

Integrating the Healthcare Enterprise



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**IHE Radiation Oncology
Technical Framework Supplement**

10

**Consistent Dose Content for External Beam
Radiation
(CDEB)**

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Rev. 1.0 - Draft for Public Comment

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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

30 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 July 29, 2016 for Public Comment. Comments are invited and can be submitted at [http://www.ihe.net/Radiation Oncology Public Comments/](http://www.ihe.net/Radiation_Oncology_Public_Comments/). In order to be considered in development of the Trial Implementation version of the supplement, comments 35 must be received by August 28, 2016.

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.

<i>Amend Section X.X by the following:</i>
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40 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.

45 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>.

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

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100 Introduction to this Supplement

This supplement modifies Sections X and Y of the IHE-RO Technical Framework.

The intent of this supplement is to describe the specific ways to describe planned and delivered nominal dose in RT workflows. This supplement relies on the content objects DICOM^{®1} RT Plan and DICOM RT Beams Treatment Record.

105 Revision History

Date	Rev	Author	Change Summary
October 13, 2014	1.0	Chris Pauer (cpauer@accray.com)	First exercise of prototype DICOM Content Profile Template. Capturing content descriptions to define consistent indication and reporting of dose in existing first generation RT DICOM objects.
October 13, 2014	1.1	Chris Pauer (cpauer@accray.com)	Add modules and requirements in module table.
October 13, 2014	1.2	Chris Pauer (cpauer@accray.com)	Switched around “*” meaning, corrected.
January 22, 2015	1.3, 1.4	Chris Pauer (cpauer@accray.com)	Review by IHE-RO TC
February 25, 2015	1.5	Chris Pauer	Corrected some items
May 10, 2015	1.6	Chris Pauer	More formatting, fixed up 1.5 notations.
Oct 22, 2015	1.7	Chris Pauer	Removed actor references. Corrected content template references
Jan 24, 2016	1.8	Chris Pauer	Review that common content modules are correct. Check on specific content requirements. Review Brachy Application Setups. Review optional support multiple targets Add Table listing Target Multiplicity Options in Section 7.4.3.2.2 RT Prescription Module for Consistent Dose Tracking.
July 29, 2106	1.0	IHE Documentation Specialist - Mary Jungers	Initial IHE Public Comment publication

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

Open Issues and Questions

None

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Closed Issues

#	Intr. in	Resp.	Description
1	1.0	Pauer	Should RT Plan modules be in Composite IOD Object Module section, Common Composite Modules or other. Treatment Record module should be in Results (?) Modules are in areas as indicated at IHE-RO meeting of 1/2015
2	1.0	Pauer	Dose References: all required? All targets? Minimum of Primary Prescriptive Target? – Only primary target required, as per discussion of 2014-10-13
3	1.0	Pauer	Dose Description: required in all cases? – Yes, required for any entries in the Dose Reference Sequence
4	1.0	Pauer	ORGAN AT RISK constraint only has attached limits if type = VOLUME – Out of scope, ORGAN_AT_RISK not required
5	1.0	Pauer	Measured Dose Module vs. Calculated Dose Module
6	1.0	Pauer	Require GY? - Beam Dose is always in Gy.
8	1.2	Pauer	Move “grouping” table to IOD definition
7	1.2	Pauer	Diagram for interaction: needed? Remove Archive certainly. – Interaction diagram not needed as per 2014-10-13 Topic 11
9	1.2	Pauer	Prescription value note, they are not in scope in this profile – Added note in version 1.3
10	1.4	Pauer	Populate introduction
11	1.4	Pauer	Resolve Actor Definitions (Appendix A)
12	1.4	Pauer	Populate the actor information and supported modules
13	1.4	Pauer	Populate Option Note
14	1.6	Pauer	Profile is a content profile. Remove references to Actors and Transactions. Correct references to content to be included in DICOM section of Technical Framework. Review

General Introduction

115 *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

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

Actor	Definition
Consistent External Beam Dose Plan Producer	Actor produces an RT Plan that contains dose values to allow consistent dose representation and tracking
Consistent External Beam Dose Record Producer	Actor produces an RT Beams Treatment Record that contains dose values to allow consistent dose representation and tracking
Consistent External Beam Dose Plan Consumer	Actor consumes and checks for consistency an RT Plan that contains dose values to allow consistent dose representation and tracking
Consistent External Beam Dose Record Consumer	Actor consumes and checks for consistency an RT Beams Treatment Record that contains dose values to allow consistent dose representation and tracking.

