Integrating the Healthcare Enterprise

IHE Radiation Oncology
Technical Framework Supplement

Treatment Planning – Plan Content Brachy (TPPC-Brachy)

(Version 2 – Revision 26)

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Foreword

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

<For Public Comment:> This supplement is published on <Month XX, 201x> for Public Comment. Comments are invited and may be submitted at http://www.ihe.net/<domain>/<domain>comments.cfm. In order to be considered in development of the Trial Implementation version of the supplement, comments must be received by <Month XX, 201X>.

<For Trial Implementation:> This supplement is published on <Month XX, 201X> 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 <Domain Name> Technical Framework. Comments are invited and may be submitted at http://www.ihe.net/<domain>/<domain>comments.cfm.

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 <Domain Name> domain can be found at: http://www.ihe.net/Domains/index.cfm.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at: http://www.ihe.net/About/process.cfm and http://www.ihe.net/profiles/index.cfm.

The current version of the IHE <Domain name>Technical Framework can be found at: http://www.ihe.net/Technical_Framework/index.cfm.

<Comments may be submitted on IHE Technical Framework templates any time at *http://ihe.net/ihetemplates.cfm*. Please enter comments/issues as soon as they are found. Do not wait until a future review cycle is announced.

Table of Contents

Introduction to this Supplement

This content profile is motivated by medical physicists working with brachytherapy planning systems, who face an increasing demand from patient-care, data-quality and research perspectives to increase the usefulness, exchangeability and availability of clinical data across the various treatment planning systems.

The main role of this profile is to address a solution for such interoperability using the DICOM objects provided in its 1st generation.

The aim is to streamline the implementation of the DICOM objects in order to identify a common understanding and key reading of the standard. This supplement provides the guidelines to handle techniques that exist in brachytherapy that benefit from digital data storage. The involved actors are either producers or consumers of a DICOM RT Plan for brachytherapy.

History

Date	Rev.	Author	Change Summary
2023 February 3	25	Yury Niatsetski, Jim Percy	WG review Feb 2023
2023 February 16	26	Yury Niatsetski, Jim Percy	Version voted to Public Comment Feb 2023

Open Issues for Public Comment

#	Comment/Issue
1	For temporary LDR treatment plans, can we restrict to just 2 control points (CP's) per channel like Permanent LDR?

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General Introduction

Update the following Appendices to the General Introduction as indicated below. Note that these are not appendices to Volume 1.

Appendix A - Actor Summary Definitions

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

Actor	Definition
HDR/PDR Structure Set Producer	A system capable of producing an HDR/PDR Structure Set
HDR/PDR Structure Set Consumer	A system capable of consuming an HDR/PDR Structure Set
LDR Structure Set Producer	A system capable of producing an LDR Structure Set
LDR Structure Set Consumer	A system capable of consuming an LDR Structure Set
HDR Treatment Plan Producer	A system capable of producing an HDR treatment plan.
HDR Treatment Plan Consumer	A system capable of consuming an HDR treatment plan
PDR Plan Producer	A system capable of producing a PDR treatment plan.
PDR Plan Consumer	A system capable of consuming a PDR treatment plan
LDR Permanent Plan Producer	A system capable of producing a permanent LDR treatment plan.

LDR Permanent Plan Consumer	A system capable of consuming a permanent LDR treatment plan
LDR Temporary Plan Producer	A system capable of producing a temporary LDR treatment plan.
LDR Temporary Plan Consumer	A system capable of consuming a temporary LDR treatment plan
RT Ultrasound Producer	A system capable of producing an RT Ultrasound image.
RT Ultrasound Consumer	A system capable of consuming an RT Ultrasound image

Appendix B - Transaction Summary Definitions

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

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Transaction	Definition
TPPC-BRACHY-01: HDR Plan Storage	An *HDR Plan Producer* stores a treatment plan to a *HDR Plan Consumer*.
TPPC-BRACHY-02: PDR Plan Storage	A *PDR Plan Producer* stores a treatment plan to a *PDR Plan Consumer*.
TPPC-BRACHY-03: LDR Permanent Plan Storage	An *LDR Permanent Plan Producer* stores a treatment plan to an *LDR Permanent Plan Consumer*.
TPPC-BRACHY-04: LDR Temporary Plan Storage	An *LDR Temporary Plan Producer* stores a treatment plan to an *LDR Temporary Plan Consumer*.

TPPC-BRACHY-05 HDR/PDR Structure Set Storage	An *HDR/PDR Structure Set Producer* stores a structure set to an *HDR/PDR Structure Set Consumer.*
TPPC-BRACHY-06 LDR Structure Set Storage	An *LDR Structure Set Producer* stores a structure set to an *LDR Structure Set Consumer.*
TPPC-BRACHY-07	An *RT Ultrasound Producer* stores an Ultrasound image series to an *RT Ultrasound Consumer.*

Glossary

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

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Glossary Term	Definition
HDR	High dose rate
PDR	Pulse dose rate
LDR	Low dose rate
Applicator	Device, consisting out of one or more catheters, holding the radioactive source(s) during brachytherapy

Volume 1 – Profiles

X Brachy Treatment Planning – Plan Content Integration (TPPC-Brachy) Profile

This integration profile involves the exchange of RT Plan information:

- Between treatment planning systems
- Between treatment planning systems and treatment management systems and / or treatment delivery systems.

The transactions revolve around the brachytherapy treatment specific workflows (e.g. specifying the process of transferring the treatment planning data to a treatment management system). On the basis of the planned technique for the treatment, the content of the DICOM object has an additional content specifications defined in chapter 7 in order to address the interoperability between different vendors.

The workflow description will make use of this content description defined in chapter 7.

This profile addresses the techniques that exist in Brachytherapy. The actors are either producers or consumers of a DICOM RT Plan.

X.1 TPPC-BRACHY Actors, Transactions, and Content Modules

In figure X.1-1 is showed how this content profile is used in the exchanging of DICOM plans between actors that are identified as producers and actors that are identified as consumers.

The DICOM objects that are exchanged between producers and consumers have to implement the requirements listed in this profile in order to be IHE compliant.

