role:	Provides the RT Plan which is prepared for treatment
Actor:	Treatment Delivery Plan Content Consumer
Role:	Retrieves the RT Plan for Treatment

3.Y1.3 Referenced Standards

DICOM 2016b Edition PS 3.3

3.Y1.4 Interaction Diagram



3.Y1.4.1 RT Plan Storage

The treatment plan is transferred with a DICOM DIMSE C-Store Service to the Treatment Delivery Plan Content Consumer.

3.Y1.4.1.1 Trigger Events

The profile is agnostic in respect to workflow events triggering the transfer. Any valid DICOM C-STORE operation can be used to transfer the DICOM objects between Producer and Consumer.

3.Y1.4.1.2 Message Semantics

The RT Plan object contains all parameters needed to deliver the therapeutic dose for the Radiotherapy treatment. Other activities during the treatment session (as positioning the patient, etc.) are out of scope of that profile.

The content of the RT Plan is defined in Section 7.3.2.1.2.

3.Y1.4.1.3 Expected Actions

The Treatment Delivery Plan Content Consumer is then expected to use the requested RT Plan in performing the treatment.

3.Y1.5 Security Considerations

See Section 9.5 TDW II Security Considerations.

Appendices

No appendices.

Volume 3 – Content Modules

5 Namespaces and Vocabularies

No namespaces and vocabularies defined.

6 Content Modules

No content modules defined.

7 DICOM Content Definition

7.1 Conventions

The conventions of RO TF-2: 2.2 DICOM Usage Conventions apply unless otherwise stated in the following.

7.1.1 Scope of Requirements

Requirements apply to all profiles which make use of the content definitions by referencing sections of this Volume. However where the uses cases covered by a profile need a different requirements, the profile may specify deviations from the definition here. This allows re-use of content definitions even in cases where only few adaptations are needed. It eliminates the need to duplicate the definitions, when the content requirements are shared in their majority and only a small number of deviations are indicated.

7.1.2 Requirements Definitions

Each content module has a list of attributes requirements. In any case, the requirements specified in the referenced DICOM Standard do apply.

Attributes not listed may or may not be present along the definition of the DICOM Standard. The producer may provide such attributes, but the receiver is not required to interpret them. Thus, it is not an error to include more than is asked for, but it is an error to reject a content based on additional attributes present.

Attributes, which may or may not be present by definition in the DICOM Standard, but shall not present under the definition of IHE-RO will be included in the specification with a requirement to be absent.

Attribute requirements of the attributes of sequence items contained in a sequence are applicable only, when the sequence is present.

7.1.3 Requirement Inheritance

Modules may inherit requirement of other modules by defining the parent module that they inherit from. They may only inherit requirements from the same type of module.

That approach is used when the differences between two module definitions are minor. In such cases the module table will only list attributes, where additional / altered requirements are specified. For better readability especially for sequences, some of the attributes may be repeated as well. In such cases, the column Presence may be annotated with a reference to the definition in the referenced module.

7.1.4 Display Requirements

Display requirements are annotated by the presence of * (not required to be displayed) respectively by its absence (required to be displayed) in accordance to RO TF-2: 2.2 DICOM Usage Conventions.

7.2 General Definitions

7.2.1 Character Sets

7.2.1.1 Support of Character Sets other than ISO-IR 100

All actors shall support at least the Default Character Set and ISO-IR 100 (Latin-1) in all transactions. Other character sets as specified in Specific Character Set (0008,0005) shall be supported along the specification of the conformance statements of the involved actors. Especially that means the following:

- It shall be possible for all actors involved in a transaction to use those character sets in their communication which all actors support along their conformance statements.
- When there are no character sets shared across all actors, ISO-RO 100 shall be used.

7.3 IOD Definitions

This section defines each DICOM IOD used in the IHE Radiation Oncology domain in detail, specifying the standards used and the information defined.

7.3.1 Prescription IODs

7.3.2 Plan IODs

7.3.2.1 RT Plan IOD

7.3.2.1.1 RT Plan IOD for Photon External Beam in Planning State

This section is present only to convey the envisioned section numbering.

