Integrating the Healthcare Enterprise

IHE Radiation Oncology
Technical Framework Supplement

Treatment Planning – Plan Content (TPPC)

Draft for Trial Implementation

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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 October 23, 2015 for Public Comment. Comments are invited and can be submitted at http://www.ihe.net/Radiation_Oncology_Public_Comments/. In order to be considered in development of the Trial Implementation version of the supplement, comments must be received by November 23, 2015.

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 integration profile involves the exchange of RT Plan information between Treatment Planning Systems (TPS) and between Treatment Planning Systems and Treatment Management Systems (TMS). The emphasis for this profile is on reducing ambiguity involved in re-planning and incorporation of the planning information into the treatment management system in anticipation of transfer to a treatment delivery system. The transactions revolve around content rather than workflow.

This profile addresses a broad variety of "Beam Techniques" that exist in Radiation Therapy. Rather than define actors that had broad involvement in many optional transactions, a large number of actors were defined which have specific mandatory/required transactions and a small number of optional transactions related to beam modifiers. The actors are either producers or consumers of a DICOM RT Plan.

It is expected that the actual products commonly referred to as Treatment Planning Systems will implement one or more of the "producer" actors, and that the choice of which actors are implemented (for which adherence is claimed) will depend on the intended functionality (which is not defined by IHE-RO). A Treatment Planning System that is intended to be able to perform re-planning based on the output of another Treatment Planning System would be expected to adhere to one or more of the "consumer" actors.

It is expected that the actual products variously referred to as Oncology Information Systems, Oncology Information Management, or Electronic Medical Record for Oncology will implement the Treatment Management System Actor. While the profile does not dictate the functionality of the TMS, the TMS is responsible for providing an adequate view of the information provided to it (as a Beam Consumer) that in normal operating practice the appropriate user can ensure that the planning information has been properly consumed, associated with the correct patient, etc. As indicated in the table identifying actors and transactions, the TMS Actor must be able to act as the consumer in all retrieve transactions, i.e., consume all Beam Techniques.

Open Issues and Questions

#	Intr. in	Description

Closed Issues

#	Intr. in	Description
1	Prepub 1.0	This supplement is the successor of the ARTI supplement. The re-naming took place to be able to specify in more detail what this profile addresses as Treatment Planning – Plan Content was considered to be too broad and unspecific.

#	Intr. in	Description
2	Prepub 1.0	In addition to the re-naming of the profile the following changes were implemented (compared to the ARTI supplement): • The Primary Fluence Mode Sequence was added to all transactions. • High Dose Technique Type is now present in all transactions. • The Source to Wedge Tray Distance was removed from the Virtual and Motorized Wedge transactions. • All transactions for a Treatment Management System are optional. • The former (ARTI) actors for stereotactic treatments were re-named, as the term stereotactic is too overloaded and too unspecific.
3	Prepub 1.0	Primary Fluence Mode Sequence: now required for all beams. If NON_STANDARD shall be of type "FFF". This type is not defined by the Standard but it seems to be the de-facto-standard term. Should this be used or should we keep it open? What is about other terms, e.g., in case of "stereotactic" treatments? TC Decision (October 2013): Do not define specific IDs for non-standard cases.
4	Prepub 1.1	Add CP 1138 changes (Average Beam Dose Parameters) to support the QAPV Profile.
5	Prepub 1.1	High Dose Technique Type is of DICOM type 1C and type "NORMAL" has been removed from the DICOM standard by DICOM CP1132. Because of this CP the condition is now unambiguous. And therefore, for most of the beam types it now says that "If present, may not be ignored". For all kinds of intensity-modulated beams as well as (former) stereotactic beams it now says "If present, shall be HDR and may not be ignored". Is this what we wanted? TC 20140919: Already cleaned up in latest version of ARTI.
6	Prepub 1.0	Any more notes on the new Average Beam Dose verification parameters in the Fraction Scheme? TC 20140919: done.
7	Prepub 1.3	What's about plans with mixed treatment modalities (e.g., beams and arcs)? Or is this a testing issue only? TC 20140919: Action Item for Bruce to draft a section in chapter 6.3. Done.
8	Prepub 1.4	Re-consider the wording for the Table Top Positions as "shall be constant" could indicate that there is a value that is supposed to be constant. Perhaps "If present, shall be constant" (see proposal in B.3) TC 20141012: Attributes are O+* and shall state that if a value is present, it shall be constant. This does not force the type 2 value to become a Type 1.
9	Prepub 1.4	Add attribute Beam Dose Meaning (300A,008B) as required with a value BEAM_LEVEL to the Fraction Group Sequence? TC 20141012: This is not the appropriate attribute to describe this. On the other hand it is well described in the DICOM Standard.
10	Prepub 1.4	What is the actual use case for the Beam Dose at the Beam Dose specification point for a TPS consuming this value? (not questioning the use case of the Beam Doses for a TMS) TC 20141012: Adapted the requirements on the Type for producing and consuming actors to reflect actual clinical use cases
11	Prepub 1.4	Block Tray ID? TC 20141012: Still R+, no change in requirement.
12	Prepub 1.4	Number of Blocks for Electron Beams? Just 1? TC 20141012: For Electron Beams 0 or 1 blocks, photon beams unchanged.
13	Prepub 1.4	Change requirement for SSD in Control Point Sequence: R+ (nor R+*) when Setup Technique is FIXED_SSD. TC 20141012: Updated the requirements with notation that was agreed upon for the Beam Dose issue and different actors in different use cases.

#	Intr. in	Description
14	Prepub 1.4	SSD is R+* for arcs? Is this correct? TC 20141013: Removed
15	Prepub 1.3	Multi-target plans? TC 20140919: Action item for Uli and Jim to draft a proposal. TBD at the next face-to-face meeting. TC 20141013: Done, see the discussion for Beam Dose Representation Point. This is now also deferred to the Dose Consistency content profile.
17	Prepub 1.3	Mixed treatment modalities with multiple treatment machines (Multi-Prescription plans)? TC 20140919: Action Item for Walter and Bruce to address the Clinical Advisory Sub-committee. TC 20141013: Decision that all beams within one plan are one the same machine.
18	Prepub 1.3	Fluence Mode ID: is currently R+, which does not make much sense in case Fluence Mode is STANDARD. Proposal: remove attribute from profile as only DICOM condition should apply. TC 20141013: Introducing a new type "D" that does not change the DICOM type, but only requires the attribute value to be displayed. Action noted for Chris to CP the Technical Framework, including the new notion of <SCP>/<SCU> for attributes with different types for different actors.
19	Prepub 1.4	Should we add CP 1331 "Treatment Time in RT Plan" to the profile as it provides an additional standardized channel for verification? (already added to the Fraction Group, to be deleted if not wanted). TC 20141013: Basic decision is to add it, but Uli and Jim to find out about overall delivery time (e.g., in case of gated treatments). 20141201: Answer from Jim: the CP basically reflects the internal behavior. 20150120: Rather a topic for TDPC, not for TPPC.
20	Prepub 1.4	Feedback during testing: rename Conformal Arc and (MLC) Arc: in case the leaves are not changing call this a Static Conformal Arc. When the leaves are moving during gantry movement call this Dynamic Conformal (MLC) Arc. TC 20141012: rename Conformal Arc to MLC Variable Aperture Arc and MLC Arc to MLC Fixed Aperture Arc.
21	Prepub 1.4	Discussion about usage of Beam Dose and Beam Dose Specification Point. TC 20141012: The TC agreed that it would be best to abandon the concept of the Beam Dose Specification Point but still there are systems in the field that rely on its presence. An updated approach was discussed where the Beam Dose is referenced through the Cumulative Dose Reference Coefficient back to the Dose Reference Item with Dose Reference Type TARGET. Chris to draft a proposal for a "dose consistency" profile for dose tracking where these parts will moved to and referenced from within this profile. TC 20141013: Based on the timeline for content profiles it needs to be decided if this still needs to be worked in to TPPC or if we stay with the separate profiles (background: when do we define the switch from ARTI to TPPC?) TC20150122: Decision to not address this for now, but rather develop the CDEB Profile and add new requirements regarding the Dose Reference Sequence in a next version of TPPC.
22	Prepub 1.4	Add CP 1399 "Add Effective Wedge Angle" (in ballot). TC 20141012: Basically done: Added attribute to motorized wedge table, but DICOM tag is still missing – should be available soon for final text of the CP. 20141201: CP is in standard, attribute tags are updated.

#	Intr. in	Description
23	Prepub 1.5	20141201: Add a TMS vs. TPS differentiation also for Referenced Dose Reference Sequence so that a TMS has to require these attributes, but a TPS does not necessarily have to consume this information,? 20150120: Decision to adapt it. See also item #26. 20150126: done
24	Prepub 1.5	20141201: Figure 6.5.2.2-1 direction of arrow of Beam Consumer to the archive: what does the arrow actually indicate? Data flow? "Basic interaction"? "Getting data from…"? 20150120: update it. 20150126: done
26	Prepub 1.7	TC20150120: Update all consumer/producer condition pairs to producer/consumer. 20150126: done.
25	Prepub 1.6	Update attribute of "Source to External Contour Distance" and "Average Beam Dose Point Source to External Contour Distance" once DICOM CP 1434 is ready. 20150120: waiting for March meeting of WG-06 20150504: Done
27	Prepub 1.7	Results of discussion of TDPC: Add additional requirements for Series Date and Time to TPPC. Also add Equipment Module, Frame of Reference Module, 20150504: added referenced to TPPC Profile and re-using the definitions from there.
28	Prepub 1.9	Issue 22 introduced the Effective Wedge Angle. The question is now, whether the second paragraph in chapter 3.31.4.1.2.1 is still required? TC20150510: Decision to keep paragraph for clarification
29	Prepub 1.9	There are a few "left-over chapters" at the end of the document that have not yet been folded in the new DICOM Content Definition structure. How should these remains be best folded in as they do not represent a specific module, but parts of a module, referenced from multiple locations? In the beginning of the section on the Beams Module? Or the first chapter using these text macros, introducing them there as sub-chapters and then and referencing to there? TC20150510: Move to chapter 7.4.4.2 "General Beam Attribute Specifications" and 7.4.4.3 "Beam Option Specifications"
16	Prepub 1.4	How to handle Plan Relationship of multiple DICOM RT Plans representing a conceptual treatment. Issue is kept open for Public Comment and WG-07 is asked to look at this question in parallel TC20180208: WG-07 recommends usage of term CONCURRENT in this case according to DICOM Standard. No additional requirement necessary for this profile
17	1.2 (Trial)	Include CP 1658 + CP 1762 and CP 1659
18	1.2 (Trial)	TC20180122: Remove distances from profile (recommended by WG-07) – Beam Dose Verification Verification CP Sequence (300A,008C),Surface Entry Point (300A,012E), External Contour Entry Point (300A,0133), Source to Surface Distance (300A,0130), Source to External Contour Distance (300A,0132)
19	1.2 (Trial)	Clarified wording Primary Fluence Mode – see issue #3 - Test instructions shall specify value for beam modelling
20	1.2 (Trial)	TC20180208: Remove Beam Delivery Duration Limit (300A,00C5)
21	1.2 (Trial)	TC20180208: Clarified specific rules for Source to Wedge Tray Distance (300A,00DA), Effective Wedge Angle(300A,00DE) and Wedge Angle (300A,00D5) for Virtual Wedge and Motorized Wedge
22	1.3(Trial)	TC20180716: Remove Source to Surface Distance (300A,0130) and Source to External Contour Distance (300A,0132) from Control Point Sequence in accordance with WG-07

#	Intr. in	Description
		(Minutes 15th Jan, 2018) Adjusted order of producer/consumer description in Module Description of section 7.4 to match order in Types/Presence column
23	1.4 (Trial)	Indentation Applicator Aperture Shape corrected
24	1.4 (Trial)	Removed TMS formulation for Effective Wedge Angle for Motorized Wedge (7.4.4.1.8)
25	1.4 (Trial)	TC20181018: Decision to add SSD for Basic Static Electron Beam (7.4.4.1.9)
26	1.4 (Trial)	TC20181018: Decision to retain Dose Rate requirement
27	1.5 (Trial)	Clarification Dose Type RT Prescription Module (7.4.3.2.1)

Volume 1 – Profiles

1.7 History of Annual Changes

Add the following to the IHE Technical Frameworks General Introduction Section 1.7:

- Treatment Planning – Plan Content Profile: This integration profile involves the exchange of RT Plan information between treatment planning systems and between treatment planning systems and treatment management systems. The emphasis for this profile is on reducing ambiguity involved in re-planning and incorporation of the planning information in to the treatment management system in anticipation of transfer to a treatment delivery system.

1.9 Copyright Permission

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

Add Section 6.