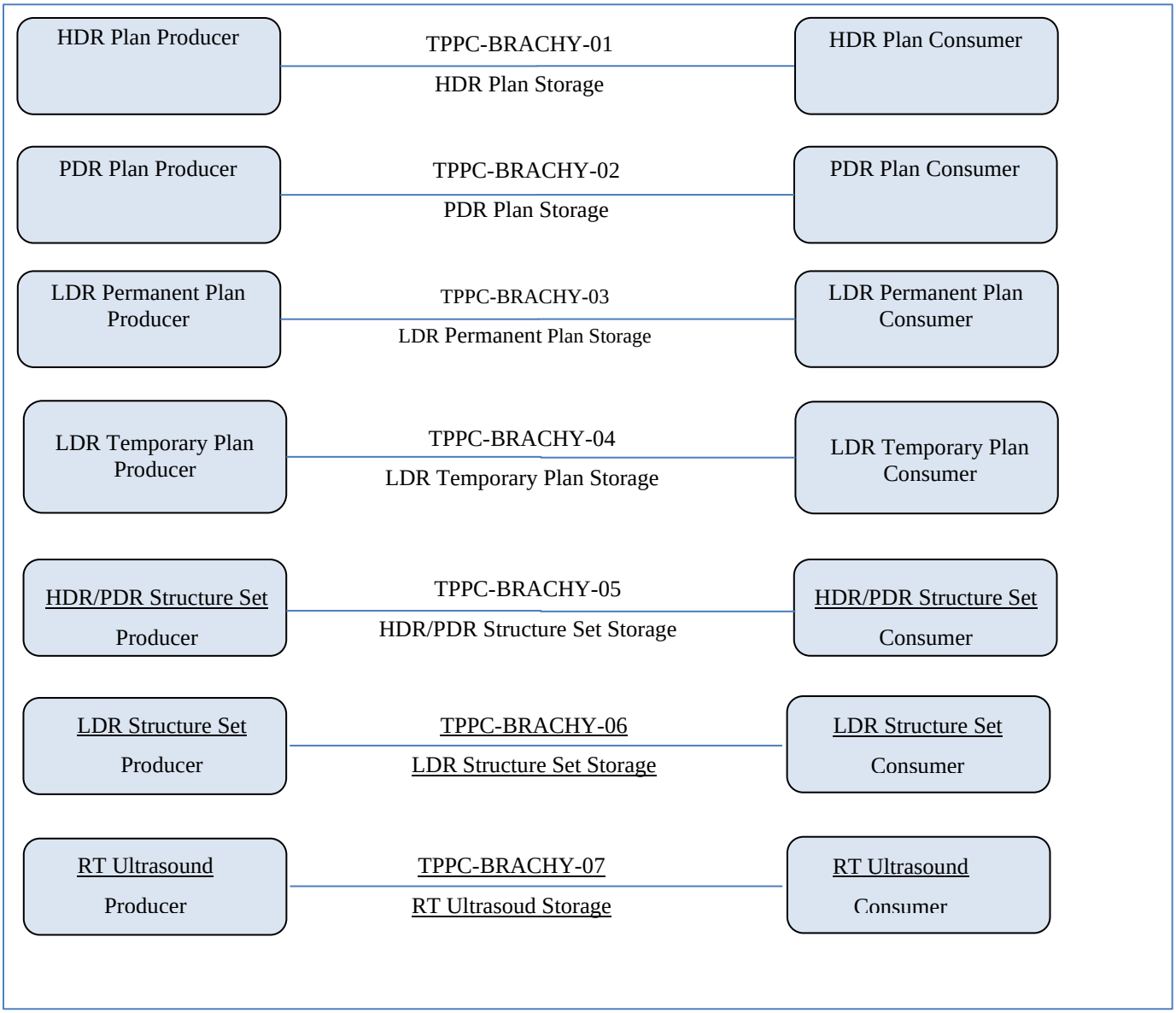


Figure X.1-1: TPPC-Brachy Actor Diagram

Transactions Overview:

Table X.1-1 lists the transactions for each actor directly involved in the TPPC-Brachy 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: TPPC-Brachy Profile - Actors and Transactions

Actors	Transactions	Optionality	Section in Vol. 2
Treatment Management System (TMS) (See Note Below)	HDR Plan Storage	O	[TPPC-Brachy 01]
	PDR Plan Storage	O	[TPPC-Brachy 02]
	LDR Permanent Plan Storage	O	[TPPC-Brachy 03]
	LDR Temporary Plan Storage	O	[TPPC-Brachy 04]
	HDR/PDR Structure Set Storage	O	[TPPC-Brachy 05]
	LDR Structure Set Storage	O	[TPPC-Brachy 06]
HDR Plan Producer	HDR Plan Storage	R	[TPPC-Brachy 01]
PDR Plan Producer	PDR Plan Storage	R	[TPPC-Brachy 02]
LDR Permanent Plan Producer	LDR Permanent Plan Storage	R	[TPPC-Brachy 03]
LDR Temporary Plan Producer	LDR Temporary Plan Storage	R	[TPPC-Brachy 04]
HDR Plan Consumer	HDR Plan Storage	R	[TPPC-Brachy 01]
PDR Plan Consumer	PDR Plan Storage	R	[TPPC-Brachy 02]
LDR Permanent Plan Consumer	LDR Permanent Plan Storage	R	[TPPC-Brachy 03]
LDR Temporary Plan Consumer	LDR Temporary Plan Storage	R	[TPPC-Brachy 04]
HDR/PDR Structure Set Producer	HDR/PDR Structure Set Storage	R	[TPPC-Brachy 05]
LDR Structure Set Producer	LDR Structure Set Storage	R	[TPPC-Brachy 06]
HDR/PDR Structure Set Consumer	HDR/PDR Structure Set Storage	R	[TPPC-Brachy 05]
LDR Structure Set Consumer	LDR Structure Set Storage	R	[TPPC-Brachy 06]
RT Ultrasound Producer	RT Ultrasound Storage	R	[TPPC-Brachy 07]
RT Ultrasound Consumer	RT Ultrasound Storage	R	[TPPC-Brachy 07]

Note: The TMS Integration Statement will indicate which transactions it is capable of supporting. In general, these will be grouped according to the overall functionality of the TMS actor. For example, a general TMS would likely support all transactions, while a Brachy only TMS may only support the brachy structure sets and brachy plans. In addition, for cases where there are insufficient actors for complete testing of the TMS, the TMS can pass the Connectathon by claiming those transactions it successfully completed.

X.1.1 Actor Descriptions and Actor Profile Requirements

For all Brachytherapy Content Producers and Consumers, the display requirements for dwell time and total dose contributions are not sufficiently met by just presenting the DICOM data. It must be converted as described in the notes in this section. An actor does not adhere to the profile unless the system provides the output in the prescribed format.

Actors shall display total times and dwell times at the reference date and time of the plan (including time zone used) and not Cumulative Time Weights.

X.2 TPPC-Brachy Transaction Options

None

X.3 Required Actor Groupings

None

X.4 Use Cases

None

X.5 TPPC-Brachy Overview

X.5.1 Concepts

This profile enhances the content of the DICOM plan objects as regard the brachytherapy scope. This is fulfilled by providing specialized actors for each technique and role (producer or consumer).

Typically, a Treatment Planning System (TPS) is expected to implement one or more of the "producer" actors.

A TPS that is intended to be able to perform a re-planning based on the output of another TPS is expected to adhere to one or more of the "consumers" actors.

The transactions included in this profile provide the guidelines that indicate how the DICOM object shall be filled focusing in the content description rather than in the workflow description.

The most important attributes that have to be properly included in the DICOM object in order to avoid ambiguities and safety implications on interpreting the object have been identified in the transactions.

X.5 TPPC-Brachy Security Considerations

None

X.6 TPPC-Brachy Cross Profile Considerations

Volume 2 – Transactions

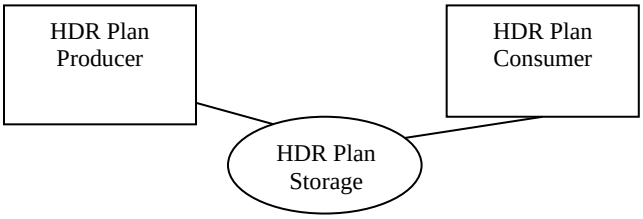
Add section 3.Y

3.Y1 HDR Plan Storage [TPPC-Brachy 01]

3.Y1.1 Scope

In the HDR Plan Storage transaction, a Producer of an RT Plan that incorporates the brachytherapy technique identified in TPPC-Brachy-01: HDR Plan Storage stores the plan to an HDR Plan Consumer. In this example, we diagram a DICOM C-Store, but other forms of transmission are acceptable for this content profile.

3.Y1.2 Actor Roles



Actor:	HDR Plan Producer
Role:	Creates a HDR plan for a treatment that shall be delivered using a treatment delivery system and stores it to an HDR Plan Consumer.
Actor:	HDR Plan Consumer
Role:	Accepts and stores the RT Plan from the HDR Plan Producer

3.Y1.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y1.4 Interaction Diagram

None provided

3.Y1.4.1.1 Trigger Events

The HDR Plan Producer transfers the plan to a storage or HDR Plan Consumer once the plan is created and the dose calculation is finished.

3.Y1.4.1.2 Message Semantics

The HDR Plan Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

The requirements for the content of the RT Plan are specified in section 7.3.2.1.3 RT Plan IOD for Brachytherapy respectively.