7.3.2.1.2 RT Plan IOD for Photon External Beam in Delivery State

7.3.2.1.2.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.3.2.1.2.2 IOD Definition

IE	Module	Reference	Usage	IHE-RO Usage
Patient	Patient	C.7.1.1	M	M See 7.4.1.1.1
	Clinical Trial Subject	C.7.1.3	U	U
Study	General Study	C.7.2.1	M	M See 7.4.1.2.1
	Patient Study	C.7.2.2	U	U
	Clinical Trial Study	C.7.2.3	U	U
Series	RT Series	C.8.8.1	M	M See 7.4.1.4.1
	Clinical Trial Series	C.7.3.2	U	U
Frame of Reference	Frame of Reference	C.7.4.1	U	R See 7.4.1.7.1
Equipment	General Equipment	C.7.5.1	M	M See 7.4.1.5.1
Plan	RT General Plan	C.8.8.9	M	M See 7.4.3.1.1
	RT Prescription	C.8.8.10	U	R See 7.4.3.2.2
	RT Tolerance Tables	C.8.8.11	U	R See 7.4.5.2.1
	RT Patient Setup	C.8.8.12	U	R See 7.4.5.3.1
	RT Fraction Scheme	C.8.8.13	U	R See 7.4.3.3.2 and 7.4.3.3.3
	RT Beams	C.8.8.14	C - Required if RT Fraction Scheme Module exists and Number of Beams (300A,0080) is greater than zero for one or more fraction groups	R See 7.4.5.1.1
	RT Brachy Application Setups	C.8.8.15	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	Absent
	Approval	C.8.8.16	U	R
	SOP Common	C.12.1	M	M See 7.4.1.6.1

7.4 Module Definitions

This section defines each DICOM Module used in the IHE Radiation Oncology domain in detail, specifying the standards used and the information defined.

7.4.1 General Modules

7.4.1.1 Patient Module

7.4.1.1.1 Patient Module Base Content

This section will be moved from Appendix A to Section 7 within the Technical Framework.
It is copied here to expose the section numbering.

7.4.1.1.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.1.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Patient's Name	(0010,0010)	R+	IHE requires that this element be present. This element is one of the primary patient identifying elements, and as such, all DICOM objects with the same Study Instance UID, must have the same value in this element. Equipment which creates new series based on other series (i.e., resampled series, new structure sets, plans, etc.) must preserve the value of this element to adhere to this profile.
Patient ID	(0010,0020)	R+	See Patient's Name (0010,0010) See Also RAD TF-2: A.3
Patient's Birth Date	(0010,0030)	O+	See Patient's Name (0010,0010) See Also RAD TF-2: A.3
Patient's Sex	(0010,0040)	O+	See Patient's Name (0010,0010) See Also RAD TF-2: A.3

7.4.1.2 Study Module

7.4.1.2.1 Study Module Base Content

This section will be moved from Appendix A to Section 7 within the Technical Framework.
It is copied here to expose the section numbering.

7.4.1.2.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.2.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Study Instance UID	(0020,000D)	R+*	IHE requires that this value be preserved in the following cases: If a set of images are resampled and re-exported. This new set of images will be a new series. This series will belong to the same study and will have the same study date. This is to facilitate grouping the images in a PACS. When a plan is constructed from a structure set. The plan will be in the same study, and will have the same study date. IHE requires that this element be present. Equipment which creates new series based on other series (i.e., resampled series, new structure sets, plans, etc.) must preserve the value of this element to adhere to this profile.
Study Date	(0008,0020)	R+	[See Study Instance UID (0020,000D)]
Study Time	(0008,0030)	R+	[See Study Instance UID (0020,000D)]
Study ID	(0020,0010)	R+	[See Study Instance UID (0020,000D)]
Study Description	(0008,1030)	O+	[See Study Instance UID (0020,000D)]

7.4.1.3 General Series Module

7.4.1.3.1 General Series Module Base Content

This section will be included in Section7 in the Technical Framework when the other General Sections are moved to Section7 in the TF. It is not used currently.