6 Treatment Planning – Plan Content Integration (TPPC) Profile

This integration profile involves the exchange of RT Plan information between treatment planning systems and between treatment planning systems and treatment management systems. The emphasis for this profile is on reducing ambiguity involved in re-planning and incorporation of the planning information in to the treatment management system in anticipation of transfer to a treatment delivery system. The transactions revolve around content rather than workflow.

This profile addresses a broad variety of "Beam Techniques" that exist in Radiation Therapy. Rather than define actors that had broad involvement in many optional transactions, a large number of actors were defined which have specific mandatory/required transactions and a small number of optional transactions related to beam modifiers. The actors are either producers or consumers of a DICOM RT Plan.

6.1 TPPC Actors, Transactions, and Content Modules

Figure 6.1-1 shows the actors directly involved in the TPPC 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.

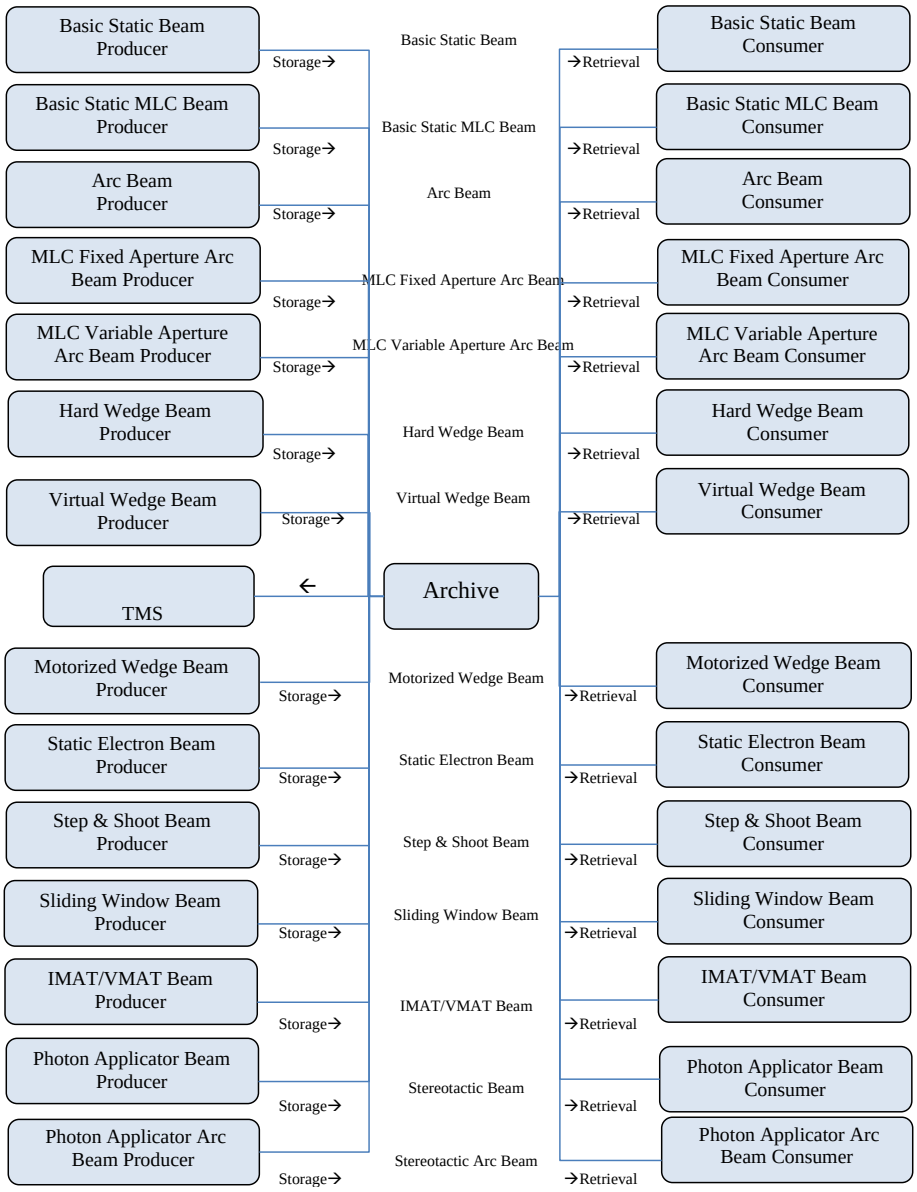


Figure 6.1-1: TPPC Actor Diagram

595 Table 6.1-1 lists the transactions for each actor directly involved in the TPPC Profile. In order to claim support of this Profile, an implementation of an actor must perform the required transactions (labeled "R") and may support the optional transactions (labeled "O"). Actor groupings are further described in Section 6.3.

600 **Table 6.1-1: TPPC Profile - Actors and Transactions**

Actors	Transactions	Optionality	Section in Vol. 2
Archive	Basic Static Beam Storage	R	TPPC-01
	Basic Static Beam Retrieval	R	TPPC-02
	Basic Static MLC Beam Storage	R	TPPC-03
	Basic Static MLC Beam Retrieval	R	TPPC-04
	Arc Beam Storage	R	TPPC-05
	Arc Beam Retrieval	R	TPPC-06
	MLC Fixed Aperture Arc Beam Storage	R	TPPC-07
	MLC Fixed Aperture Arc Beam Retrieval	R	TPPC-08
	MLC Variable Aperture Arc Beam Storage	R	TPPC-09
	MLC Variable Aperture Arc Beam Retrieval	R	TPPC-10
	Hard Wedge Beam Storage	R	TPPC-11
	Hard Wedge Beam Retrieval	R	TPPC-12
	Virtual Wedge Beam Storage	R	TPPC-13
	Virtual Wedge Beam Retrieval	R	TPPC-14
	Motorized Wedge Beam Storage	R	TPPC-15
	Motorized Wedge Beam Retrieval	R	TPPC-16
	Static Electron Beam Storage	R	TPPC-17
	Static Electron Beam Retrieval	R	TPPC-18
	Step & Shoot Beam Storage	R	TPPC-19
	Step & Shoot Beam Retrieval	R	TPPC-20
	Sliding Window Beam Storage	R	TPPC-21
	Sliding Window Beam Retrieval	R	TPPC-22
	IMAT/VMAT Beam Storage	R	TPPC-23
	IMAT/VMAT Beam Retrieval	R	TPPC-24
	Photon Applicator Beam Storage	R	TPPC-25
	Photon Applicator Beam Retrieval	R	TPPC-26
	Photon Applicator Arc Beam	R	TPPC-27

Actors	Transactions	Optionality	Section in Vol. 2
	Storage		
	Photon Applicator Arc Beam Retrieval	R	TPPC-28
Treatment Management System (TMS) (See Note Below)	Basic Static Beam Retrieval	O	TPPC-02
	Basic Static MLC Beam Retrieval	O	TPPC-04
	Arc Beam Retrieval	O	TPPC-06
	MLC Fixed Aperture Arc Beam Retrieval	O	TPPC-08
	MLC Variable Aperture Arc Beam Retrieval	O	TPPC-10
	Hard Wedge Beam Retrieval	O	TPPC-12
	Virtual Wedge Beam Retrieval	O	TPPC-14
	Motorized Wedge Beam Retrieval	O	TPPC-16
	Static Electron Beam Retrieval	O	TPPC-18
	Step & Shoot Beam Retrieval	O	TPPC-20
	Sliding Window Beam Retrieval	O	TPPC-22
	IMAT/VMAT Beam Retrieval	O	TPPC-24
	Photon Applicator Beam Retrieval	O	TPPC-26
	Photon Applicator Arc Beam Retrieval	O	TPPC-26
Basic Static Beam Producer	Basic Static Beam Storage	R	TPPC-01
Basic Static Beam Consumer	Basic Static Beam Retrieval	R	TPPC-02
Basic Static MLC Beam Producer	Basic Static MLC Beam Storage	R	TPPC-03
Basic Static MLC Beam Consumer	Basic Static MLC Beam Retrieval	R	TPPC-04
Arc Beam Producer	Arc Beam Storage	R	TPPC-05
Arc Beam Consumer	Arc Beam Retrieval	R	TPPC-06
MLC Fixed Aperture Arc Beam Producer	MLC Fixed Aperture Arc Beam Storage	R	TPPC-07
MLC Fixed Aperture Arc Beam Consumer	MLC Fixed Aperture Arc Beam Retrieval	R	TPPC-08
MLC Variable Aperture Arc Beam Producer	MLC Variable Aperture Arc Beam Storage	R	TPPC-09
MLC Variable Aperture Arc Beam Consumer	MLC Variable Aperture Arc Beam Retrieval	R	TPPC-10
Hard Wedge Beam Producer	Hard Wedge Beam Storage	R	TPPC-11
Hard Wedge Beam Consumer	Hard Wedge Beam Retrieval	R	TPPC-12
Virtual Wedge Beam Producer	Virtual Wedge Beam Storage	R	TPPC-13
Virtual Wedge Beam Consumer	Virtual Wedge Beam Retrieval	R	TPPC-14
Motorized Wedge Beam Producer	Motorized Wedge Beam Storage	R	TPPC-15
Motorized Wedge Beam Consumer	Motorized Wedge Beam Retrieval	R	TPPC-16
Static Electron Beam Producer	Static Electron Beam Storage	R	TPPC-17

Actors	Transactions	Optionality	Section in Vol. 2
Static Electron Beam Consumer	Static Electron Beam Retrieval	R	TPPC-18
Step & Shoot Beam Producer	Step & Shoot Beam Storage	R	TPPC-19
Step & Shoot Beam Consumer	Step & Shoot Beam Retrieval	R	TPPC-20
Sliding Window Beam Producer	Sliding Window Beam Storage	R	TPPC-21
Sliding Window Beam Consumer	Sliding Window Beam Retrieval	R	TPPC-22
IMAT/VMAT Beam Producer	IMAT/VMAT Beam Storage	R	TPPC-23
IMAT/VMAT Beam Consumer	IMAT/VMAT Beam Retrieval	R	TPPC-24
Photon Applicator Beam Producer	Stereotactic Beam Storage	R	TPPC-25
Photon Applicator Beam Consumer	Stereotactic Beam Retrieval	R	TPPC-26
Photon Applicator Arc Beam Producer	Stereotactic Arc Beam Storage	R	TPPC-27
Photon Applicator Arc Beam Consumer	Stereotactic Arc Beam Retrieval	R	TPPC-28

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 14 transactions, while a Radiosurgery TMS may only support the Stereotactic-oriented beams. 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.

6.1.1 Actor Descriptions and Actor Profile Requirements

Normative requirements are typically documented in Volume 2 (Transactions) and Volume 3 (Content Modules). Some Integration Profiles, however, contain requirements which link transactions, data, and/or behavior. Those Profile requirements are documented in this section as normative requirements ("shall").

6.2 TPPC Transaction Options

Options that may be selected for this Profile are listed in the Table 6.2-1 along with the Transactions to which they apply. In Table 6.1-1, each * Beam Producer has exactly one transaction, * Beam Storage. Similarly, each * Beam Consumer has exactly one transaction, * Beam Retrieval. For each of these, there are additional content options as noted in Table 5.2-1 from the set of {Bolus, Block, Compensator, Hard Wedge}. One or more of these content additions can be added to the base transaction based on the Integration Statement for the application. The Archive Actor must implement all options of all transactions. The TMS Actor must implement all options of all Retrieval transactions. Dependencies between options when applicable are specified in notes.