3.Y1.4.1.3 Expected Actions

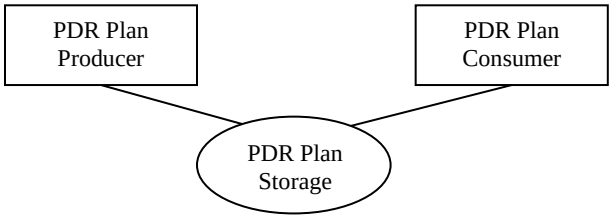
The HDR Plan Consumer stores the RT Plan.

3.Y2 PDR Plan Storage [TPPC-Brachy 02]

3.Y2.1 Scope

In the PDR Plan Storage transaction, a Producer of an RT Plan that incorporates the brachytherapy technique identified in TPPC-Brachy-XX: PDR Plan Storage stores the plan to an HDR Plan Consumer. In this example, we diagram a DICOM C-Store, but other forms of transmission are acceptable for this content profile.

3.Y2.2 Actor Roles



Actor:	PDR Plan Producer
Role:	Creates an PDR plan for a treatment that shall be delivered using a treatment delivery system and stores it to a PDR Plan Consumer.
Actor:	PDR Plan Consumer
Role:	Accepts and stores the RT Plan from the PDR Plan Producer

3.Y2.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y2.4 Interaction Diagram

None Provided

3.Y2.4.1 PDR Plan Storage

3.Y2.4.1.1 Trigger Events

The PDR Plan Producer transfers the plan to a storage or PDR Plan Consumer once the plan is created and the dose calculation is finished.

3.Y2.4.1.2 Message Semantics

The PDR Plan Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

The requirements for the content of the RT Plan are specified in section 7.3.2.1.3.

3.Y2.4.1.3 Expected Actions

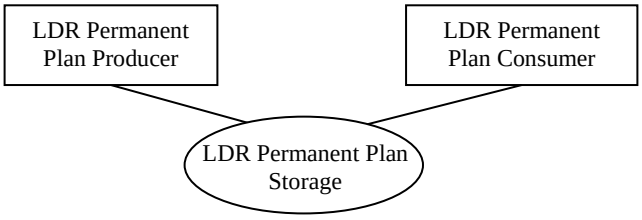
The PDR Plan Consumer stores the RT Plan and its RT Structure Set.

3.Y3 LDR Permanent Plan Storage [TPPC-Brachy 03]

3.Y3.1 Scope

In the LDR Permanent Plan Storage transaction, a Producer of an RT Plan that incorporates the brachytherapy technique identified in TPPC-Brachy-03: LDR Permanent Plan Storage stores the plan to an LDR Permanent Plan Consumer. In this example, we diagram a DICOM C-Store, but other forms of transmission are acceptable for this content profile.

3.Y3.2 Actor Roles



Actor:	LDR Permanent Plan Producer
Role:	Creates an LDR Permanent plan for a treatment that shall be delivered using a treatment delivery system and stores it to an LDR Permanent Plan consumer
Actor:	LDR Permanent Plan Consumer
Role:	Accepts and stores the RT Plan from the LDR Permanent Plan Producer

3.Y3.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y3.4 Interaction Diagram

None provided

3.Y3.4.1 LDR Permanent Plan Storage

3.Y3.4.1.1 Trigger Events

The LDR Permanent Plan Producer transfers the plan to a storage or LDR Permanent Plan Consumer once the plan is created and the dose calculation is finished.

3.Y3.4.1.2 Message Semantics

The LDR Permanent Plan Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

The requirements for the content of the RT Plan are specified in section 7.3.2.1.3.

3.Y3.4.1.3 Expected Actions

The LDR Permanent Plan Consumer stores the RT Plan.

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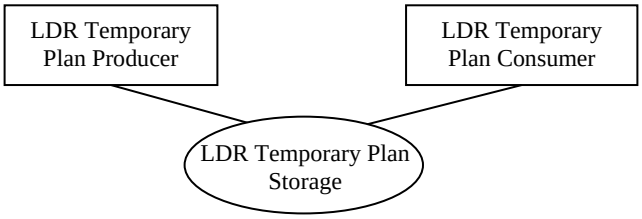
3.Y4 LDR Temporary Plan Storage [TPPC-Brachy 04]

3.Y4.1 Scope

In the LDR Temporary Plan Storage transaction, a Producer of an RT Plan that incorporates the brachytherapy technique identified in TPPC-Brachy-04: LDR Temporary Plan Storage stores the plan to an LDR Temporary Plan Consumer. In this example, we diagram a DICOM C-Store, but other forms of transmission are acceptable for this content profile.

3.Y4.2 Actor Roles



Actor:	LDR Temporary Plan Producer
Role:	Creates an LDR Temporary plan for a treatment that shall be delivered using a treatment delivery system and stores it to an LDR Temporary Plan Consumer
Actor:	LDR Temporary Plan Consumer
Role:	Accepts and stores the RT Plan from the LDR Temporary Plan Producer

3.Y4.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y4.4 Interaction Diagram

None provided

3.Y4.4.1 LDR Temporary Plan Storage

3.Y4.4.1.1 Trigger Events

The LDR Temporary Plan Producer transfers the plan to a storage or LDR Temporary Plan Consumer once the plan is created and the dose calculation is finished.

3.Y4.4.1.2 Message Semantics

The LDR Temporary Plan Producer may create a new series containing the plan or may use an existing series, where previous plan(s) are contained.

The study where the series of the plan is contained shall be the same study as the one containing the structure set referenced in the plan.

The requirements for the content of the RT Plan are specified in section 7.3.2.1.3.

3.Y4.4.1.3 Expected Actions

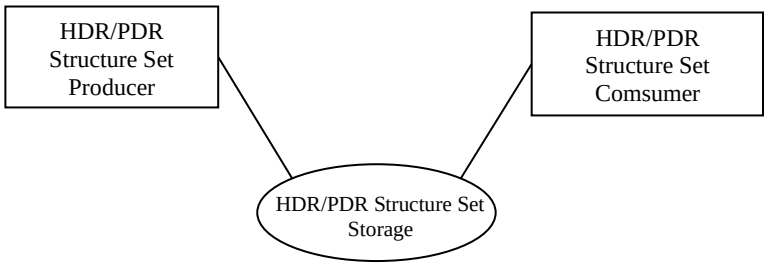
The LDR Temporary Plan Consumer stores the RT Plan.

3.Y5 HDR/PDR Structure Set Storage [TPPC-Brachy-05]

3.Y5.1 Scope

In the HDR/PDR Structure Set Storage transaction for Brachy, a producer of a Structure Set that
365 incorporates the contours identified as necessary for an HDR or PDR treatment plan, stores the structure set to an HDR/PDR Structure Set Consumer.

3.Y5.2 Actor Roles



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Actor:	HDR/PDR Structure Set Producer
Role:	Creates an HDR/PDR Structure Set and stores it to an HDR/PDR Structure Set Consumer
Actor:	HDR/PDR Structure Set Consumer
Role:	Accepts and stores the HDR/PDR Structure Set from the HDR/PDR Structure Set Producer

3.Y5.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y5.4 Interaction Diagram

None

375 ### 3.Y5.4.1 HDR/PDR Structure Set Storage

3.Y5.4.1.1 Trigger Events

The HDR/PDR Structure Set Producer transfers the structure set to an HDR/PDR Structure Set Consumer once the HDR or PDR plan is created.

3.Y5.4.1.2 Message Semantics

The HDR/PDR Structure Set Producer may create a new series containing the structure set or may use an existing series, where previous structure set(s) are contained.

The requirements for the content of the RT Structure Set and RT Plan are specified in section 7.3.4.1.3 RT Structure Set for Brachytherapy.