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Glossary

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

No new terms

125

Volume 1 – Profiles

Copyright Licenses

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

130 Not applicable.

Domain-specific additions

Not applicable.

135 *Add Section X*

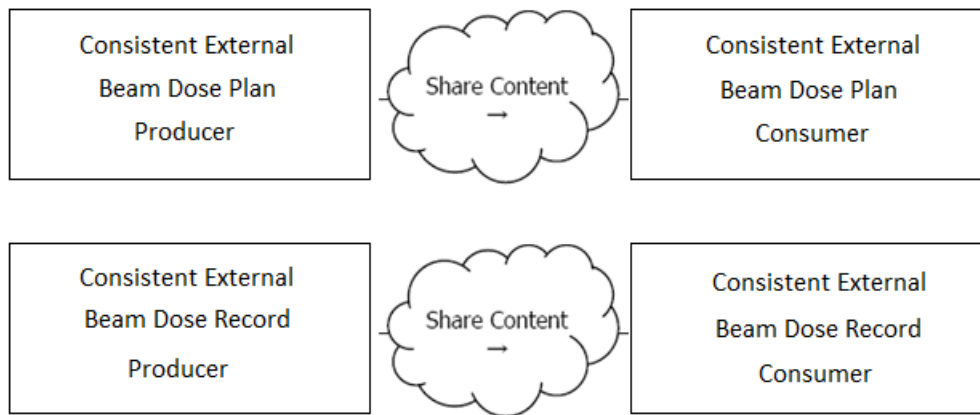
X Consistent Dose for External Beam (CDEB) Profile

X.1 CDEB Actors, Transactions, and Content Modules

140 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://ihe.net/Technical_Frameworks.

Figure X.1-1 shows the actors directly involved in the CDEB Profile and the direction that the content is exchanged.

145 A product implementation using this profile must group actors from this profile with actors from a workflow or transport profile to be functional. The grouping of the content module described in this profile to specific actors is described in more detail in the “Required Actor Groupings” section below.



150

Figure X.1-1: CDEB Actor Diagram

155 Table X.1-1 lists the content module defined in the CDEB Profile. To claim support with this profile, an actor shall support all required content modules (labeled “R”) but must adhere to at least one of the options described in Section X.2 Actor Options

Table X.1-1: CDEB Profile - Actors and Content Modules

Actors	Content Modules	Optionality	Reference
Consistent External Beam Dose Plan	RT Prescription Module for Consistent Dose Tracking –	O	CDEB TF-3: 7.4.3.2.3

Actors	Content Modules	Optionality	Reference
Producer	Multiple Target		
	RT Prescription Module for Consistent Dose Tracking – Single Target	R	CDEB TF-3: 7.4.3.2.3
	RT Fraction Scheme Module for Consistent Dose Tracking	R	CDEB TF-3: 7.4.3.3.1
	Control Point Attributes for Consistent Dose Tracking	R	CDEB TF-3: 7.4.4.2.2
Consistent External Beam Dose Record Producer	Calculated Dose Reference Record Module for Consistent Dose	R	CDEB TF-3: 7.4.11.1
Consistent External Beam Dose Plan Consumer	RT Prescription Module for Consistent Dose Tracking – Multiple Target	O	CDEB TF-3: 7.4.3.2.2
	RT Prescription Module for Consistent Dose Tracking – Single Target	R	CDEB TF-3: 7.4.3.2.3
	RT Fraction Scheme Module for Consistent Dose Tracking	R	CDEB TF-3: 7.4.3.3.1
	Control Point Attributes for Consistent Dose Tracking	R	CDEB TF-3: 7.4.4.2.2
Consistent External Beam Dose Record Consumer	Calculated Dose Reference Record Module for Consistent Dose	R	CDEB TF-3: 7.4.11.1