Table 6.2-1: TPPC - Transaction Options

Transactions	Options	Optionality	Section in Vol 2
Basic Static Beam Storage	Bolus Beam Modifier	O	3.19
	Block Beam Modifier	O	3.19
	Compensator Beam Modifier	O	3.19
Basic Static Beam Retrieval	Bolus Beam Modifier	O	3.20
	Block Beam Modifier	O	3.20
	Compensator Beam Modifier	O	3.20
Basic Static MLC Beam Storage	Bolus Beam Modifier	O	3.21
	Compensator Beam Modifier	O	3.21
Basic Static MLC Beam Retrieval	Bolus Beam Modifier	O	3.22
	Compensator Beam Modifier	O	3.22
Arc Beam Storage	Bolus Beam Modifier	O	3.23
	Block Beam Modifier	O	3.23
Arc Beam Retrieval	Bolus Beam Modifier	O	3.24
	Block Beam Modifier	O	3.24
MLC Fixed Aperture Arc Beam Storage	Bolus Beam Modifier	O	3.25
MLC Fixed Aperture Arc Beam Retrieval	Bolus Beam Modifier	O	3.26
MLC Variable Aperture Arc Beam Storage	Bolus Beam Modifier	O	3.27
	Block Beam Modifier	O	3.27
MLC Variable Aperture Arc Beam Retrieval	Bolus Beam Modifier	O	3.28
	Block Beam Modifier	O	3.28
Hard Wedge Beam Storage	Bolus Beam Modifier	O	3.29
	Block Beam Modifier	O	3.29
	Compensator Beam Modifier	O	3.29
Hard Wedge Beam Retrieval	Bolus Beam Modifier	O	3.30
	Block Beam Modifier	O	3.30
	Compensator Beam Modifier	O	3.30
Virtual Wedge Beam Storage	Bolus Beam Modifier	O	3.31
	Block Beam Modifier	O	3.31
	Compensator Beam Modifier	O	3.31
	Hard Wedge Beam Modifier	O	3.31
Virtual Wedge Beam Retrieval	Bolus Beam Modifier	O	3.32
	Block Beam Modifier	O	3.32
	Compensator Beam Modifier	O	3.32
	Hard Wedge Beam Modifier	O	3.32
Motorized Wedge Beam Storage	Bolus Beam Modifier	O	3.33
	Block Beam Modifier	O	3.33
	Compensator Beam Modifier	O	3.33

Transactions	Options	Optionality	Section in Vol 2
	Hard Wedge Beam Modifier	O	3.33
Motorized Wedge Beam Retrieval	Bolus Beam Modifier	O	3.34
	Block Beam Modifier	O	3.34
	Compensator Beam Modifier	O	3.34
	Hard Wedge Beam Modifier	O	3.34
Static Electron Beam Storage	Bolus Beam Modifier	O	3.35
	Block Beam Modifier	O	3.35
	Compensator Beam Modifier	O	3.35
Static Electron Beam Retrieval	Bolus Beam Modifier	O	3.36
	Block Beam Modifier	O	3.36
	Compensator Beam Modifier	O	3.36
Step & Shoot Beam Storage	Bolus Beam Modifier	O	3.37
	Block Beam Modifier	O	3.37
	Compensator Beam Modifier	O	3.37
	Hard Wedge Beam Modifier	O	3.37
Step & Shoot Beam Retrieval	Bolus Beam Modifier	O	3.38
	Block Beam Modifier	O	3.38
	Compensator Beam Modifier	O	3.38
	Hard Wedge Beam Modifier	O	3.38
Sliding Window Beam Storage	Bolus Beam Modifier	O	3.39
	Block Beam Modifier	O	3.39
	Compensator Beam Modifier	O	3.39
	Hard Wedge Beam Modifier	O	3.39
Sliding Window Beam Retrieval	Bolus Beam Modifier	O	3.40
	Block Beam Modifier	O	3.40
	Compensator Beam Modifier	O	3.40
	Hard Wedge Beam Modifier	O	3.40
IMAT/VMAT Beam Storage	Bolus Beam Modifier	O	3.41
IMAT/VMAT Beam Retrieval	Bolus Beam Modifier	O	3.42
Photon Applicator Beam Storage	Bolus Beam Modifier	O	3.43
Photon Applicator Beam Retrieval	Bolus Beam Modifier	O	3.44
Photon Applicator Arc Beam Storage	Bolus Beam Modifier	O	3.45
Photon Applicator Arc Beam Retrieval	Bolus Beam Modifier	O	3.46

6.2.1 Producer / Consumer Transaction Groupings

Although not within the scope of this profile, it is possible for a clinical application to produce a treatment plan using several beams, each of which is defined by a different **Beam Storage** transaction as defined in this profile. For Producers, it is clinically acceptable for them to create a treatment plan with beams satisfying any of the Producer transactions with which they claim adherence. For such cases, a Consumer actor which also claims adherence to **Beam Retrieval** transactions encompassing the composited treatment plan may be able to receive such a plan containing a mixed transaction set of beams. However, if the Consumer actor cannot accept a plan with such a mixed set of beams, it must be able to handle the rejection of the plan in a safe manner.

Although an application may claim adherence to a set of transactions involving one or more Producer / Consumer pairs, the plan produced may not be deliverable by the equipment defined in a specific SOP instance created by a transaction. It is not required that all transactions defined in this profile are capable of being delivered by all delivery devices. As a result, there may be single transaction plans, or mixed transaction plans, that are not capable of being delivered by a given delivery device, even though it is defined as the delivery device in the treatment plan. The application user must be aware of the limitations of their delivery equipment, and should configure, where possible, their treatment planning systems and treatment management systems so that such incompatible plans cannot be created. Where such configuration is not possible, the application user should be aware of the limitations, and recognize that such plans may fail to be accepted when transferred to the delivery equipment, which is responsible for handling such incompatible plans in a safe manner.

6.3 TPPC Actor Required Groupings

Actor(s) which are required to be grouped with another actor(s) are listed in this section. The grouped actor may be from this profile or a different domain/profile. These mandatory required groupings, plus further descriptions if necessary, are given in the table below.

An actor from this profile (Column 1) must implement all of the required transactions in this profile in addition to all of the required transactions for the grouped profile/actor listed (Column 2).

Table 6.3-1: TPPC - Actors Required Groups

TPPC Actor	Required Grouping Actor	Technical Framework Reference	Note
Archive	None	--	
Treatment Management System	None	--	
Basic Static Beam Producer	None	--	
Basic Static Beam Consumer	None	--	
Basic Static MLC Beam Producer	None	--	
Basic Static MLC Beam Consumer	None	--	

TPPC Actor	Required Grouping Actor	Technical Framework Reference	Note
Arc Beam Producer	None	--	
Arc Beam Consumer	None	--	
MLC Fixed Aperture Arc Beam Producer	None	--	
MLC Fixed Aperture Arc Beam Consumer	None	--	
MLC Variable Aperture Arc Beam Producer	None	--	
MLC Variable Aperture Arc Beam Consumer	None	--	
Hard Wedge Beam Producer	None	--	
Hard Wedge Beam Consumer	None	--	
Virtual Wedge Beam Producer	None	--	
Virtual Wedge Beam Consumer	None	--	
Motorized Wedge Beam Producer	None	--	
Motorized Wedge Beam Consumer	None	--	
Static Electron Beam Producer	None	--	
Static Electron Beam Consumer	None	--	
Step & Shoot Beam Producer	None	--	
Step & Shoot Beam Consumer	None	--	
Sliding Window Beam Producer	None	--	
Sliding Window Beam Consumer	None	--	
IMAT/VMAT Beam Producer	None	--	
IMAT/VMAT Beam Consumer	None	--	
Photon Applicator Beam Producer	None	--	
Photon Applicator Beam Consumer	None	--	
Photon Applicator Arc Beam Producer	None	--	
Photon Applicator Arc Beam Consumer	None	--	

6.4 TPPC Document Content Module

Not applicable.

6.5 TPPC Overview

This integration profile involves the exchange of RT Plan information between treatment planning systems and between treatment planning systems and treatment management systems. The emphasis for this profile is on reducing ambiguity involved in re-planning and incorporation of the planning information in to the treatment management system in anticipation of transfer to a treatment delivery system.

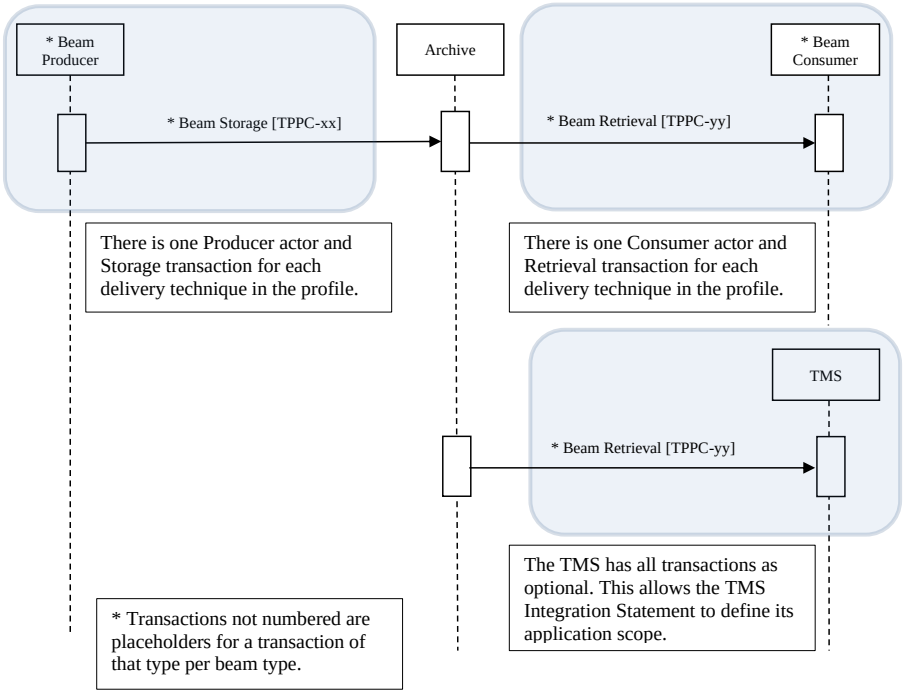


Figure 6.5.1-1: Overall Process Flow in TPPC Profile

6.5.1 Concepts

This integration profile involves the exchange of RT Plan information between treatment planning systems and between treatment planning systems and treatment management systems. The emphasis for this profile is on reducing ambiguity involved in re-planning and incorporation

of the planning information in to the treatment management system in anticipation of transfer to a treatment delivery system. The transactions revolve around content rather than workflow.

This profile addresses a broad variety of "Beam Techniques" that exist in Radiation Therapy. Rather than define actors that have broad involvement in many optional transactions, a large number of actors were defined which each have specific mandatory/required transactions and a small number of optional transactions related to beam modifiers. The actors are either producers or consumers of a DICOM RT Plan.

It is expected that the actual products commonly referred to as Treatment Planning Systems will implement one or more of the "producer" actors, and that the choice of which actors are implemented (for which adherence is claimed) will depend on the intended functionality (which is not defined by IHE-RO). A Treatment Planning System that is intended to be able to perform re-planning based on the output of another Treatment Planning System would be expected to adhere to one or more of the "consumer" actors.

It is expected that the actual products variously referred to as Oncology Information Systems, Oncology Information Management, or Electronic Medical Record for Oncology will implement the Treatment Management System (TMS) Actor. While the profile does not dictate the functionality of the TMS, the TMS is responsible for providing an adequate view of the information provided to it (as a Beam Consumer) such that, in normal operating practice, the appropriate user can ensure that the planning information has been properly consumed, associated with the correct patient, etc. No transactions have been defined between the TMS Actor in this profile and the TMS Actor in other profiles, and any necessary interface is considered private (in the same way that an Image Manager and an Image Archive are related in the Radiology Domain Scheduled Workflow Profile). In practice, it is expected that once a TMS has consumed the information provided to it by a Beam Producer, the system incorporating the TMS Actor will then be able to act as the TMS in delivery-oriented profiles and provide that information to a Treatment Delivery System Actor in that profile. It is not expected that a TMS Actor for this profile from one vendor will interoperate with a TMS Actor for other delivery profiles from another vendor. As indicated in the table identifying actors and transactions, the TMS Actor can support retrieval of any of the beam types (all transactions are optional). The TMS shall indicate in its Integration Statement the scope of its capabilities (i.e., which beam types it supports). It is expected that a TMS will support most, if not all, beam types. However, there may be beam types for which full testing is not possible due to limitations on the number of producers of a specific beam type, hence the optional transaction list.

It should also be noted that chapter 7 in this Supplement's Volume 3 specifies content that is mandatory across all transactions.

Finally, there are individual attributes within a RT Plan that are not specified in this profile, but have significant safety implications if ignored. As much as possible, these attributes have been identified in the transactions and it is indicated that a 'retrieval' actor shall handle RT Plans that may include these attributes in a safe manner. This behavior can include rejection of the RT Plan or appropriate warmings (with user acknowledgement) as possible courses of action in such circumstances.

6.5.2 Use Case #1: Treatment Replanning

A radiation oncology treatment planning system (TPS) creates and stores a treatment plan according to one of the techniques specified. A second TPS, requiring the initial plan in order to add/change information, retrieves the original treatment plan, modifies the plan, and then stores the modified treatment plan as a new plan to the archive.

6.5.2.1 Treatment Re-planning Use Case Description

- A TPS, through transactions not described in this profile (but similar to the IHE-RO Basic Radiation Therapy Objects Profile) acquires sufficient information to create a treatment plan according to one of the treatment techniques described in this profile.
- The treatment plan is stored to the archive.
- A second TPS, required the original treatment plan in order to modify it, will read in the original plan, perform modifications to the plan, and then save the modified plan as a new plan to the archive.