3.Y5.4.1.3 Expected Actions

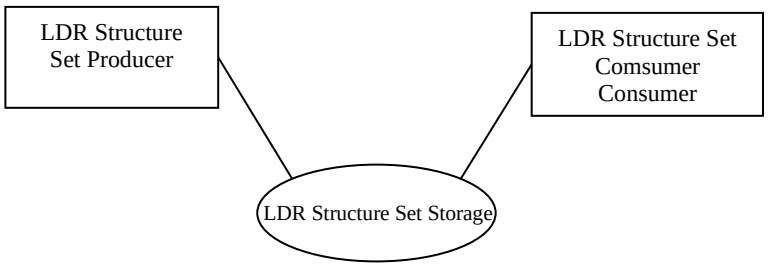
The HDR/PDR Structure Set Consumer stores the RT Structure Set.

3.Y6 LDR Structure Set Storage [TPPC-Brachy-06]

3.Y6.1 Scope

In the LDR Structure Set Storage transaction for Brachy, a producer of a Structure Set that incorporates the contours identified as necessary for an LDR Permanent or LDR Temporary treatment plan, stores the structure set to an LDR Structure Set Consumer.

3.Y6.2 Actor Roles



Actor:	LDR Structure Set Producer
Role:	Creates an LDR Structure Set and stores it to an LDR Structure Set Consumer
Actor:	LDR Structure Set Consumer
Role:	Accepts and stores the LDR Structure Set from the LDR Structure Set Producer

3.Y6.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y6.4 Interaction Diagram

None

3.Y6.4.1 LDR Structure Set Storage

3.Y6.4.1.1 Trigger Events

The LDR Structure Set Producer transfers the structure set to an LDR Structure Set Consumer once the LDR plan is created.

3.Y6.4.1.2 Message Semantics

The LDR Structure Set Producer may create a new series containing the structure set or may use an existing series, where previous structure set(s) are contained.

The requirements for the content of the RT Structure Set and RT Plan are specified in section 7.3.4.1.3 RT Structure Set for Brachytherapy.

3.Y6.4.1.3 Expected Actions

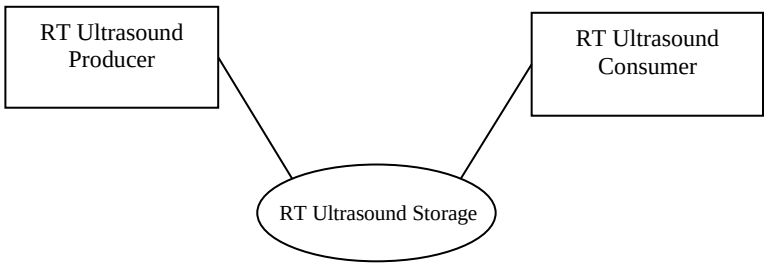
The LDR Structure Set Consumer stores the RT Structure Set.

3.Y7 LDR RT Ultrasound Storage [TPPC-Brachy-07]

3.Y7.1 Scope

In the RT Ultrasound Storage transaction for Brachy, a Producer of an RT Ultrasound set of images that incorporates the image plane details identified as necessary for an RT Ultrasound plan, stores the RT Ultrasound image series to an RT Ultrasound Consumer.

3.Y7.2 Actor Roles



Actor:	RT Ultrasound Producer
Role:	Creates an RT Ultrasound series of images and stores it to an RT Ultrasound Consumer
Actor:	RT Ultrasound Consumer
Role:	Accepts and stores an RT Ultrasound series from an RT Ultrasound Producer

3.Y7.3 Referenced Standards

DICOM 2021c Edition. PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.Y7.4 Interaction Diagram

None

3.Y7.4.1 LDR Structure Set Storage

3.Y7.4.1.1 Trigger Events

The RT Ultrasound Producer transfers the RT Ultrasound images series to an RT Ultrasound Consumer once the image set is created

3.Y7.4.1.2 Message Semantics

The RT Ultrasound Producer will create a new series containing the images.

The requirements for the content of the RT Ultrasound images are specified in section 7.4.6.3 RT Ultrasound Image for Brachytherapy.

3.Y7.4.1.3 Expected Actions

The RT Ultrasound Consumer stores the RT Ultrasound images.

Volume 3 – Content Modules

6. Content Modules

No Content Modules defined.

7. DICOM Content Definition

7.1 Conventions

Key to IHE-RO Column of requirements
▪ R+ = The requirement is an IHE extension of the DICOM requirements and needs to be displayed (note: when consumed!, not produced) ▪ R* = The attribute is required to be there but not required to be displayed ▪ R+* = The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed ▪ O+ = The attribute is optional but if there, it must be displayed. ▪ -* = The DICOM usage applies but the value does not need to be displayed

7.3.2 Plan IODs

7.3.2.1.3 RT Plan for Brachytherapy

7.3.2.1.3.1 Referenced Standards

DICOM 2021c Edition. PS 3.3

7.3.2.1.3.2 IOD Definition

IE	Module	Reference	Usage	IHE-RO Usage
Patient	Patient	C.7.1.1	M	R See 7.4.1.1.1 (Base Content)
	Clinical Trial Subject	C.7.1.3	U	U
Study	General Study	C.7.2.1	M	R See 7.4.1.2.1 (Base Content)
	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	R See 7.4.1.4.1(Base Content)
	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 (Base Content)
Equipment	General Equipment	C.7.5.1	M	R See 7.4.1.5.1 (Base Content)
Plan	RT General Plan	C.8.8.9	M	R See 7.4.3.1.1
	RT Prescription	C.8.8.10	U	R See 7.4.3.2.1
	RT Tolerance Tables	C.8.8.11	U	
	RT Patient Setup	C.8.8.12	U	-
	RT Fraction Scheme	C.8.8.13	U	R See 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	Shall not be present
	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	R See relevant section for the type of plan being generated: HDR and PDR 7.4.4.6.1 LDR Permanent 7.4.4.6.2 LDR Temporary 7.4.4.6.3

	Approval	C.8.8.16	U	R
	SOP Common	C.12.1	M	R See 7.4.1.6.1

7.3.3 Image IODs

7.3.3.3 US Image

IE	Module	Reference	Usage	IHE-RO Usage
Patient	Patient	C.7.1.1	M	-
	Clinical Trial Subject	C.7.1.3	U	-
Study	General Study	C.7.2.1	M	-
	Patient Study	C.7.2.2	U	-
	Clinical Trial Study	C.7.2.3	U	-
Series	General Series	C.7.3.1	M	-
	Clinical Trial Series	C.7.3.2	U	-
Frame of Reference	Frame of Reference	C.7.4.1	U	R
	Synchronization	C.7.4.2	U	-
Equipment	General Equipment	C.7.5.1	M	-
Image	General Image	C.7.6.1	M	-
	Image Plane Module	C.7.6.2	Not used in regular US image	R Added module for IHE-RO planning use. See section 7.4.6.3.4
	General Reference	C.12.4	U	-
	Image Pixel	C.7.6.3	M	-
	Contrast/Bolus	C.7.6.4	C - Required if contrast media	-

IE	Module	Reference	Usage	IHE-RO Usage
			was used in this image	
	Palette Color Lookup Table	C.7.9	C - Required if Photometric Interpretation (0028,0004) has a value of PALETTE COLOR	R* Shall not be used
	Device	C.7.6.12	U	-
	Specimen	C.7.6.22	U	-
	US Region Calibration	C.8.5.5	U	R Shall not be present
	US Image	C.8.5.6	M	-
	Overlay Plane	C.9.2	U	-
	VOI LUT	C.11.2	U	-
	ICC Profile	C.11.15	U	-
	SOP Common	C.12.1	M	-
	Common Instance Reference	C.12.2	U	-

7.3.4 RT Structure Set IOD

7.3.4.1.3 RT Structure Set for Brachytherapy

460 In the IHE-RO Usage column, the specific content required by Brachytherapy, is indicated; otherwise the Base Content is referenced. .