X.2 CDEB Actor Options

- 160 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: CDEB - Actors and Options

Actor	Option Name	Reference
Consistent External Beam Dose Plan Producer	RT Prescription Module for Multiple Targets	See 7.4.3.2.3
Consistent External Beam Dose Record Producer	No options defined	-
Consistent External Beam Dose Plan Consumer	RT Prescription Module for Multiple Targets	See 7.4.3.2.3
Consistent External Beam Dose Record Consumer	No options defined	-

X.2.1 RT Prescription Module Multiple Target Support

- 165 Actor will support multiple targets in the RT Prescription Module as described in 7.4.3.2.3

X.3 Required Actor Groupings

None

X.4 Consistent Dose Content Overview

X.4.1 Concepts

- 170 Consistent specification of how dose should be described in the original RT DICOM objects can be tested with an agreed upon description of dose components as defined here. This content profile aims to define specific required attributes needed to determine planned dose to dose reference, and then how to consistently report on those dose references.

X.4.2 Use Cases

- 175 Not applicable

Appendices

None

Volume 2 – Transactions

No transactions.

180

Appendices

None

Volume 3 – Content Modules

5 Namespaces and Vocabularies

Add to Section 5 Namespaces and Vocabularies

185

NA

6 Content Modules

No content module definitions.

190

7 DICOM Content Definition

7.3 IOD Definitions

195 7.3.2.2.3 RT Plan OID for Consistent Dose Tracking

7.3.2.2.3.1 Referenced Standards

DICOM PS 3.3

7.3.2.2.3.2 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	-
Equipment	General Equipment	C.7.5.1	M	M See 7.4.1.5.1
Plan	RT General Plan	C.8.8.9	M	-

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RT Prescription	C.8.8.10	U	R See Target Multiplicity Options below.
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 7.4.3.3.1 RT Fraction Scheme Module for Consistent Dose Tracking
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 Use appropriate Beams Module to Plan Type – Include 7.4.4.2.2 Control Point Attributes for Consistent Dose
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	-
SOP Common	C.12.1	M	M See 7.4.1.6.1

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Multiplicity of Targets	Reference
Multiple Target Support	See 7.4.3.2.3 RT Prescription Module for Consistent Dose Tracking – Multiple Target
Single Target Support	See 7.4.3.2.2 RT Prescription Module for Consistent Dose Tracking – Single Target

7.3.6.2.1 RT Treatment Record IOD for Consistent Dose Tracking

7.3.6.2.1.1 Referenced Standards

DICOM PS 3.3

205 7.3.6.2.1.2 IOD Definition

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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
Equipment	General Equipment	C.7.5.1	M	M See 7.4.1.5.1
Treatment Record	RT General Treatment Record	C.8.8.17	M	-
	RT Patient Setup	C.8.8.12	U	-
	RT Treatment Machine Record	C.8.8.18	M	-
	Measured Dose Reference Record	C.8.8.19	U	-
	Calculated Dose Reference Record	C.8.8.20	U	R See 7.4.11.1 Calculated Dose Reference Record Module for Consistent Dose
	RT Beams Session Record	C.8.8.21	M	-
	RT Treatment Summary Record	C.8.8.23	U	-
	SOP Common	C.12.1	M	M See 7.4.1.6.1
	Common Instance Reference	C.12.2	U	-

7.4 DICOM Content Modules

7.4.3.2.2 RT Prescription Module for Consistent Dose Tracking – Multiple Target

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Table 7.4.3.2.2-1: Required Attributes for RT Prescription Module-Multiple Target in RT Plan