6.5.2.2 Treatment Replanning Process Flow

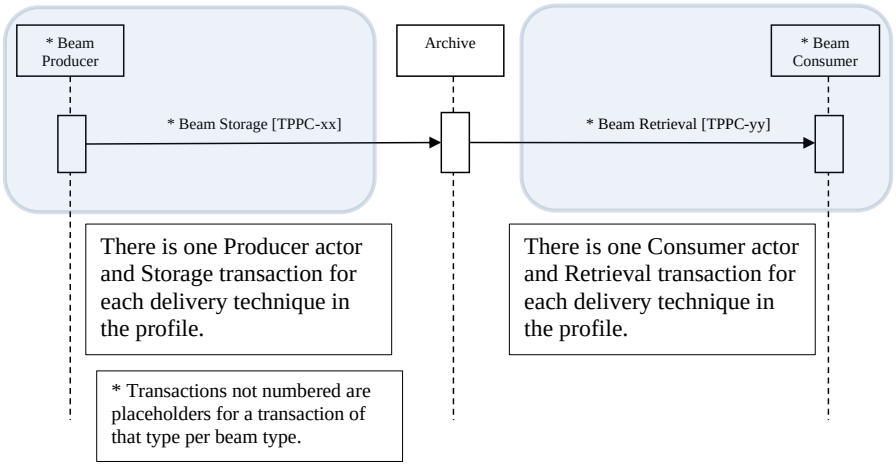


Figure 6.5.2.2-1: Process Flow for Treatment Replanning Use Case

6.5.3 Use Case #2: TMS Upload

A radiation oncology treatment planning system (TPS) creates and stores a treatment plan according to one of the techniques specified. The Treatment Management System (TMS)

retrieves the treatment plan in order to process it for further use and potential delivery (not included in this profile).

6.5.3.1 TMS Upload Use Case Description

- A TPS, through transactions not described in this profile (but similar to the IHE-RO Basic Radiation Therapy Objects Profile) acquires sufficient information to create a treatment plan according to one of the treatment techniques described in this profile.
- The treatment plan is stored to the archive.
- A TMS retrieves the plan from the archive.

6.5.3.2 TMS Upload Process Flow

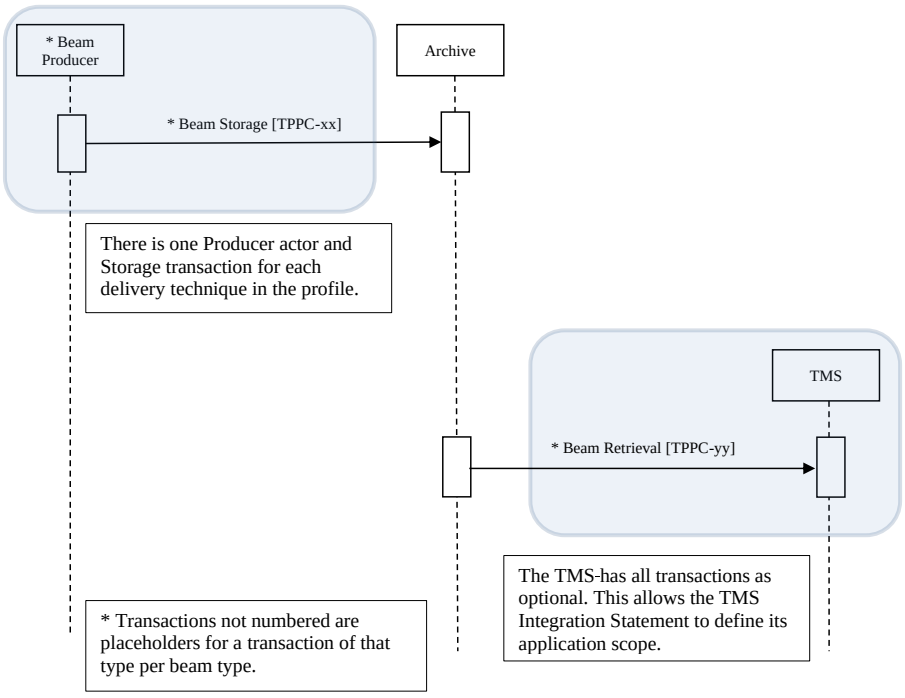


Figure 6.5.3.2-1: Process Flow for TMS Upload Use Case

6.6 TPPC Security Considerations

Not Applicable

6.7 TPPC Cross Profile Considerations

Not Applicable

Appendices

Appendix A Actor Summary Definitions

Add the following terms to the IHE TF General Introduction Appendix A:

Basic Static Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static, non-MLC, treatment beams.

Basic Static Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static, non-MLC, treatment beams.

Basic Static MLC Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static, MLC, treatment beams.

Basic Static MLC Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static, MLC, treatment beams.

Arc Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with non-MLC Fixed Aperture Arc treatment beams.

Arc Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with non-MLC Fixed Aperture Arc treatment beams.

MLC Fixed Aperture Arc Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with MLC Fixed Aperture Arc treatment beams.

MLC Fixed Aperture Arc Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with MLC Fixed Aperture Arc treatment beams.

MLC Variable Aperture Arc Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with MLC Variable Aperture Arc treatment beams.

MLC Variable Aperture Arc Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with MLC Variable Aperture Arc treatment beams.

Hard Wedge Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static treatment beams using physical wedges.

Hard Wedge Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static treatment beams using physical wedges.

Virtual Wedge Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static treatment beams using virtual wedges.

Virtual Wedge Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static treatment beams using virtual wedges.

Motorized Wedge Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static treatment beams using motorized wedges.

Motorized Wedge Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static treatment beams using motorized wedges.

Static Electron Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static electron treatment beams.

Static Electron Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static electron treatment beams.

Step & Shoot Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with step & shoot IMRT treatment beams.

Step & Shoot Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with step & shoot IMRT treatment beams.

Sliding Window Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with sliding window IMRT treatment beams.

Sliding Window Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with sliding window IMRT treatment beams.

IMAT/VMAT Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with VMAT/IMAT IMRT treatment beams.

IMAT/VMAT Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with VMAT/IMAT IMRT treatment beams.

Photon Applicator Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with static, stereotactic treatment beams.

Photon Applicator Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with static, stereotactic treatment beams.

Photon Applicator Arc Beam Producer – A Treatment Planning System (TPS) capable of producing a radiation therapy treatment plan with stereotactic arc treatment beams.

Photon Applicator Arc Beam Consumer – A Treatment Planning System (TPS) capable of consuming a radiation therapy treatment plan with stereotactic arc treatment beams.

Treatment Management System (TMS) – An application providing radiation oncology management services and capable of consuming treatment plans with any of the above treatment techniques.

Transaction Summary Definitions

Add the following terms to the IHE TF General Introduction Namespace list of Transactions:

TPPC-01: Basic Static Beam Storage

In the Basic Static Beam Storage transaction, a ***Static Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static, non-MLC treatment beams.

TPPC-02: Basic Static Beam Retrieval

In the Basic Static Beam Retrieval transaction, a ***Static Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static, non-MLC treatment beams.

TPPC-03: Basic Static MLC Beam Storage

In the Basic Static MLC Beam Storage transaction, a ***Static MLC Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static, MLC treatment beams.

TPPC-04: Basic Static MLC Beam Retrieval

In the Basic Static MLC Beam Retrieval transaction, a ***Static MLC Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static, MLC treatment beams.

TPPC-05: Arc Beam Storage

In the Arc Beam Storage transaction, an ***Arc Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only non-MLC Fixed Aperture Arc treatment beams.

TPPC-06: Arc Beam Retrieval

In the Arc Beam Retrieval transaction, an ***Arc Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only non-MLC Fixed Aperture Arc treatment beams.

TPPC-07: MLC Fixed Aperture Arc Beam Storage

In the MLC Fixed Aperture Arc Beam Storage transaction, an ***MLC Fixed Aperture Arc Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only MLC Fixed Aperture Arc treatment beams.

TPPC-08: MLC Fixed Aperture Arc Beam Retrieval

In the MLC Fixed Aperture Arc Beam Retrieval transaction, an ***MLC Fixed Aperture Arc Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only MLC Fixed Aperture Arc treatment beams.

TPPC-09: MLC Variable Aperture Arc Beam Storage

In the MLC Variable Aperture Arc Beam Storage transaction, a ***MLC Variable Aperture Arc Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only MLC Variable Aperture Arc treatment beams.

TPPC-10: MLC Variable Aperture Arc Beam Retrieval

In the MLC Variable Aperture Arc Beam Retrieval transaction, an ***MLC Variable Aperture Arc Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only MLC Variable Aperture Arc treatment beams.

TPPC-11: Hard Wedge Beam Storage

In the Hard Wedge Beam Storage transaction, a ***Hard Wedge Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static treatment beams using physical wedges.

TPPC-12: Hard Wedge Beam Retrieval

In the Hard Wedge Beam Retrieval transaction, a ***Hard Wedge Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static treatment beams using physical wedges.

TPPC-13: Virtual Wedge Beam Storage

In the Virtual Wedge Beam Storage transaction, a ***Virtual Wedge Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static treatment beams using virtual wedges.

TPPC-14: Virtual Wedge Beam Retrieval

In the Virtual Wedge Beam Retrieval transaction, a ***Virtual Wedge Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static treatment beams using virtual wedges.

TPPC-15: Motorized Wedge Beam Storage

In the Motorized Wedge Beam Storage transaction, a ***Motorized Wedge Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static treatment beams using motorized wedges.

TPPC-16: Motorized Wedge Beam Retrieval

In the Motorized Wedge Beam Retrieval transaction, a ***Motorized Wedge Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static treatment beams using motorized wedges.

TPPC-17: Static Electron Beam Storage

In the Static Electron Beam Storage transaction, a ***Static Electron Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static electron treatment beams.

TPPC-18: Static Electron Beam Retrieval

In the Static Electron Beam Retrieval transaction, a ***Static Electron Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static electron treatment beams.

TPPC-19: Step & Shoot Beam Storage

In the Step & Shoot Beam Storage transaction, a ***Step & Shoot Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only step & shoot IMRT treatment beams.

TPPC-20: Step & Shoot Beam Retrieval

In the Step & Shoot Beam Retrieval transaction, a ***Step & Shoot Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only step & shoot IMRT treatment beams.

TPPC-21: Sliding Window Beam Storage

In the Sliding Window Beam Storage transaction, a ***Sliding Window Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only sliding window IMRT treatment beams.

TPPC-22: Sliding Window Beam Retrieval

In the Sliding Window Beam Retrieval transaction, a ***Sliding Window Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only sliding window IMRT treatment beams.

TPPC-23: IMAT/VMAT Beam Storage

In the IMAT/VMAT Beam Storage transaction, an ***IMAT/VMAT Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only IMAT/VMAT IMRT treatment beams.

TPPC-24: IMAT/VMAT Beam Retrieval

In the IMAT/VMAT Beam Retrieval transaction, an ***IMAT/VMAT Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only IMAT/VMAT IMRT treatment beams.

TPPC-25: Photon Applicator Beam Storage

In the Photon Applicator Beam Storage transaction, a ***Photon Applicator Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only static treatment beams using photon applicators.

TPPC-26: Photon Applicator Beam Retrieval

In the Photon Applicator Beam Retrieval transaction, a ***Photon Applicator Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only static treatment beams using photon applicator.

TPPC-27: Photon Applicator Arc Beam Storage

In the Stereotactic Arc Beam Storage transaction, a ***Stereotactic Arc Beam Producer*** stores a treatment plan to the ***Archive***. The treatment plan shall contain only stereotactic arc treatment beams.

TPPC-28: Photon Applicator Arc Beam Retrieval

In the Stereotactic Arc Beam Retrieval transaction, a ***Stereotactic Arc Beam Consumer*** or a ***TMS*** receives a treatment plan from the ***Archive***. The treatment plan shall contain only stereotactic **arc** treatment beams.

Glossary

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

None

Volume 2 – Transactions

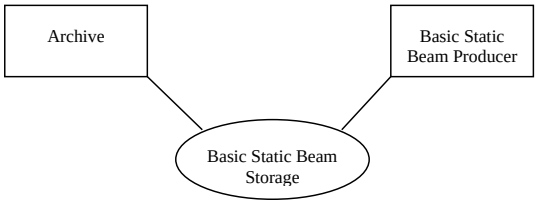
Add Section 3.19.

3.19 TPPC-01 Basic Static Beam Storage

3.19.1 Scope

In the Basic Static Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-01: Basic Static Beam Storage stores the plan to the archive

3.19.2 Use Case Roles

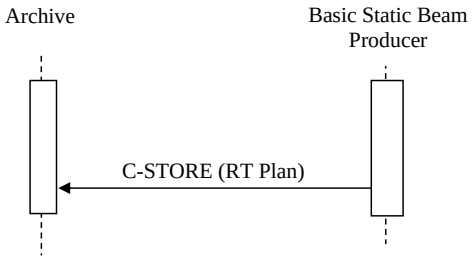


Actor:	Basic Static Beam Producer
Role:	Creates Basic Static Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Basic Static Beam Producer

3.19.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.19.4 Interaction Diagram



3.19.4.1 Basic Static Beam Storage

3.19.4.1.1 Trigger Events

The Basic Static Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.19.4.1.2 Message Semantics

The Basic Static Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Basic Static Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Basic Static Beam 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.