7.4.1.3.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.3.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Series Date	(0008,0021)	RC+	Must be used and preserved, if present. If the producer creates a new series must be defined.
Series Time	(0008,0031)	RC+	Must be used and preserved, if present. If the producer creates a new series must be defined.

7.4.1.4 RT Series Module

7.4.1.4.1 RT Series Module Base Content

This section will be included in Section 7 in the Technical Framework when the other General Sections are moved to Section 7 in the TF.

7.4.1.4.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.4.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Series Date	(0008,0021)	RC+	Must be used and preserved, if present. If the producer creates a new series must be defined.
Series Time	(0008,0031)	RC+	Must be used and preserved, if present. If the producer creates a new series must be defined.

7.4.1.5 Equipment Module

7.4.1.5.1 Equipment Module Base Content

This section will be moved from Appendix A to Section 7 within the Technical Framework.

It is copied here to expose the section numbering.

7.4.1.5.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.5.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Manufacturer	(0008,0070)	R+*	IHE requires that this element be present, and should contain the manufacturer of the equipment creating the image, structure set, plan, or dose. If the equipment is storing and forwarding information, the value of this element shall be preserved. If a new plan is created from a previous plan, the manufacturer of the equipment producing the new plan shall insert their identifier in this element. If a new structure set is created from a previous structure set, the manufacturer of the equipment producing the new structure set shall insert their identifier in this element.

Attribute	Tag	Type	Attribute Note
Manufacturer's Model Name	(0008,1090)	R+*	If an application resamples and re-exports a series of CT images, or modifies an instance then this element must be present, and must contain the model name of the equipment doing the resampling.
Software Versions	(0018,1020)	R+*	Must be present.

7.4.1.6 SOP Common Module

7.4.1.6.1 SOP Common Module Base Content

This section will be included in Section 7 in the Technical Framework when the other General Sections are moved to Section 7 in the TF.

7.4.1.6.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.6.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Instance Creation Date	(0008,0012)	R+	Shall be present.
Instance Creation Time	(0008,0013)	R+	Shall be present.

7.4.1.7 Frame of Reference Module

7.4.1.7.1 Frame of Reference Module Base Content

This section will be moved from Appendix A to Section 7 within the Technical Framework.
It is copied here to expose the section numbering.

7.4.1.7.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.1.7.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Position Reference Indicator	(0020,1040)	O*	Equipment which creates new series based on other series (i.e., resampled series, new structure sets, plans, etc.) must preserve the value of this element to adhere to this profile.

7.4.1.8 General Image Module

7.4.1.8.1 General Image Module Base Content

This section will be moved from Appendix A to Section 7 within the Technical Framework.

It is copied here to expose the section numbering.

Attribute	Tag	Type	Attribute Note
Acquisition Date	(0008,0022)	R+	In case of CT Images: Shall be present, is CT Image was acquired by Radiotherapy equipment. In case of RT Image: Shall be present, if the Value 1 / Value 2 of Image Type (0008,0008) is ORIGINAL\PRIMARY.
Acquisition Time	(0008,0032)	R+	In case of CT Images: Shall be present, is CT Image was acquired by Radiotherapy equipment. In case of RT Image: Shall be present, if the Value 1 / Value 2 of Image Type (0008,0008) is ORIGINAL\PRIMARY.

7.4.2 Workflow-Related Modules

7.4.3 General Plan-Related Modules

7.4.3.1 General Plan Module

7.4.3.1.1 General Plan Module Base Content

7.4.3.1.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.3.1.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
RT Plan Label	(300A,0002)	R+	The label which serves as the identification of the plan for the user.
RT Plan Date	(300A,0006)	R+	The date when the plan was last modified.
RT Plan Time	(300A,0007)	R+	The time when the plan was last modified.
RT Plan Geometry	(300A,000C)	R+*	Shall be PATIENT. This implies that the RT Structure Set exists and is referenced in the General Plan module.

7.4.3.2 RT Prescription Module

This section is present only to convey the envisioned section numbering.

7.4.3.3 RT Fraction Scheme Module

RT Fraction Scheme Module Base

This section is present only to convey the envisioned section numbering.