Attribute	Tag	Presence	Specific Rules
Dose Reference Sequence	(300A, 0020)	R+*	At least one Dose Reference Item with Dose Reference Type = TARGET shall be included.
> Dose Reference Number	(300A,0012)	-	
> Dose Reference UID	(300A,0013)	R+*	Shall be present and unique to this dose reference, but can be used to indicate same dose reference across plans.
> Dose Reference Structure Type	(300A,0014)	-	
> Dose Reference Description	(300A,0016)	R+	Shall be present.
> Dose Reference Type	(300A,0020)	R*	

Note: the expression of the Prescription is out of scope for this profile.

215 7.4.3.2.3 RT Prescription Module for Consistent Dose Tracking – Single Target

Table 7.4.3.2.3-1: Required Attributes for RT Prescription Module – Single Target in RT Plan

Attribute	Tag	Presence	Specific Rules
Dose Reference Sequence	(300A, 0020)	R+*	Only one Dose Reference Item with Dose Reference Type = TARGET shall be included.
> Dose Reference Number	(300A,0012)	-	
> Dose Reference UID	(300A,0013)	R+*	Shall be present and unique to this dose reference, but can be used to indicate same dose reference across plans.
> Dose Reference Structure Type	(300A,0014)	-	
> Dose Reference Description	(300A,0016)	R+	Shall be present
> Dose Reference Type	(300A,0020)	R*	

Note: the expression of the Prescription is out of scope for this profile.

220 7.4.3.3.1 RT Fraction Scheme Module for Consistent Dose Tracking

Table 7.4.3.3.1-1: Required Attributes for RT Fraction Scheme Module in RT Plan

Attribute	Tag	Presence	Specific Rules
Fraction Group Sequence	(300A,0070)	R*	
> Number of Fractions Planned	(300A,0078)	R+	
> Number of Beams	(300A,0080)	R+*	Shall be greater than 0
> Referenced Beam Sequence	(300C,0004)	R+*	Shall contain 1 or more items
>>Beam Dose	(300A,0084)	R+*	Shall be present. Not necessarily tied to Beam Dose Specification Point. Allowed to be a scalar value used to indicate planned dose to dose references. This value shall indicate beam dose per fraction, not for entire plan. (As detailed in the DICOM Standard)

7.4.4.2.2 Control Point Attributes for Consistent Dose Tracking

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Table 7.4.4.2.2-1: Required Attributes for RT Beams Module in RT Plan

Attribute	Tag	Presence	Specific Rules
Beam Sequence	(300A,00B0)	R*	
>Control Point Sequence	(300A,0111)	R*	The following attributes shall appear for every control point.
>>Control Point Index	(300A,0112)	-	
>>>Referenced Dose Reference Sequence	(300C,0050)	R+*	Shall be present for all dose references in the RT Prescription Module of Dose Reference Type = TARGET. Other dose references may be present.
>>>>Referenced Dose Reference Number	(300C,0051)	R*	
>>>>Cumulative Dose Reference Coefficient	(300CA010C)	R+*	Shall be present

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7.4.11.1 Calculated Dose Reference Record Module for Consistent Dose

Table 7.4.11.1-1: Required Attributes for Calculated Dose Record Module in RT Beams Treatment Record

Attribute	Tag	Presence	Specific Rules
Calculated Dose Reference Sequence	(3008,0070)	R*	Shall be present for all dose references in the RT Plan RT Prescription Module of Dose Reference Type = TARGET. Other dose references may be present.
> Referenced Dose Reference Number	(300C,0051)	R+*	
>Calculated Dose Reference Dose Value	(3008,0076)	R+	Shall be present

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Appendices

None

Volume 3 Namespace Additions

<i>Add the following terms to the IHE Namespace:</i>
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240 None

245

Volume 4 – National Extensions

Add appropriate Country section

4 National Extensions

NA