3.19.4.1.2.1 Storage of RT Plan containing a Basic Static Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.19.4.1.2.2 Optional Modifiers

The Basic Static Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.19.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.19.5 Security Considerations

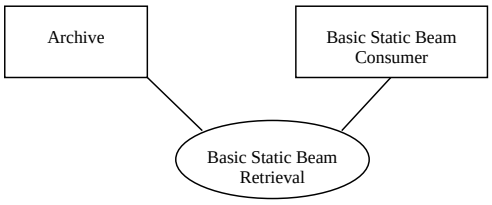
There are no specific security considerations.

3.20 TPPC-02: Basic Static Beam Retrieval

3.20.1 Scope

In the Basic Static Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-01: Basic Static Beam Storage, retrieves the plan from the archive.

3.20.2 Use Case Roles

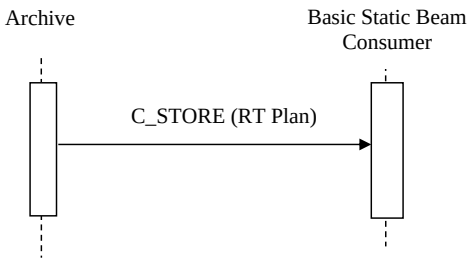


Actor:	Basic Static Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Basic Static Beam Consumer

3.20.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.20.4 Interaction Diagram



3.20.4.1 Basic Static Beam Retrieval

3.20.4.1.1 Trigger Events

The Archive transfers the plan to the Basic Static Beam Consumer.

3.20.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Basic Static Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.20.4.1.2.1 Storage of RT Plan containing a Basic Static Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.20.4.1.2.2 Optional Modifiers

The Basic Static Beam Consumer may support the following optional modifications :

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.20.4.1.3 Expected Actions

The Basic Static Beam Consumer stores the RT Plan.

3.20.5 Security Considerations

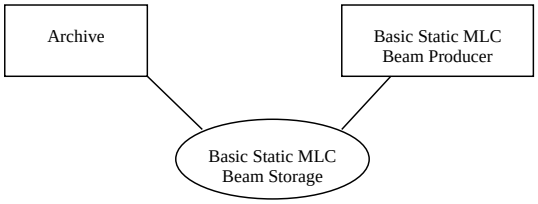
There are no specific security considerations.

3.21 TPPC-03 Basic Static MLC Beam Storage

3.21.1 Scope

In the Basic Static MLC Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-03: Basic Static MLC Beam Storage stores the plan to the archive

3.21.2 Use Case Roles

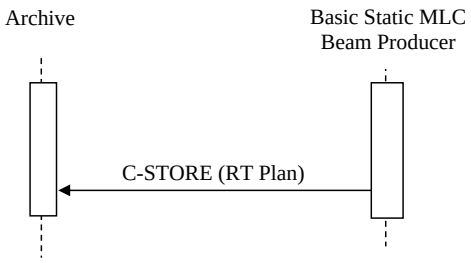


Actor:	Basic Static MLC Beam Producer
Role:	Creates Basic Static MLC Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Basic Static MLCBeam Producer

3.21.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.21.4 Interaction Diagram



3.21.4.1 Basic Static MLC Beam Storage

3.21.4.1.1 Trigger Events

The Basic Static MLC Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.21.4.1.2 Message Semantics

The Basic Static MLC Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Basic Static MLC Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Basic Static MLC Beam 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.

3.21.4.1.2.1 Storage of RT Plan containing a Basic Static MLC Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.21.4.1.2.2 Optional Modifiers

The Basic Static MLC Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.21.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.21.5 Security Considerations

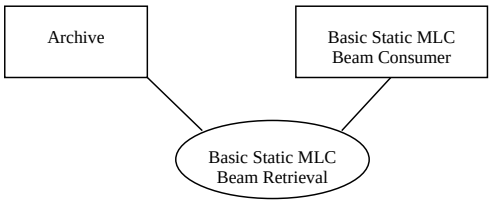
There are no specific security considerations.

3.22 TPPC-04: Basic Static MLC Beam Retrieval

3.22.1 Scope

In the Basic Static MLC Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-03: Basic Static MLC Beam Storage, retrieves the plan from the archive.

3.22.2 Use Case Roles

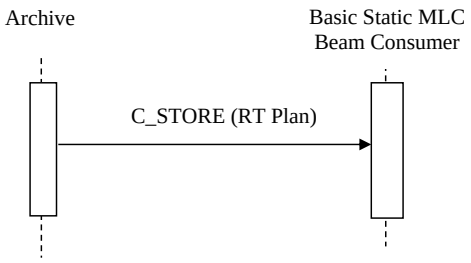


Actor:	Basic Static MLC Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Basic Static MLC Beam Consumer

3.22.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.22.4 Interaction Diagram



3.22.4.1 Basic Static MLC Beam Retrieval

3.22.4.1.1 Trigger Events

The Archive transfers the plan to the Basic Static Beam Consumer.

3.22.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Basic Static MLC Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.22.4.1.2.1 Storage of RT Plan containing a Basic Static MLC Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.22.4.1.2.2 Optional Modifiers

The Basic Static Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.22.4.1.3 Expected Actions

The Basic Static MLC Beam Consumer stores the RT Plan.

3.22.5 Security Considerations

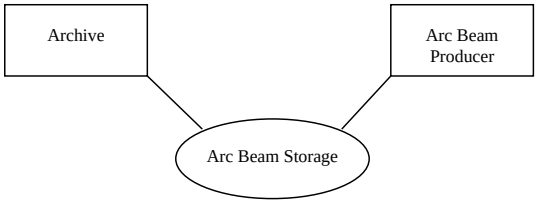
There are no specific security considerations.

3.23 TPPC-05 Arc Beam Storage

3.23.1 Scope

In the Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-05: Arc Beam Storage stores the plan to the archive

3.23.2 Use Case Roles

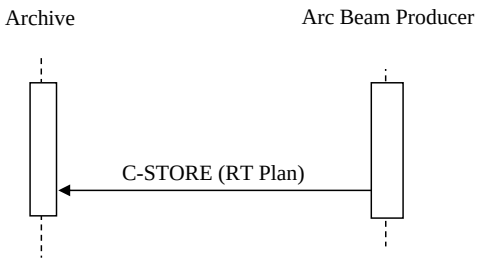


Actor:	Arc Beam Producer
Role:	Creates Arc Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Basic Arc Beam Producer

3.23.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.23.4 Interaction Diagram



3.23.4.1 Arc Beam Storage

3.23.4.1.1 Trigger Events

The Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.23.4.1.2 Message Semantics

The Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Arc Beam 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.

3.23.4.1.2.1 Storage of RT Plan containing an Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.23.4.1.2.2 Optional Modifiers

The Arc Beam Producer may support the following optional :

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.23.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.23.5 Security Considerations

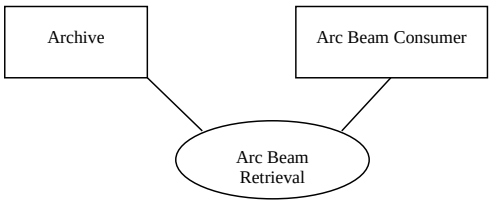
There are no specific security considerations.

3.24 TPPC-06: Arc Beam Retrieval

3.24.1 Scope

In the Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-05: Arc Beam Storage, retrieves the plan from the archive.

3.24.2 Use Case Roles

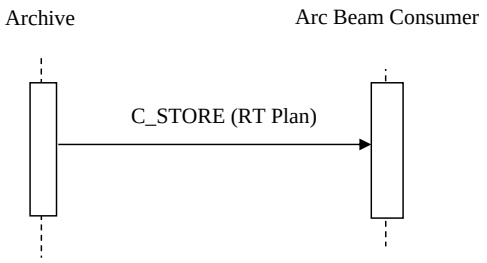


Actor:	Arc Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Arc Beam Consumer

3.24.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.24.4 Interaction Diagram



3.24.4.1 Arc Beam Retrieval

3.24.4.1.1 Trigger Events

The Archive transfers the plan to the Arc Beam Consumer.

3.24.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.24.4.1.2.1 Storage of RT Plan containing an Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.24.4.1.2.2 Optional Modifiers

The Arc Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.24.4.1.3 Expected Actions

The Arc Beam Consumer stores the RT Plan.

3.24.5 Security Considerations

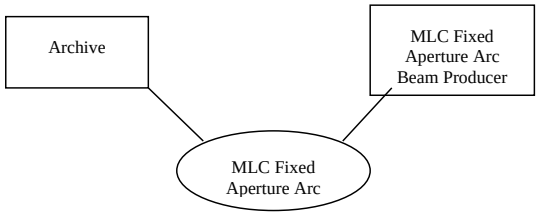
There are no specific security considerations.

3.25 TPPC-07 MLC Fixed Aperture Arc Beam Storage

3.25.1 Scope

In the MLC Fixed Aperture Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-07: MLC Fixed Aperture Arc Beam Storage stores the plan to the archive

3.25.2 Use Case Roles

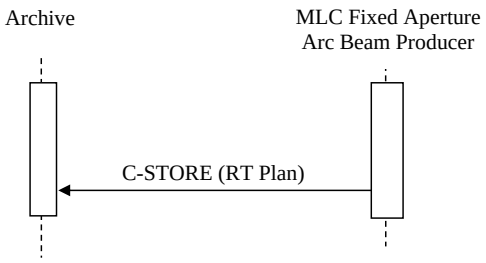


Actor:	MLC Fixed Aperture Arc Beam Producer
Role:	Creates MLC Fixed Aperture Arc Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from MLC Fixed Aperture Arc Beam Producer

3.25.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.25.4 Interaction Diagram



3.25.4.1 MLC Fixed Aperture Arc Beam Storage

3.25.4.1.1 Trigger Events

The MLC Fixed Aperture Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.25.4.1.2 Message Semantics

The MLC Fixed Aperture Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The MLC Fixed Aperture Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The MLC Fixed Aperture Arc Beam 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.

3.25.4.1.2.1 Storage of RT Plan containing a MLC Fixed Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.25.4.1.2.2 Optional Modifiers

The MLC Fixed Aperture Arc Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.25.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.25.5 Security Considerations

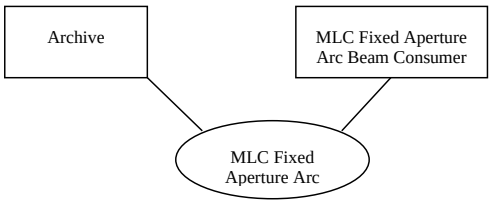
There are no specific security considerations.

3.26 TPPC-08: MLC FIXED APERTURE ARC Beam Retrieval

3.26.1 Scope

In the MLC Fixed Aperture Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-07: MLC Fixed Aperture Arc Beam Storage, retrieves the plan from the archive.

3.26.2 Use Case Roles

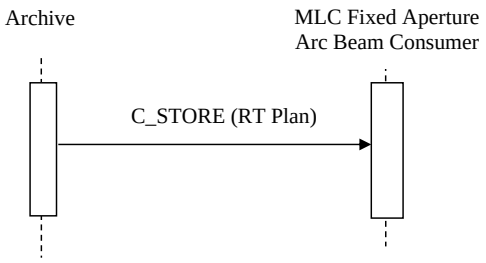


Actor:	MLC Fixed Aperture Arc Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to MLC Fixed Aperture Arc Beam Consumer

3.26.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.26.4 Interaction Diagram



3.26.4.1 MLC Fixed Aperture Arc Beam Retrieval

3.26.4.1.1 Trigger Events

The Archive transfers the plan to the MLC Fixed Aperture Arc Beam Consumer.

3.26.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the MLC Fixed Aperture Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.26.4.1.2.1 Storage of RT Plan containing a MLC Fixed Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.26.4.1.2.2 Optional Modifiers

The MLC Fixed Aperture Arc Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.26.4.1.3 Expected Actions

The MLC Fixed Aperture Arc Beam Consumer stores the RT Plan.

3.26.5 Security Considerations

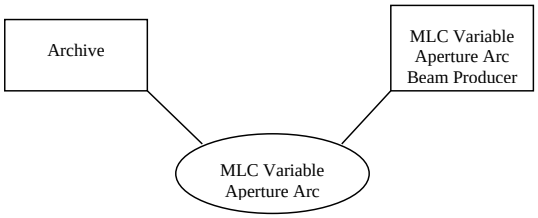
There are no specific security considerations.

3.27 TPPC-09 MLC Variable Aperture Arc Beam Storage

3.27.1 Scope

In the MLC Variable Aperture Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-09: MLC Variable Aperture Arc Beam Storage stores the plan to the archive

3.27.2 Use Case Roles

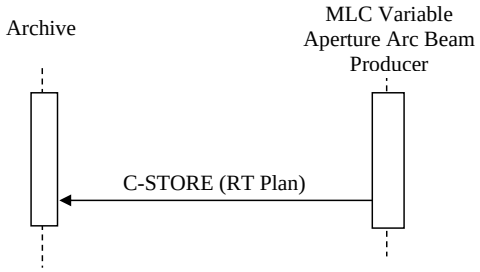


Actor:	MLC Variable Aperture Arc Beam Producer
Role:	Creates MLC Variable Aperture Arc Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from MLC Variable Aperture Arc Beam Producer

3.27.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.27.4 Interaction Diagram



3.27.4.1 MLC Variable Aperture Arc Beam Storage

3.27.4.1.1 Trigger Events

The MLC Variable Aperture Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.27.4.1.2 Message Semantics

The MLC Variable Aperture Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The MLC Variable Aperture Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The MLC Variable Aperture Arc Beam 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.