IE	Module	Reference	Usage	IHE-RO Usage
Patient	Patient	C.7.1.1	M	R See Section **Error! Reference source not found.**~~7.4.1.1.1~~ (Base Content)
	Clinical Trial Subject	C.7.1.3	U	U

IE	Module	Reference	Usage	IHE-RO Usage
Study	General Study	C.7.2.1	M	R See Section **Error! Reference source not found.**~~7.4.1.2.1~~ (Base Content)
	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	R See Section **Error! Reference source not found.**~~7.4.1.4.1~~ (Base Content)
	Clinical Trial Series	C.7.3.2	U	U
Frame of Reference	Frame of Reference	C.7.4.1	U	R See Section **Error! Reference source not found.**~~7.4.1.7.1~~ (Base Content)
Equipment	General Equipment	C.7.5.1	M	R See Section **Error! Reference source not found.**~~7.4.1.5.1~~ (Base Content)
Structure Set	Structure Set	C.8.8.5	M	R See Section 7.4.8.3.3.
	ROI Contour	C.8.8.6	M	R See Section 7.4.8.2.3
	RT ROI Observation	C.8.8.8	M	R See relevant section for the type of plan being generated HDR/PDR 7.4.8.1.3 LDR 7.4.8.1.4
	Approval	C.8.8.16	U	U
	SOP Common	C.12.1	M	R
	Common Instance Reference	C.12.2	U	C – Required if reference information is available

7.3.5 Dose IODs

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

7.3.6 Treatment Record IODs

7.3.6.1 Technique Specific RT Treatment Record

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

7.3.6.2 RT Treatment Record for General Use

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

7.3.6.3 RT Brachy Treatment Records

7.3.6.3.1 RT Brachy Treatment Record

7.3.6.3.1.1 Referenced Standards

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7.3.6.3.1.2 IOD Definition7.4 Module Definitions

7.4.1 General Modules

7.4.1.3 General Series Module

7.4.1.3.4 General Series Module Brachy Content

Attribute Name	Tag	DICOM usage	IHE-RO usage	Attribute Description
Series Instance UID	(0020,000E)	1	-	
Series Date	(0008,0021)	3	R*	Shall be present
Series Time	(0008,0031)	3	R*	Shall be present
Operators' Name	(0008,1070)	3	R*	Shall be present

7.4.1.5 Equipment Module

7.4.1.5.~~2~~1 General Equipment Module Content

485 #### 7.4.1.5.1.3 General Equipment Module Brachy Content

Attribute Name	Tag	IHE-RO usage	Attribute Description
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.
Manufacturer's Model Name	(0008,1090)	R+*	If an application resamples **or adds data** and re-exports a series of CT or US images, or modifies an instance then this element must be present, and must contain the model name of the equipment doing the resampling **or additions**~~.~~
Software Versions	(0018,1020)	R+*	Must be present. **If images are edited, this is the Software Versions of the system that made the changes.**

7.4.1.6SOP Common Module

7.4.1.6.2 SOP Common Module Brachy Content

7.4.1.6.2.1 Referenced Standards

DICOM 2021c Edition PS 3.3

7.4.1.6.2.2 Module Definition

Key to IHE-RO Column of requirements

- R+ = The requirement is an IHE extension of the DICOM requirements and needs to be displayed (note: when consumed!, not produced)
- R* = The attribute is required to be there but not required to be displayed
- R+* = The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed
- O+ = The attribute is optional but if there, it must be displayed.
- -* = The DICOM usage applies but the value does not need to be displayed

Attribute Name	Tag	Type	IHE-RO usage	Attribute Description
Instance Creation Date	(0008,0012)		R+	Shall be present. If an image has been modified for planning purposes, the Date shall be when the modifying system created the instance.
Instance Creation Time	(0008,0013		R+	Shall be present. If an image has been modified for planning purposes, the Time shall be when the modifying system created the instance.
SOP Instance UID	(0008,0018)	1	R*	If an image has been modified for planning purposes, the UID shall be updated and contain the root of the manufacturer of the updated image.

7.4.3.3.3 RT Fraction Scheme Module for Brachy

Key to IHE-RO Column of requirements

- R+ = The requirement is an IHE extension of the DICOM requirements and needs to be displayed (note: when consumed!, not produced)
- R* = The attribute is required to be there but not required to be displayed
- R+* = The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed
- O+ = The attribute is optional but if there, it must be displayed.
- -* = The DICOM usage applies but the value does not need to be displayed

Attribute	Tag	Presence	Specific Rules
Fraction Group Sequence	(300A,0070)	R+*	Shall have only a single item in the sequence.
> Referenced Dose Reference Sequence	(300C,0050)		
>> Referenced Dose Reference Number	(300C,0051)		
>Number of Fractions Planned	(300A,0078)	R+	
> Number of Beams	(300A,0080)	R+*	Shall be 0.
> Number of Brachy Application Setups	(300A,000A)	R+*	Shall be equal to the number of items under "Application Setup Sequence" (300A,0230)
> Referenced Brachy Application Setup Sequence	(300C,000C)	-	
>> Brachy Application Setup Dose Specification Point	(300A,00A2)	-	
>> Brachy Application Setup Dose	(300A,00A4)	R+*	If the plan contains multiple Application Setups, the sum of the Brachy Application Setup Doses represents the dose per fraction for the plan.
>>Referenced Dose Reference UID	(300A,0083)	R+*	Identifies the Dose Reference specified by Dose Reference UID (300A,0013) in the Dose Reference Sequence (300A,0010) in the RT Prescription Module which specifies the primary target for the current Application Setup. If present shall have a value that is present in the Dose Reference Sequence.

7.4.4 Plan-Related Modules in Planning

7.4.4.6 RT Brachy Application Setups

7.4.4.6.1 RT Application Setup Module for HDR Plan and PDR Plan

Key to IHE-RO Column of requirements

- R+ = The requirement is an IHE extension of the DICOM requirements and needs to be displayed (note: when consumed!, not produced)
- R* = The attribute is required to be there but not required to be displayed
- R+* = The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed
- O+ = The attribute is optional but if there, it must be displayed.
- -* = The DICOM usage applies but the value does not need to be displayed

Attribute	Tag	HDR and PDR Technique		
			Presence	Specific Rules
Brachy Treatment Technique	(300A,0200)	1	R+*	Shall not be PERMANENT
Brachy Treatment Type	(300A,0202)	1	R+	Shall be HDR or PDR
Treatment Machine Sequence	(300A,0206)	1		
>Treatment Machine Name	(300A,00B2)	2	R+	Shall have a value.
>Manufacturer	(0008,0070)	3	R+*	Shall have a value.
>Institution Name	(0008,0080)	3	-	
>Institution Address	(0008,0081)	3	-	
>Institutional Department Name	(0008,1040)	3	-	
>Manufacturer's Model Name	(0008,1090)	3	R+	Shall have a value.
>Device Serial Number	(0018,1000)	3	-	
Source Sequence	(300A,0210)	1		
>Source Number	(300A,0212)	1	-*	
>Source Serial Number	(3008,0105)	3	-	
>Source Model ID	(300A,021B)	3	-	
>Source Description	(300A,021C)	3	R+	Use this for the full model ID as it is not limited by the Source Model ID that is limited to 16 characters.
>Source Type	(300A,0214)	1	-*	
>Source Manufacturer	(300A,0216)	3	-	
>Active Source Diameter	(300A,0218)	3	-	
>Active Source Length	(300A,021A)	3	-	