7.4.4 Plan-Related Modules in Planning

This section is present only to convey the envisioned section numbering.

7.4.5 Plan-Related Modules in Delivery

7.4.5.1 RT Beams

7.4.5.1.1 RT Beams Module for Treatment Delivery

7.4.5.1.1.1 Referenced Standards

DICOM 2016b Edition PS 3.3

7.4.5.1.1.2 Module Definition

The RT Beams Module for Delivery has the same definition as specified in 7.4.4 Plan-Related Modules in Planning (TPPC) unless otherwise stated.

Table 7.4.5.1.1.2-1: Attribute Requirements for the RT Beams Module

Attribute	Tag	Presence	Specific Rules
Beam Sequence	(300A,00B0)	See 7.4.4	
…			
>Referenced Tolerance Table Number	(300C,00A0)	R+*	
…			
>Wedge Sequence	(300A,00D1)	See 7.4.4	See Note 1
>>Accessory Code	(300A,00F9)	O*	See Note 2
…			
>Compensator Sequence	(300A,00E3)	See 7.4.4	See Note 1
>>Accessory Code	(300A,00F9)	O*	See Note 2
…			
>Referenced Bolus Sequence	(300C,00B0)	See 7.4.4	See Note 1
>>Accessory Code	(300A,00F9)	O*	See Note 2
…			

Attribute	Tag	Presence	Specific Rules
> Block Sequence	(300A,00F4)	See 7.4.4	See Note 1
>>Accessory Code	(300A,00F9)	O*	See Note 2
…			
>Applicator Sequence	(300A,0107)	See 7.4.4	See Note 1
>>Accessory Code	(300A,00F9)	O*	See Note 2
…			
>> Table Top Pitch Angle	(300A,0140)	R+	Shall be constant.
>> Table Top Pitch Rotation Direction	(300A,0142)	R+*	Shall be NONE.
>> Table Top Roll Angle	(300A,0144)	R+	Shall be constant.
>> Table Top Roll Rotation Direction	(300A,0146)	R+*	Shall be NONE

Note 1: These attribute requirements of the attributes contained in this sequence are applicable only, when the sequence is present

Note 2: The presence of the accessory code shall be recognized by the Delivery Device. Depending on the verification technology, this may e.g., be accomplished by a bar code reading device, by electronic readouts etc.

7.4.5.2 RT Tolerance Tables Module

7.4.5.2.1 RT Tolerance Tables Module for Treatment Delivery

7.4.5.2.1.1 Referenced Standards

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7.4.5.2.1.2 Module Definition

Table 7.4.5.2.1.2-1: Attribute Requirements for the RT Tolerance Tables Module

Attribute	Tag	Presence	Specific Rules
Tolerance Table Sequence	(300A,0040)	R+*	
>Tolerance Table Label	(300A,0043)	R+	
>Gantry Angle Tolerance	(300A,0044)	O	If present and applicable, shall be used by the delivery device.
>Gantry Pitch Angle Tolerance	(300A,014E)	O	If present and applicable, shall be used by the delivery device.
>Beam Limiting Device Angle Tolerance	(300A,0046)	O	If present and applicable, shall be used by the delivery device.
>Beam Limiting Device Tolerance Sequence	(300A,0048)	O	If present and applicable, shall be used by the delivery device.
>>RT Beam Limiting Device Type	(300A,00B8)	O	If present and applicable, shall be used by the delivery device.

Attribute	Tag	Presence	Specific Rules
>>Beam Limiting Device Position Tolerance	(300A,004A)	O	If present and applicable, shall be used by the delivery device.
>Patient Support Angle Tolerance	(300A,004C)	O	If present and applicable, shall be used by the delivery device.
>Table Top Eccentric Angle Tolerance	(300A,004E)	O	If present and applicable, shall be used by the delivery device.
>Table Top Pitch Angle Tolerance	(300A,004F)	O	If present and applicable, shall be used by the delivery device.
>Table Top Roll Angle Tolerance	(300A,0050)	O	If present and applicable, shall be used by the delivery device.
>Table Top Vertical Position Tolerance	(300A,0051)	O	If present and applicable, shall be used by the delivery device.
>Table Top Longitudinal Position Tolerance	(300A,0052)	O	If present and applicable, shall be used by the delivery device.
>Table Top Lateral Position Tolerance	(300A,0053)	O	If present and applicable, shall be used by the delivery device.