3.27.4.1.2.1 Storage of RT Plan containing a MLC Variable Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.27.4.1.2.2 Optional Modifiers

The MLC Variable Aperture Arc Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.27.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.27.5 Security Considerations

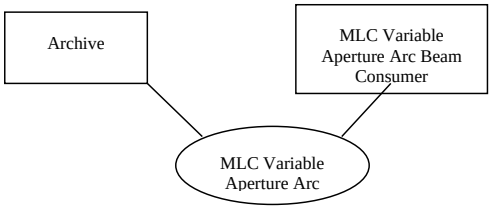
There are no specific security considerations.

3.28 TPPC-10: MLC Variable Aperture Arc Beam Retrieval

3.28.1 Scope

In the MLC Variable Aperture Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-09: MLC Variable Aperture Arc Beam Storage, retrieves the plan from the archive.

3.28.2 Use Case Roles

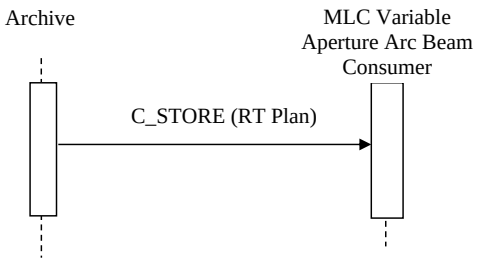


Actor:	MLC Variable Aperture Arc Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to MLC Variable Aperture Arc Beam Consumer

3.28.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.28.4 Interaction Diagram



3.28.4.1 MLC Variable Aperture Arc Beam Retrieval

3.28.4.1.1 Trigger Events

The Archive transfers the plan to the MLC Variable Aperture Arc Beam Consumer.

3.28.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the MLC Variable Aperture Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.28.4.1.2.1 Storage of RT Plan containing a MLC Variable Aperture Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.28.4.1.2.2 Optional Modifiers

The MLC Variable Aperture Arc Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.28.4.1.3 Expected Actions

The MLC Variable Aperture Arc Beam Consumer stores the RT Plan.

3.28.5 Security Considerations

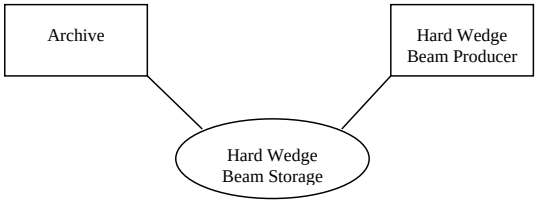
There are no specific security considerations.

3.29 TPPC-11 Hard Wedge Beam Storage

3.29.1 Scope

In the Hard Wedge Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-11: Hard Wedge Beam Storage stores the plan to the archive

3.29.2 Use Case Roles

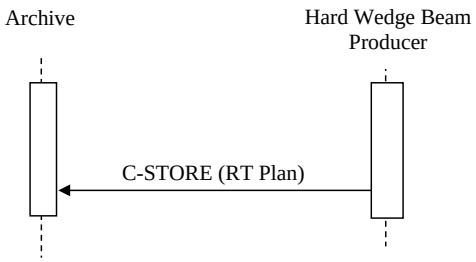


Actor:	Hard Wedge Beam Producer
Role:	Creates Hard Wedge Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Hard Wedge Beam Producer

3.29.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.29.4 Interaction Diagram



3.29.4.1 Hard Wedge Beam Storage

3.29.4.1.1 Trigger Events

The Hard Wedge Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.29.4.1.2 Message Semantics

The Hard Wedge Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Hard Wedge Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Hard Wedge Beam 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.

3.29.4.1.2.1 Storage of RT Plan containing a Hard Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.29.4.1.2.2 Optional Modifiers

The Hard Wedge Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.29.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.29.5 Security Considerations

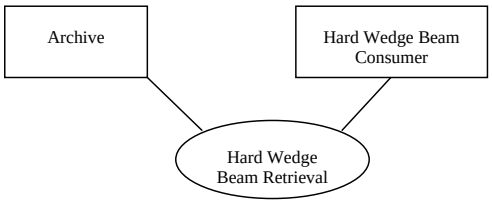
There are no specific security considerations.

3.30 TPPC-12: Hard Wedge Beam Retrieval

3.30.1 Scope

In the Hard Wedge Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-11: Hard Wedge Beam Storage, retrieves the plan from the archive.

3.30.2 Use Case Roles

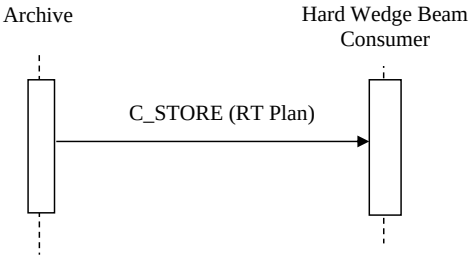


Actor:	Hard Wedge Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Hard Wedge Beam Consumer

3.30.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.30.4 Interaction Diagram



3.30.4.1 Hard Wedge Beam Retrieval

3.30.4.1.1 Trigger Events

The Archive transfers the plan to the Hard Wedge Beam Consumer.

3.30.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Hard Wedge Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.30.4.1.2.1 Storage of RT Plan containing a Hard Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.30.4.1.2.2 Optional Modifiers

The Hard Wedge Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.30.4.1.3 Expected Actions

The Hard Wedge Beam Consumer stores the RT Plan.

3.30.5 Security Considerations

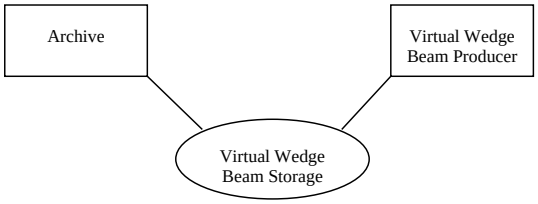
There are no specific security considerations.

3.31 TPPC-13 Virtual Wedge Beam Storage

3.31.1 Scope

In the Virtual Wedge Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-13: Virtual Wedge Beam Storage stores the plan to the archive

3.31.2 Use Case Roles

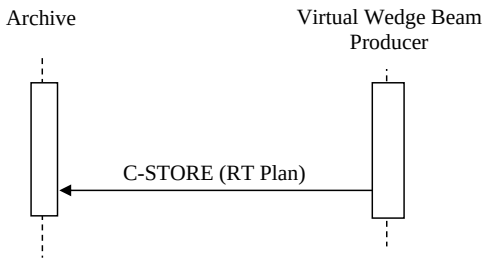


Actor:	Virtual Wedge Beam Producer
Role:	Creates Virtual Wedge Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Virtual Wedge Beam Producer

3.31.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.31.4 Interaction Diagram



3.31.4.1 Virtual Wedge Beam Storage

3.31.4.1.1 Trigger Events

The Virtual Wedge Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.31.4.1.2 Message Semantics

The Virtual Wedge Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Virtual Wedge Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Virtual Wedge Beam 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.

3.31.4.1.2.1 Storage of RT Plan containing a Virtual Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

A virtual wedge does not actually have an actual wedge angle (300A,00D5) in the same sense as a physical wedge. Most treatment planning systems, however, incorporate the concept of such an

angle for reference during the planning and delivery process. This 'physical' setting of the delivery device should be placed in the wedge angle (300A,00D5) attribute.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.31.4.1.2.2 Optional Modifiers

The Virtual Wedge Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.31.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.31.5 Security Considerations

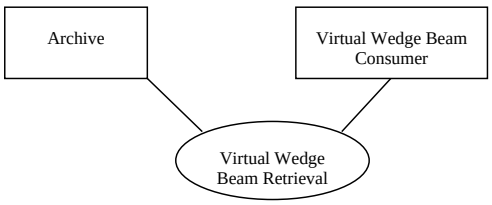
There are no specific security considerations.

3.32 TPPC-14: Virtual Wedge Beam Retrieval

3.32.1 Scope

In the Virtual Wedge Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-13: Virtual Wedge Beam Storage, retrieves the plan from the archive.

3.32.2 Use Case Roles

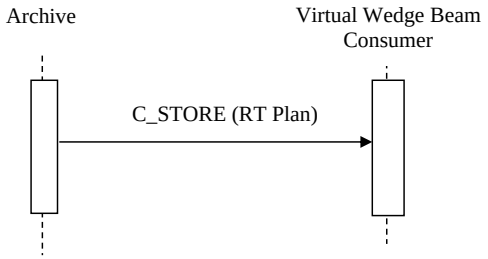


Actor:	Virtual Wedge Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Virtual Wedge Beam Consumer

3.32.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.32.4 Interaction Diagram



1450

3.32.4.1 Virtual Wedge Beam Retrieval

3.32.4.1.1 Trigger Events

The Archive transfers the plan to the Virtual Wedge Beam Consumer.

3.32.4.1.2 Message Semantics

1455 The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Virtual Wedge Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.32.4.1.2.1 Storage of RT Plan containing a Virtual Wedge Beam

1460 Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.32.4.1.2.2 Optional Modifiers

The Virtual Wedge Beam Consumer may support the following optional:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.32.4.1.3 Expected Actions

The Virtual Wedge Beam Consumer stores the RT Plan.

3.32.5 Security Considerations

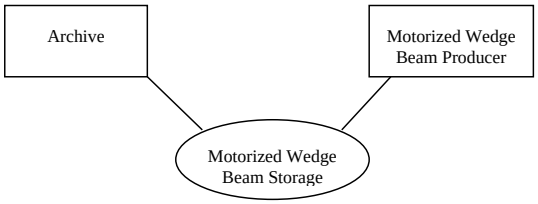
There are no specific security considerations.

3.33 TPPC-15 Motorized Wedge Beam Storage

3.33.1 Scope

In the Motorized Wedge Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-15: Virtual Wedge Beam Storage stores the plan to the archive

3.33.2 Use Case Roles



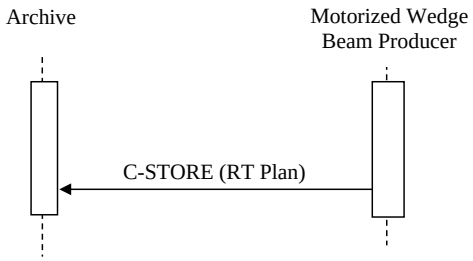
Actor:	Motorized Wedge Beam Producer
Role:	Creates Motorized Wedge Beam RT Plan and stores plan to an RT Archive
Actor:	Archive

Role:	Accept and store RT Plan from Motorized Wedge Beam Producer

3.33.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.33.4 Interaction Diagram



3.33.4.1 Motorized Wedge Beam Storage

3.33.4.1.1 Trigger Events

The Motorized Wedge Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.33.4.1.2 Message Semantics

The Motorized Wedge Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Motorized Wedge Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Motorized Wedge Beam 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.

3.33.4.1.2.1 Storage of RT Plan containing a Motorized Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

In the delivery of a motorized wedge beam the wedge angle (300A,00D5) could represent either the effective angle of the total beam delivery or the angle of the physical wedge moved into the beam. For the TPPC Profile, the physical angle of the motorized wedge should be placed into the wedge angle (300A,00D5) attribute.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.33.4.1.2.2 Optional Modifiers

The Motorized Wedge Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.33.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.33.5 Security Considerations

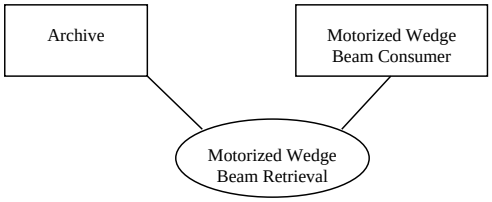
There are no specific security considerations.

3.34 TPPC-16: Motorized Wedge Beam Retrieval

3.34.1 Scope

In the Motorized Wedge Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-15: Motorized Wedge Beam Storage, retrieves the plan from the archive.

3.34.2 Use Case Roles

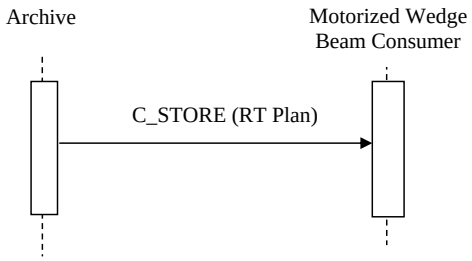


Actor:	Motorized Wedge Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Motorized Wedge Beam Consumer

3.34.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.34.4 Interaction Diagram



3.34.4.1 Motorized Wedge Beam Retrieval

3.34.4.1.1 Trigger Events

The Archive transfers the plan to the Motorized Wedge Beam Consumer.