Attribute	Tag	HDR and PDR Technique		
			Presence	Specific Rules
>Material ID	(300A,00E1)	3	-	
>Source Encapsulation Nominal Thickness	(300A,0222)	3	-	
>Source Encapsulation Nominal Transmission	(300A,0224)	3	-	
>Source Isotope Name	(300A,0226)	1	R+	Representation of the Source shall be in the form used by SNOMED: <Element>-<number of nucleons> e.g. Iridium-192
>Source Isotope Half Life	(300A,0228)	1	-*	
>Source Strength Units	(300A,0229)	1C	R+	Shall have a value without constraint for gamma-emitting source. Measurement unit of Source Strength. Enumerated Values: AIR_KERMA_RATE Air Kerma Rate DOSE_RATE_WATER Dose Rate in Water
>Reference Air Kerma Rate	(300A,022A)	1	R+	Required if source is calibrated in Air-Kerma-Rate. If not, value shall be 0
>Source Strength	(300A,022B)	1C	R+	Source strength used to calculate the dwell times. Required if source is calibrated in Dose Rate in water. If not, attribute shall not be present.-
>Source Strength Reference Date	(300A,022C)	1	-	
>Source Strength Reference Time	(300A,022E)	1	-	
Application Setup Sequence	(300A,0230)	1	R+*	Number of items shall be 1.
>Application Setup Type	(300A,0232)	1	-*	
>Application Setup Number	(300A,0234)	1	-*	
>Application Setup Name	(300A,0236)	3	-	
>Application Setup Manufacturer	(300A,0238)	3	-	
>Template Number	(300A,0240)	3	-	
>Template Type	(300A,0242)	3	-	
>Template Name	(300A,0244)	3	-	
>Referenced Reference Image Sequence	(300C,0042)	3	-	
>Total Reference Air Kerma	(300A,0250)	1	-	
>Brachy Accessory Device Sequence	(300A,0260)	3	-	

Attribute	Tag	HDR and PDR Technique		
			Presence	Specific Rules
>>Brachy Accessory Device Number	(300A,0262)	2	-	
>>Brachy Accessory Device ID	(300A,0263)	2	-	
>>Brachy Accessory Device Type	(300A,0264)	1		
>>Brachy Accessory Device Name	(300A,0266)	3	-	
>>Material ID	(300A,00E1)	3	-	
>>Brachy Accessory Device Nominal Thickness	(300A,026A)	3	-	
>>Brachy Accessory Device Nominal Transmission	(300A,026C)	3	-	
>Channel Sequence	(300A,0280)	1	-*	
>>Referenced ROI Number	(3006,0084)	2	R+*	Shall be present in order to reproduce the channel of the applicator. RT ROI Interpreted Type (3006,00A4) for the referenced ROI shall be BRACHY_CHANNEL
>>Channel Effective Length	(300A,0271)	3	R+	Shall be present to correctly specify the distance between connector on the afterloader and the center of the distal-most possible position of the source.
>>Channel Inner Length	(300A,0272)	2C	R+	Shall be present to correctly specify the distance between connector on afterloader and the end of the channel.
>>Afterloader Channel ID	(300A,0273)	2C	R+	Shall be present to correctly identify the channel connection on the afterloader.
>>Channel Number	(300A,0282)	1	-*	
>>Channel Length	(300A,0284)	2	-	
>>Channel Total Time	(300A,0286)	1	-	
>>Source Movement Type	(300A,0288)	1	-*	
>>Number of Pulses	(300A,028A)	1C	-	

Attribute	Tag	HDR and PDR Technique		
			Presence	Specific Rules
>>Pulse Repetition Interval	(300A,028C)	1C	-	
>>Source Applicator Number	(300A,0290)	3	R+	Shall be present for enabling (300A,0291) for channel mapping
>>Source Applicator ID	(300A,0291)	2C	R+	Shall be present in the plan for correct channel mapping
>>Source Applicator Type	(300A,0292)	1C	-*	Required if Source Applicator number is present FLEXIBLE or RIGID
>>Source Applicator Name	(300A,0294)	3	-	
>>Source Applicator Length	(300A,0296)	1C	-	
>>>Source Applicator Tip Length	(300A,0274)	2C	R+	Shall be present to specify the distance between the outer tip of the applicator and the center of the distal-most possible position of the source.
>>Source Applicator Manufacturer	(300A,0298)	3	-	
>>Material ID	(300A,00E1)	3	-	
>>Source Applicator Wall Nominal Thickness	(300A,029C)	3	-	
>>Source Applicator Wall Nominal Transmission	(300A,029E)	3	-	
>>Source Applicator Step Size	(300A,02A0)	1C	-	
>>Applicator Shape Referenced ROI Number	(300A,02A1)	3	O+*	If present, the RT ROI Interpreted Type (3006,00A4) for the referenced ROI shall be BRACHY_SRC_APP
>>Referenced ROI Number	(3006,0084)	2C	R+*	Shall be present in order to reproduce the channel of the applicator. RT ROI Interpreted Type (3006,00A4) for the referenced ROI shall be BRACHY_CHANNEL
>>Transfer Tube Number	(300A,02A2)	2	-*	
>>Transfer Tube Length	(300A,02A4)	2C	-*	
>>Channel Shield Sequence	(300A,02B0)	3	-	
>>>Channel Shield Number	(300A,02B2)	1		
>>>Channel Shield ID	(300A,02B3)	2	-	
>>>Channel Shield Name	(300A,02B4)	3	-	
>>>Material ID	(300A,00E1)	3	-	
>>>Channel Shield Nominal Thickness	(300A,02B8)	3	-	

Attribute	Tag	HDR and PDR Technique		
			Presence	Specific Rules
>>>Channel Shield Nominal Transmission	(300A,02BA)	3	-	
>>>Referenced ROI Number	(3006,0084)	2	-	
>>Referenced Source Number	(300C,000E)	1		
>>Number of Control Points	(300A,0110)	1		
>>Final Cumulative Time Weight	(300A,02C8)	1C	R+	As described in section X.1.1, display the final dwell time value
>>Brachy Control Point Sequence	(300A,02D0)	1	-	
>>>Control Point Index	(300A,0112)	1	-	
>>>Cumulative Time Weight	(300A,02D6)	2	R+	As described in section X.1.1, display the dwell time spent at each location
>>>Control Point Relative Position	(300A,02D2)	1	-	
>>>Control Point 3D Position	(300A,02D4)	3	R+*	If present it has to be consistent with the related information in the structure. The structure is defined by the Referenced ROI Number (3006,0084).
>>>Control Point Orientation	(300A,0412)	3	R+*	Shall be consistent with the related information in the structure. The structure is defined by the Referenced ROI Number (3006,0084)
>>>Brachy Referenced Dose Reference Sequence	(300C,0055)	3	R+	Mandatory for the last Control Point, see DICOM PS 3.3 C.8.8.15.11. See Note 1 for display requirement.
>>>>Referenced Dose Reference Number	(300C,0051)	1	-	
>>>>Cumulative Dose Reference Coefficient	(300A,010C)	1	-	

Note 1: As a minimum, the dose contribution from each Channel and all Channels to all Dose References shall be displayed.

7.4.4.6.2 RT Application Setup Module for LDR Permanent Plan

Key to IHE-RO Column of requirements

- R+ = The requirement is an IHE extension of the DICOM requirements and needs to be displayed (note: when consumed!, not produced)
- R* = The attribute is required to be there but not required to be displayed
- R+* = The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed
- O+ = The attribute is optional but if there, it must be displayed.

- -* = The DICOM usage applies but the value does not need to be displayed.