7.4.5.3 RT Patient Setup Module

7.4.5.3.1 RT Patient Setup Module for Treatment Delivery

7.4.5.3.1.1 Referenced Standards

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7.4.5.3.1.2 Module Definition

Table 7.4.5.3.1.2-1: Attribute Requirements for the RT Patient Setup Module

Attribute	Tag	Presence	Specific Rules
Patient Setup Sequence	(300A,0180)	R+*	
>Patient Position	(0018,5100)	R+	Shall be one of {HFS, FFS, HFP, FFP}.
>Fixation Device Sequence	(300A,0190)	O*	See Note 1
>>Fixation Device Type	(300A,0192)	R	Should be displayed.
>>Fixation Device Label	(300A,0194)	R+	Should be displayed.
>>Fixation Device Description	(300A,0196)	O	Should be displayed, if present.
>>Fixation Device Position	(300A,0198)	O	Should be displayed, if present.
>>Fixation Device Pitch Angle	(300A,0199)	O	Should be displayed, if present.
>>Fixation Device Roll Angle	(300A,019A)	O	Should be displayed, if present.

Attribute	Tag	Presence	Specific Rules
>>Accessory Code	(300A,00F9)	O*	See Note 2
>Shielding Device Sequence	(300A,01A0)	O*	See Note 1
>>Shielding Device Type	(300A,01A2)	R	Should be displayed.
>>Shielding Device Label	(300A,01A4)	R+	Should be displayed.
>>Shielding Device Description	(300A,01A6)	O	Should be displayed, if present.
>>Shielding Device Position	(300A,01A8)	O	Should be displayed, if present.
>>Accessory Code	(300A,00F9)	O*	See Note 2
>Setup Technique	(300A,01B0)	O	Should be displayed.
>Setup Technique Description	(300A,01B2)	O	Should be displayed, if present.
>Setup Device Sequence	(300A,01B4)	O*	See Note 1
>>Setup Device Type	(300A,01B6)	R	Should be displayed.
>>Setup Device Label	(300A,01B8)	R+	Should be displayed.
>>Setup Device Description	(300A,01BA)	O	Should be displayed, if present.
>>Setup Device Parameter	(300A,01BC)	O	Should be displayed, if present.
>>Setup Reference Description	(300A,01D0)		
>>Accessory Code	(300A,00F9)	O*	See Note 2
>Table Top Vertical Setup Displacement	(300A,01D2)	O	Should be displayed, if present.
>Table Top Longitudinal Setup Displacement	(300A,01D4)	O	Should be displayed, if present.
>Table Top Lateral Setup Displacement	(300A,01D6)	O	Should be displayed, if present.
>Motion Synchronization Sequence	(300A,0410)	O*	Should be displayed, if present.
>>Respiratory Motion Compensation Technique	(0018,9170)	R	Should be displayed.
>>Respiratory Signal Source	(0018,9171)	R	
>>Respiratory Motion Compensation Technique Description	(0018,9185)	O	Should be displayed, if present.
>>Respiratory Signal Source ID	(0018,9186)	O	

Note 1: These attribute requirements of the attributes contained in this sequence are applicable only, when the sequence is present

Note 2: The presence of the accessory code shall be recognized by the TDD. Depending on the verification technology, this may e.g., be accomplished by a bar code reading device, by electronic readouts etc.

7.4.6 Image-related Modules in Planning

This section is present only to convey the envisioned section numbering.

7.4.6.1 RT Image Module

7.4.6.1.1 RT Image Module in Planning State

7.4.7 Image-related Modules in Delivery

This section is present only to convey the envisioned section numbering.

7.4.7.1 RT Image Module

7.4.7.1.1 RT Image Module in Delivery State

7.5 Service Definitions

Not applicable.

Appendices

Not applicable.

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Not applicable.