3.34.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Motorized Wedge Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.34.4.1.2.1 Storage of RT Plan containing a Motorized Wedge Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements

build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.34.4.1.2.2 Optional Modifiers

The Motorized Wedge Beam Consumer may support the following optional:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.34.4.1.3 Expected Actions

The Motorized Wedge Beam Consumer stores the RT Plan.

3.34.5 Security Considerations

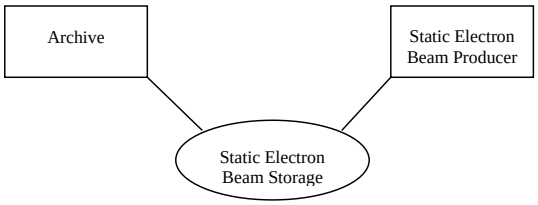
There are no specific security considerations.

3.35 TPPC-17 Static Electron Beam Storage

3.35.1 Scope

In the Static Electron Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-17: Static Electron Beam Storage stores the plan to the archive

3.35.2 Use Case Roles



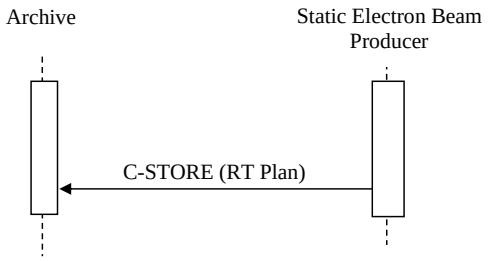
Actor:	Static Electron Beam Producer

Role:	Creates Static Electron Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Static Electron Beam Producer

3.35.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.35.4 Interaction Diagram



3.35.4.1 Static Electron Beam Storage

3.35.4.1.1 Trigger Events

The Static Electron Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.35.4.1.2 Message Semantics

The Static Electron Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Static Electron Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Static Electron Beam 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.

3.35.4.1.2.1 Storage of RT Plan containing a Static Electron Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in Section 7.3.1.1.

3.35.4.1.2.2 Optional Modifiers

The Static Electron Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.35.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.35.5 Security Considerations

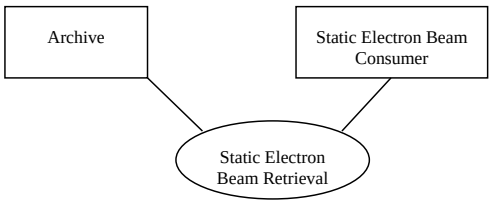
There are no specific security considerations.

3.36 TPPC-18: Static Electron Beam Retrieval

3.36.1 Scope

In the Static Electron Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-17: Static Electron Beam Storage, retrieves the plan from the archive.

3.36.2 Use Case Roles

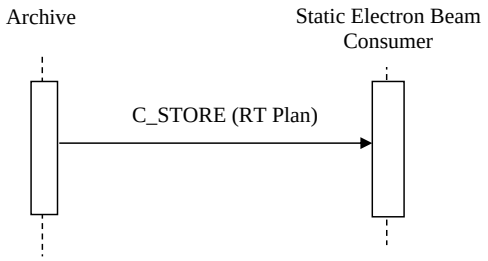


Actor:	Static Electron Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Static Electron Beam Consumer

3.36.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.36.4 Interaction Diagram



3.36.4.1 Static Electron Beam Retrieval

3.36.4.1.1 Trigger Events

The Archive transfers the plan to the Static Electron Beam Consumer.

3.36.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Static Electron Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.36.4.1.2.1 Storage of RT Plan containing a Static Electron Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements

build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.36.4.1.2.2 Optional Modifiers

The Static Electron Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Compensator Beam Modifier	7.4.4.3.3
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.36.4.1.3 Expected Actions

The Static Electron Beam Consumer stores the RT Plan.

3.36.5 Security Considerations

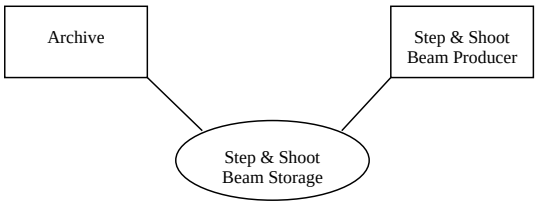
There are no specific security considerations.

3.37 TPPC-19 Step & Shoot Beam Storage

3.37.1 Scope

In the Step & Shoot Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-19: Step & Shoot Beam Storage stores the plan to the archive

3.37.2 Use Case Roles



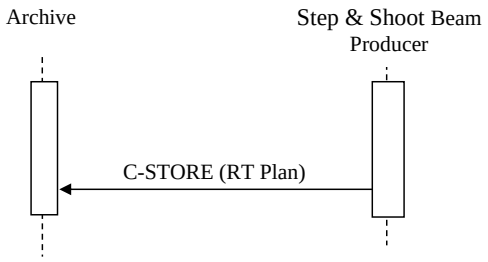
Actor:	Step & Shoot Beam Producer
Role:	Creates Step & Shoot Beam RT Plan and stores plan to an RT Archive
Actor:	Archive

Role:	Accept and store RT Plan from Step & Shoot Beam Producer

3.37.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.37.4 Interaction Diagram



3.37.4.1 Step & Shoot Beam Storage

3.37.4.1.1 Trigger Events

The Step & Shoot Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.37.4.1.2 Message Semantics

The Step & Shoot Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Step & Shoot Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Step & Shoot Beam 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.

3.37.4.1.2.1 Storage of RT Plan containing a Step & Shoot Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.37.4.1.2.2 Optional Modifiers

The Step & Shoot Beam Producer may support the following optional :

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.37.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.37.5 Security Considerations

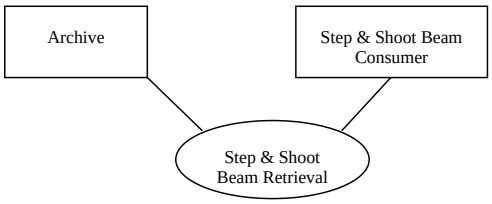
There are no specific security considerations.

3.38 TPPC-20: Step & Shoot Beam Retrieval

3.38.1 Scope

In the Step & Shoot Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-19: Step & Shoot Beam Storage, retrieves the plan from the archive.

3.38.2 Use Case Roles



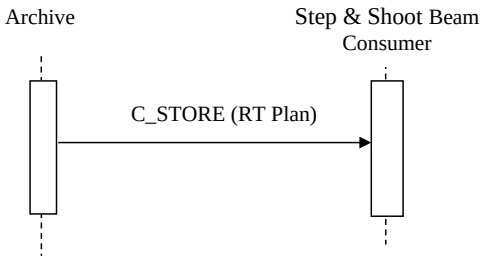
Actor:	Step & Shoot Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive

Role:	Transmits Plan to Step & Shoot Beam Consumer

3.38.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.38.4 Interaction Diagram



3.38.4.1 Step & Shoot Beam Retrieval

3.38.4.1.1 Trigger Events

The Archive transfers the plan to the Step & Shoot Beam Consumer.

3.38.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Step & Shoot Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.38.4.1.2.1 Storage of RT Plan containing a Step & Shoot Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.38.4.1.2.2 Optional Modifiers

The Step & Shoot Beam Consumer may support the following optional:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.38.4.1.3 Expected Actions

The Step & Shoot Beam Consumer stores the RT Plan.

3.38.5 Security Considerations

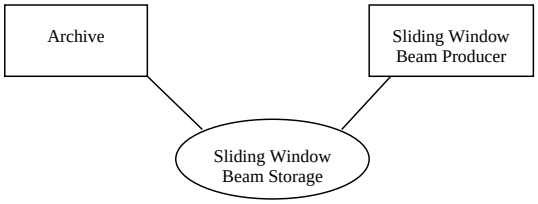
There are no specific security considerations.

3.39 TPPC-21 Sliding Window Beam Storage

3.39.1 Scope

In the Sliding Window Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-21: Sliding Window Beam Storage stores the plan to the archive

3.39.2 Use Case Roles

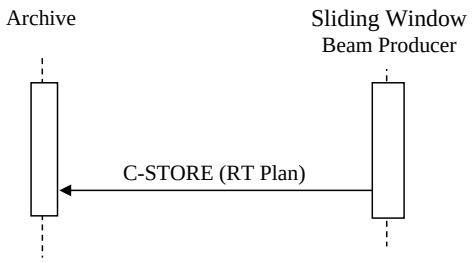


Actor:	Sliding Window Beam Producer
Role:	Creates Sliding Window Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Sliding Window Beam Producer

3.39.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.39.4 Interaction Diagram



3.39.4.1 Sliding Window Beam Storage

3.39.4.1.1 Trigger Events

The Sliding Window Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.39.4.1.2 Message Semantics

The Sliding Window Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Sliding Window Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Sliding Window Beam 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.

3.39.4.1.2.1 Storage of RT Plan containing a Sliding Window Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.39.4.1.2.2 Optional Modifiers

The Sliding Window Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.39.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.39.5 Security Considerations

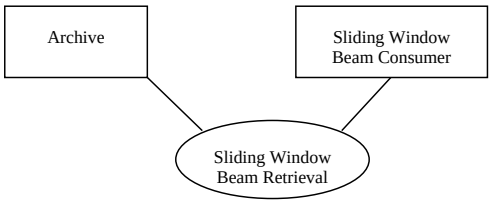
There are no specific security considerations.

3.40 TPPC-22: Sliding Window Beam Retrieval

3.40.1 Scope

In the Sliding Window Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-21: Sliding Window Beam Storage, retrieves the plan from the archive.

3.40.2 Use Case Roles

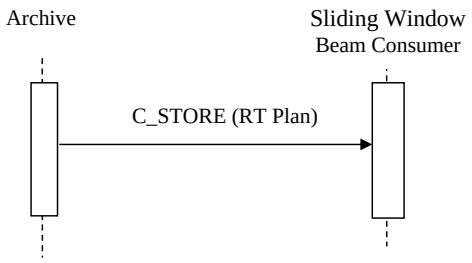


Actor:	Sliding Window Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Sliding Window Beam Consumer

3.40.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.40.4 Interaction Diagram



3.40.4.1 Sliding Window Beam Retrieval

3.40.4.1.1 Trigger Events

The Archive transfers the plan to the Sliding Window Beam Consumer.

3.40.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Sliding Window Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.40.4.1.2.1 Storage of RT Plan containing a Sliding Window Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.40.4.1.2.2 Optional Modifiers

The Sliding Window Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Hard Wedge Beam Modifier	7.4.4.3.4
Bolus Beam Modifier	7.4.4.3.1
Block Beam Modifier	7.4.4.3.2

3.40.4.1.3 Expected Actions

The Sliding Window Beam Consumer stores the RT Plan.

3.40.5 Security Considerations

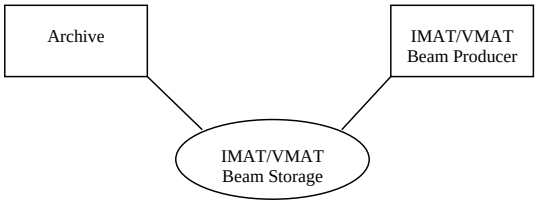
There are no specific security considerations.

3.41 TPPC-23 IMAT/VMAT Beam Storage

3.41.1 Scope

In the IMAT/VMAT Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-41: IMAT/VMAT Beam Storage stores the plan to the archive

3.41.2 Use Case Roles

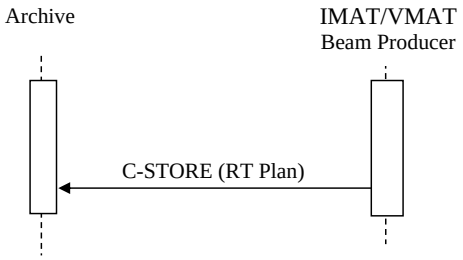


Actor:	IMAT/VMAT Beam Producer
Role:	Creates IMAT/VMAT Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from IMAT/VMAT Beam Producer

3.41.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.41.4 Interaction Diagram



3.41.4.1 IMAT/VMAT Beam Storage

3.41.4.1.1 Trigger Events

The IMAT/VMAT Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.41.4.1.2 Message Semantics

The IMAT/VMAT Beam Producer uses the DICOM C-STORE message to transfer the plan.

The IMAT/VMAT Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The IMAT/VMAT Beam 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.

3.41.4.1.2.1 Storage of RT Plan containing a IMAT/VMAT Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.41.4.1.2.2 Optional Modifiers

The IMAT/VMAT Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.41.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.41.5 Security Considerations

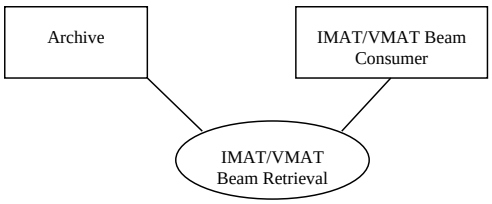
There are no specific security considerations.