Attribute	Tag	LDR Permanent Technique		
			Presence	Specific Rules
Brachy Treatment Technique	(300A,0200)	1	R+*	Shall be PERMANENT
Brachy Treatment Type	(300A,0202)	1	R+*	Shall be LDR
Treatment Machine Sequence	(300A,0206)	1	-	
Source Sequence	(300A,0210)	1		
>Source Number	(300A,0212)	1	-*	
>Source Serial Number	(3008,0105)	3	-	
>Source Model ID	(300A,021B)	3	-	
>Source Description	(300A,021C)	3	R+	Use this for the full Model ID
>Source Type	(300A,0214)	1	-*	
>Source Manufacturer	(300A,0216)	3	-	
>Active Source Diameter	(300A,0218)	3	-	
>Active Source Length	(300A,021A)	3	-	
>Material ID	(300A,00E1)	3	-	
>Source Encapsulation Nominal Thickness	(300A,0222)	3	-	
>Source Encapsulation Nominal Transmission	(300A,0224)	3	-	
>Source Isotope Name	(300A,0226)	1	R+	Representation of the Source shall be in the SNOMED format : <Element>-<number of nucleons> e.g. Iridium-192
>Source Isotope Half Life	(300A,0228)	1	-*	
>Source Strength Units	(300A,0229)	1C	R+	Shall have a value without constraint for gamma-emitting source. Measurement unit of Source Strength. Enumerated Values: AIR_KERMA_RATE Air Kerma Rate DOSE_RATE_WATER Dose Rate in Water
>Reference Air Kerma Rate	(300A,022A)	1	R+	Required if source is calibrated in Air-Kerma-Rate. If not, value shall be 0
>Source Strength	(300A,022B)	1C	~~R~~R+	Source strength used to calculate the dwell times. Required if source is calibrated in Dose Rate in water. If not, attribute shall not be present.
>Source Strength Reference Date	(300A,022C)	1	-	
>Source Strength Reference Time	(300A,022E)	1	-	
Application Setup Sequence	(300A,0230)	1	R+*	Number of items shall be 1.

Attribute	Tag	LDR Permanent Technique		
			Presence	Specific Rules
>Application Setup Type	(300A,0232)	1	-*	
>Application Setup Number	(300A,0234)	1	-*	
>Application Setup Name	(300A,0236)	3	-	
>Application Setup Manufacturer	(300A,0238)	3	-	
>Template Number	(300A,0240)	3	-	
>Template Type	(300A,0242)	3	-	
>Template Name	(300A,0244)	3	-	
>Referenced Reference Image Sequence	(300C,0042)	3	-	
>Total Reference Air Kerma	(300A,0250)	1	-	
>Brachy Accessory Device Sequence	(300A,0260)	3	-	
>Channel Sequence	(300A,0280)	1	-*	
>>Referenced ROI Number	(3006,0084)	2C	-*	
>>Channel Effective Length	(3006,0271)	3	-	
>>Channel Inner Length	(300A,0272)	2C	-*	
>>Afterloader Channel ID	(300A,0273)	2C	-*	
>>Channel Number	(300A,0282)	1	-*	
>>Channel Length	(300A,0284)	2	-	
>>Channel Total Time	(300A,0286)	1	-*	
>>Source Movement Type	(300A,0288)	1	R+*	Shall be FIXED
>>Number of Pulses	(300A,028A)	1C	-	
>>Pulse Repetition Interval	(300A,028C)	1C	-	
>>Source Applicator Number	(300A,0290)	3	-	
>>Source Applicator ID	(300A,0291)	2C	-	
>>Source Applicator Type	(300A,0292)	1C	-	
>>Source Applicator Name	(300A,0294)	3	-	
>>Source Applicator Length	(300A,0296)	1C	-	
>>Source Applicator Manufacturer	(300A,0298)	3	-	
>>Material ID	(300A,00E1)	3	-	
>>Source Applicator Wall Nominal Thickness	(300A,029C)	3	-	
>>Source Applicator Wall Nominal Transmission	(300A,029E)	3	-	
>>Source Applicator Step Size	(300A,02A0)	1C	-	
>>Applicator Shape Referenced ROI Number	(300A,02A1)	3	-	
>>Referenced ROI Number	(3006,0084)	2C	-	

Attribute	Tag	LDR Permanent Technique		
			Presence	Specific Rules
>>Transfer Tube Number	(300A,02A2)	2	-*	
>>Transfer Tube Length	(300A,02A4)	2C	-*	
>>Channel Shield Sequence	(300A,02B0)	3	-	
>>Referenced Source Number	(300C,000E)	1	-*	
>>Number of Control Points	(300A,0110)	1	R+*	Value shall be 2
>>Final Cumulative Time Weight	(300A,02C8)	1C	-	As described in section X.1.1, display the final time value.
>>Brachy Control Point Sequence	(300A,02D0)	1	-*	
>>>Control Point Index	(300A,0112)	1	-*	
>>>Cumulative Time Weight	(300A,02D6)	2	-	As described in section X.1.1display the total time spent at each location.
>>>Control Point Relative Position	(300A,02D2)	1	-	
>>>Control Point 3D Position	(300A,02D4)	3	R+*	Shall be present.
>>>Control Point Orientation	(300A,0412)	3	R+*	Shall be present.
>>>Brachy Referenced Dose Reference Sequence	(300C,0055)	3	R+	Mandatory for the last Control Point, see DICOM PS 3.3 C.8.8.15.11. See Note 1 for display requirement.
>>>>Referenced Dose Reference Number	(300C,0051)	1	-	
>>>>Cumulative Dose Reference Coefficient	(300A,010C)	1	-	

Note 1: As a minimum, the dose contribution from all Channels to all Dose References shall be displayed.

7.4.4.6.3 RT Application Setup Module for LDR Temporary Plan

Attribute	Tag	LDR Temporary Technique		
			Presence	Specific Rules
Brachy Treatment Technique	(300A,0200)	1		Shall not be PERMANENT
Brachy Treatment Type	(300A,0202)	1		Shall be LDR
Treatment Machine Sequence	(300A,0206)	1	-	
>Treatment Machine Name	(300A,00B2)	2	-	
>Manufacturer	(0008,0070)	3	-	
>Institution Name	(0008,0080)	3	-	
>Institution Address	(0008,0081)	3	-	

Attribute	Tag	LDR Temporary Technique		
			Presence	Specific Rules
>Institutional Department Name	(0008,1040)	3	-	
>Manufacturer's Model Name	(0008,1090)	3	-	
>Device Serial Number	(0018,1000)	3	-	
Source Sequence	(300A,0210)	1		
>Source Number	(300A,0212)	1		
>Source Serial Number	(3008,0105)	3	-	
>Source Model ID	(300A,021B)	3	-	
>Source Description	(300A,021C)	3	R+	Use this for the full Model ID
>Source Type	(300A,0214)	1	-*	
>Source Manufacturer	(300A,0216)	3	-	
>Active Source Diameter	(300A,0218)	3	-	
>Active Source Length	(300A,021A)	3	-	
>Material ID	(300A,00E1)	3	-	
>Source Encapsulation Nominal Thickness	(300A,0222)	3	-	
>Source Encapsulation Nominal Transmission	(300A,0224)	3	-	
>Source Isotope Name	(300A,0226)	1	R+	Representation of the Source shall be in the SNOMED form: <Element>-<number of nucleons> e.g. Iridium-192
>Source Isotope Half Life	(300A,0228)	1	-*	
>Source Strength Units	(300A,0229)	1C	R+	Shall have a value without constraint for gamma-emitting source. Measurement unit of Source Strength. Enumberated Values: AIR_KERMA_RATE Air Kerma Rate DOSE_RATE_WATER Dose Rate in Water
>Reference Air Kerma Rate	(300A,022A)	1	R+	Required if source is calibrated in Air-Kerma-Rate. If not, value shall be 0.
>Source Strength	(300A,022B)	1C	R+	Source strength used to calculate the dwell times. Required if source is calibrated in Dose Rate in water. If not, attribute shall not be present.
>Source Strength Reference Date	(300A,022C)	1	-	
>Source Strength Reference Time	(300A,022E)	1	-	
Application Setup Sequence	(300A,0230)	1	R+*	Number of items shall be 1.
>Application Setup Type	(300A,0232)	1	-*	
>Application Setup Number	(300A,0234)	1	-*	
>Application Setup Name	(300A,0236)	3	-	

Attribute	Tag	LDR Temporary Technique		
			Presence	Specific Rules
>Application Setup Manufacturer	(300A,0238)	3	-	
>Template Number	(300A,0240)	3	-	
>Template Type	(300A,0242)	3	-	
>Template Name	(300A,0244)	3	-	
>Referenced Reference Image Sequence	(300C,0042)	3	-	
>Total Reference Air Kerma	(300A,0250)	1	-	
>Brachy Accessory Device Sequence	(300A,0260)	3	-	
>Channel Sequence	(300A,0280)	1	-*	
>>Referenced ROI Number	(3006,0084)	2C	-	
>>Channel Effective Length	(300A,0271)	3	-	
>>Channel Inner Length	(300A,0272)	2C	-	
>>Afterloader Channel ID	(300A,0273)	2C	-	
>>Channel Number	(300A,0282)	1	-*	
>>Channel Length	(300A,0284)	2	-	
>>Channel Total Time	(300A,0286)	1	-	Calculated Treatment Time
>>Source Movement Type	(300A,0288)	1	-*	
>>Referenced Source Number	(300C,000E)	1	-	
>>Number of Control Points	(300A,0110)	1	R*	See Open Issue #1
>>Final Cumulative Time Weight	(300A,02C8)	1C	R+	As described in section X.1.1, display the final dwell time value.
>>Brachy Control Point Sequence	(300A,02D0)	1	-	
>>>Control Point Index	(300A,0112)	1	-*	
>>>Cumulative Time Weight	(300A,02D6)	2	R+	As described in section X.1.1display the dwell time spent at each location.
>>>Control Point Relative Position	(300A,02D2)	1	R*	
>>>Control Point 3D Position	(300A,02D4)	3	R+*	Shall be present.
>>>Control Point Orientation	(300A,0412)	3	R+*	
>>>Brachy Referenced Dose Reference Sequence	(300C,0055)	3	R+	Mandatory for the last Control Point, see DICOM PS 3.3 C.8.8.15.11. See Note 1 for display requirement.
>>>>Referenced Dose Reference Number	(300C,0051)	1	-	
>>>>Cumulative Dose Reference Coefficient	(300A,010C)	1	-	

Note 1: As a minimum, the dose contribution from each Channel and all Channels to all Dose References shall be displayed.

7.4.5 Plan-Related Modules in Delivery

7.4.5.1 RT Beams

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

7.4.5.2 RT Tolerance Table

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

7.4.5.3 RT Patient Setup Module

7.4.5.3.1 RT Patient Setup Module for Treatment Delivery

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

7.4.6 Image-related Modules in Planning

7.4.6.3 RT Ultrasound Image for Brachytherapy

7.4.6.3.1 Referenced Standard

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7.4.6.3.2 Image Module Brachy Content

Attribute Name	Tag	Type	IHE-RO Usage	Attribute Description
Content Date	(0008,0023)	2C	R	Shall be present if Image Module is present in US images.
Content Time	(0008,0033)	2C	R	Shall be present if Image Module is present in US images.
…				

Attribute Name	Tag	Type	IHE-RO Usage	Attribute Description
Photometric Interpretation	(0028,0004)	1	R*	Shall be MONOCHROME2
Bits Allocated	(0028,0100)	1	R*	Shall be 8
Bits Stored	(0028,0101)	1	R*	Shall be 8
High Bit	(0028,0102)	1	R+	Shall be 7

7.4.7 Image-related Modules in Delivery

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

7.4.8 Image-related Modules in Delivery

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

7.4.8 Segment Modules

7.4.8.1 ROI Observations Module

7.4.8.1.1 ROI Observations Base Content

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

7.4.8.1.2 ROI Observations Base TBD

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

7.4.8.1.3 ROI Observations In HDR/PDR Brachy

Multiple RT Plans may reference the same RT Structure Set instance. For brachytherapy this means that the RT Structure Set can contain brachytherapy channel contours from multiple plans.

Base content applies except where noted below.

Attribute	Tag	Type	Presence	Attribute Note
RT ROI Observations Sequence	(3006,0080)			
>RT ROI Interpreted Type	(3006,00A4)		R+*	If referenced ROI has associated contours of type CLOSED_PLANAR, the content consumer must accept at minimum the following values: EXTERNAL PTV CTV GTV TREATED_VOLUME IRRAD_VOLUME BOLUS AVOIDANCE ORGAN CONTRAST_AGENT CAVITY BRACHY_SRC_APP BRACHY_CHNL_SHLD If referenced ROI has associated contours of type POINT, the content consumer must accept at minimum the following values: MARKER REGISTRATION ISOCENTER If referenced ROI has associated contours of type OPEN_NONPLANAR, the content consumer must accept at minimum the following values: BRACHY_CHANNEL See Note 1.
>>ROI Physical Property	(3006,00B2)		R+*	Only the following shall be supported: REL_MASS_DENSITY REL_ELEC_DENSITY

Note 1. The ROI with value 'BRACHY_CHANNEL' as the RT ROI Interpreted Type (3006,00A4) shall contain a single item in the Contour Sequence (3006,0040) and the Number of Contour Points (3006,0046) shall be two or greater. The points in the Contour Data (3006,0050) shall start from the distal end of the channel (the point furthest from the after-loader). See also Figure C.8.8.15-1 in DICOM standard part 3.

7.4.8.1.4 ROI Observations for LDR Permanent Brachy

No special Brachy requirements. Sources are not to be modeled as structures. Base requirements apply.

7.4.8.1.4 ROI Observations for LDR Temporary Brachy

No special Brachy requirements. Sources are not to be modeled as structures. Base requirements apply.

7.4.8.2 ROI Contour Module

7.4.8.2.1 ROI Contour Base Content

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

7.4.8.2.2 ROI Contour Offslice

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

7.4.8.2.3 ROI Contour In HDR/PDR Brachy

The Base content of tags apply unless superseded by the definitions below.

Attribute	Tag	Type	Attribute Note
ROI Contour Sequence	(3006,0039)		
>> Contour Geometric Type	(3006,0042)	R+*	OPEN_PLANAR shall not be used.

7.4.8.2.4 ROI Contour in LDR Brachytherapy

Base Applies; no special Brachy requirements.

7.4.8.3 RT Structure Set Module

7.4.8.3.3 RT Structure Set Module ~~in~~ Brachy Content

The Base content of attributes apply unless superseded by the definitions below.

Attribute	Tag	Type	Attribute Note
>>>>Referenced SOP Class UID	(0008,1155)	R+*	Must be present with a value of '1.2.840.10008.5.1.4.1.1.2', (CT) or '1.2.840.10008.5.1.4.1.1.4' (MR) or **'1.2.840.10008.5.1.4.1.1.6.1' (Ultrasound)**

7.4.6.2 Image Plane Module

7.4.6.2 Image Plane Brachy Content

7.4.13.3.2.1 Referenced Standard

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7.4.6.2.2 Module Content

The Base content of tags apply unless superseded by the definitions below.

Attribute Name	Tag	Type	IHE-RO Usage	Attribute Description
Image Orientation (Patient)	(0020,0037)	1	R+*	This element shall NOT be restricted to TRANSVERSE patient orientation only. The IOP (patient) shall create a cuboid dose pattern. That is, the frame shall be square or rectangular, the normal to the IOP shall point in the same direction and be in alignment. All frames shall have the same X and Y pixel sizes and a uniform Grid Frame Offset Vector (3004,000C)

7.4.13.3 RT Dose Module

7.4.13.3.1 RT Dose Module Base Content

7.4.13.3.2 RT Dose Module Brachy Content

RT Dose Module Base Content applies unless otherwise noted below.

Attribute Name	Tag	Type	IHE-RO Usage	Attribute Description
Bits Allocated	(0028,0100)	1C	R+*	Shall be present and equal to 32
Dose Type	(3004,0004)	1	R+	Shall be **PHYSICAL**

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615 Not applicable.