3.42 TPPC-24: IMAT/VMAT Beam Retrieval

3.42.1 Scope

In the IMAT/VMAT Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-40: IMAT/VMAT Beam Storage, retrieves the plan from the archive.

3.42.2 Use Case Roles

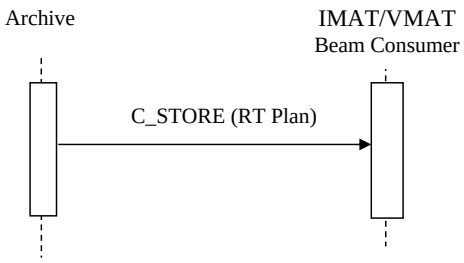


Actor:	IMAT/VMAT Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to IMAT/VMAT Beam Consumer

3.42.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.42.4 Interaction Diagram



3.42.4.1 IMAT/VMAT Beam Retrieval

3.42.4.1.1 Trigger Events

The Archive transfers the plan to the IMAT/VMAT Beam Consumer.

3.42.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the IMAT/VMAT Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.42.4.1.2.1 Storage of RT Plan containing a IMAT/VMAT Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.42.4.1.2.2 Optional Modifiers

The IMAT/VMAT Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.42.4.1.3 Expected Actions

The IMAT/VMAT Beam Consumer stores the RT Plan.

3.42.5 Security Considerations

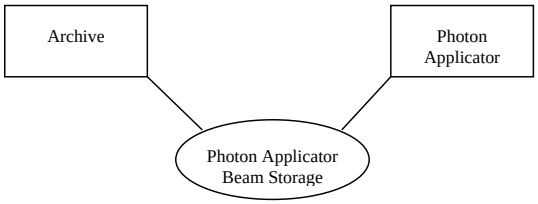
There are no specific security considerations.

3.43 TPPC-25 Photon Applicator Beam Storage

3.43.1 Scope

In the Photon Applicator Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-43: Photon Applicator Beam Storage stores the plan to the archive

3.43.2 Use Case Roles

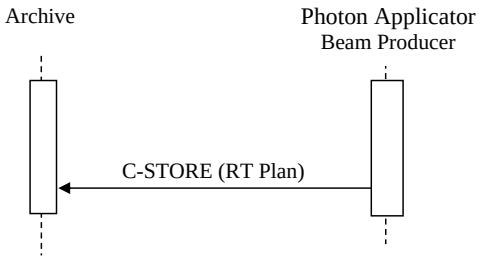


Actor:	Photon Applicator Beam Producer
Role:	Creates Photon Applicator Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Photon Applicator Beam Producer

3.43.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.43.4 Interaction Diagram



3.43.4.1 Photon Applicator Beam Storage

3.43.4.1.1 Trigger Events

The Photon Applicator Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.43.4.1.2 Message Semantics

The Photon Applicator Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Photon Applicator Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Photon Applicator Beam 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.

3.43.4.1.2.1 Storage of RT Plan containing a Photon Applicator Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.43.4.1.2.2 Optional Modifiers

The Photon Applicator Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.43.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.43.5 Security Considerations

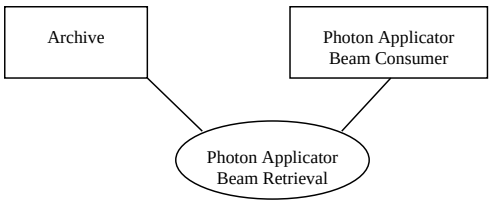
There are no specific security considerations.

3.44 TPPC-26: Photon Applicator Beam Retrieval

3.44.1 Scope

In the Photon Applicator Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-25: Photon Applicator Beam Storage, retrieves the plan from the archive.

3.44.2 Use Case Roles

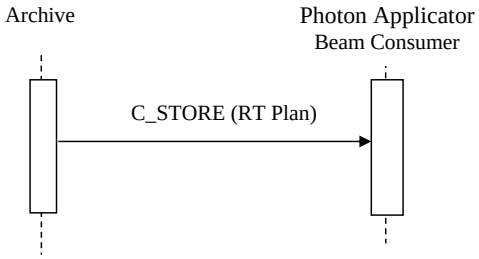


Actor:	Photon Applicator Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Photon Applicator Beam Consumer

3.44.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.44.4 Interaction Diagram



3.44.4.1 Photon Applicator Beam Retrieval

3.44.4.1.1 Trigger Events

The Archive transfers the plan to the Photon Applicator Beam Consumer.

3.44.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Photon Applicator Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.44.4.1.2.1 Storage of RT Plan containing a Photon Applicator Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.44.4.1.2.2 Optional Modifiers

The Photon Applicator Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.44.4.1.3 Expected Actions

The Photon Applicator Beam Consumer stores the RT Plan.

3.44.5 Security Considerations

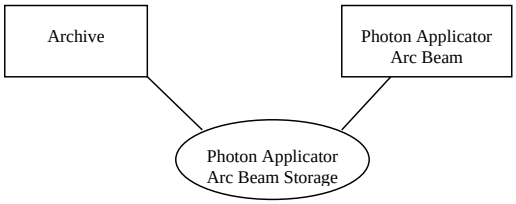
There are no specific security considerations.

3.45 TPPC-27 Photon Applicator Arc Beam Storage

3.45.1 Scope

In the Photon Applicator Arc Beam Storage transaction, a Producer of an RT Plan that incorporates the beam technique identified in TPPC-45: Photon Applicator Arc Beam Storage stores the plan to the archive

3.45.2 Use Case Roles

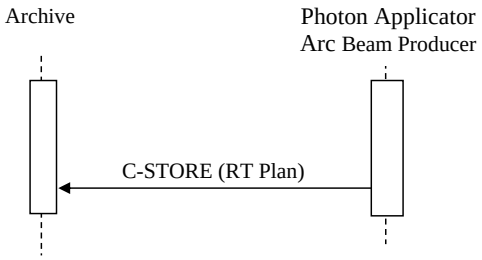


Actor:	Photon Applicator Arc Beam Producer
Role:	Creates Basic Static Beam RT Plan and stores plan to an RT Archive
Actor:	Archive
Role:	Accept and store RT Plan from Photon Applicator Arc Beam Producer

3.45.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.45.4 Interaction Diagram



3.45.4.1 Photon Applicator Arc Beam Storage

3.45.4.1.1 Trigger Events

The Photon Applicator Arc Beam Producer transfers the plan to the Archive once the plan is created and the dose calculation is finished.

3.45.4.1.2 Message Semantics

The Photon Applicator Arc Beam Producer uses the DICOM C-STORE message to transfer the plan.

The Photon Applicator Arc Beam Producer is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The Photon Applicator Arc Beam 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.

3.45.4.1.2.1 Storage of RT Plan containing a Photon Applicator Arc Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.45.4.1.2.2 Optional Modifiers

The Photon Applicator Arc Beam Producer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.45.4.1.3 Expected Actions

The Archive stores the RT Plan.

3.45.5 Security Considerations

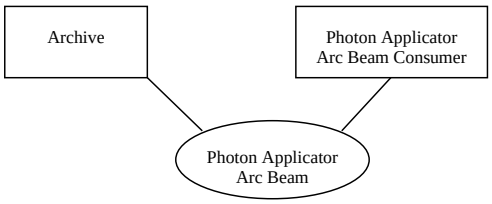
There are no specific security considerations.

3.46 TPPC-28: Photon Applicator Arc Beam Retrieval

3.46.1 Scope

In the Photon Applicator Arc Beam Retrieval transaction, a consumer of an RT Plan that incorporates the beam technique identified in TPPC-27: Photon Applicator Arc Beam Storage, retrieves the plan from the archive.

3.46.2 Use Case Roles

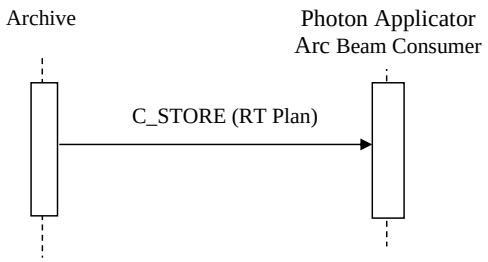


Actor:	Photon Applicator Arc Beam Consumer
Role:	Stores plan transmitted from Archive
Actor:	Archive
Role:	Transmits Plan to Photon Applicator Arc Beam Consumer

3.46.3 Referenced Standards

DICOM ~~2015a~~2018e, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.46.4 Interaction Diagram



3.46.4.1 Photon Applicator Arc Beam Retrieval

3.46.4.1.1 Trigger Events

The Archive transfers the plan to the Photon Applicator Arc Beam Consumer.

3.46.4.1.2 Message Semantics

The Archive uses the DICOM C-STORE message to transfer the plan.

The Archive is the DICOM Storage SCU and the Photon Applicator Arc Beam Consumer is the DICOM Storage SCP.

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.46.4.1.2.1 Storage of RT Plan containing a Photon Applicator Beam

Systems supporting the Treatment Planning - Plan Content Profile are required to support a number of attributes as described in the following tables and text. Many of these requirements build on attributes which are Type 2 or Type 3 in DICOM (such attributes are indicated with R+ or R+*).

All attributes in required modules for RT Plan as listed in chapters 7.3.2.1.

3.46.4.1.2.2 Optional Modifiers

The Photon Applicator Arc Beam Consumer may support the following optional modifications:

Optional Modifiers	Section
Bolus Beam Modifier	7.4.4.3.1

3.46.4.1.3 Expected Actions

The Photon Applicator Arc Beam Consumer stores the RT Plan.

3.46.5 Security Considerations

There are no specific security considerations.

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

<No change to framework>

7.2 General Definitions

7.3 <No change to framework> 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 for Photon External Beam in Planning State

7.3.2.1.1 Referenced Standards

DICOM ~~2015a~~2018e PS 3.3

7.3.2.1.2 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 - See Note.	R See7.4.1.7.1
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 7.4.3.2.1
	RT Tolerance Tables	C.8.8.11	U	U

IE	Module	Reference	Usage	IHE-RO Usage
	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 7.4.3.3.1 and 7.4.3.3.2
	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 Definitions see below
	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

RT Beams Module is defined as follows:

Beam Content Type	Section
Basic Static Beam	7.4.4.1.1
Basic Static MLC Beam	7.4.4.1.2
Arc Beam	7.4.4.1.3
MLC Fixed Aperture Arc Beam	7.4.4.1.4
MLC Variable Aperture Arc Beam	7.4.4.1.5
Hard Wedge Beam	7.4.4.1.6
Virtual Wedge Beam	7.4.4.1.7
Motorized Wedge Beam	7.4.4.1.8
Static Electron Beam	7.4.4.1.9
Step & Shoot Beam	7.4.4.1.10
Sliding Window Beam	7.4.4.1.11
IMAT/VMAT Beam	7.4.4.1.12
Photon Applicator Beam	7.4.4.1.13
Photon Applicator Arc Beam	7.4.4.1.14

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.

When more than 1 type is shown for an attribute, the order is Producer / Consumer

7.4.1 General Modules

7.4.1.1 Patient Module

7.4.1.1.1 Patient Module Base Content

<No change to framework>

7.4.1.2 Study Module

7.4.1.2.1 Study Module Base Content

7.4.1.3 <No change to framework>General Series Module

7.4.1.3.1 General Series Module Base Content

7.4.1.4 <No change to framework>RT Series Module

7.4.1.4.1 RT Series Module Base Content

7.4.1.5 <No change to framework>Equipment Module

7.4.1.5.1 Equipment Module Base Content

7.4.1.6 <No change to framework>SOP Common Module

7.4.1.6.1 SOP Common Module Base Content

7.4.1.7 <No change to framework>Frame of Reference Module

7.4.1.7.1 Frame of Reference Module Base Content

7.4.2 <No change to framework>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

7.4.3.2 <No change to framework>RT Prescription Module

7.4.3.2.1 RT Prescription Module Base Content

7.4.3.2.1.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.3.2.1.2 Module Definition

Attribute	Tag	Type	Attribute Note
Dose Reference Sequence	(300A,0010)	R+*	See Dose reference requirements in the RT Beams module for the TPPC transactions.
> Dose Reference UID	(300A,0013)	R+*	

Attribute	Tag	Type	Attribute Note
> Dose Reference Description	(300A,0016)	R+	
> Target Prescription Dose	(300A,0026)	O+	If present, shall be of the same type of dose as the Beam Dose Type (300A,0090) in the RT Fraction Scheme Module (see 7.4.3.3.2)

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7.4.3.3 RT Fraction Scheme Module

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

7.4.3.3.1 RT Fraction Scheme Module for Consistent Dose

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

7.4.3.3.2 RT Fraction Scheme Module for Delivery

7.4.3.3.2.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.3.3.2.2 Module Definition

Attribute	Tag	Type	Attribute Note
Fraction Group Sequence	(300A,0070)	R+*	Shall have only a single item in the sequence
> Number of Fractions Planned	(300A,0078)	R+	
> Referenced Beam Sequence	(300C,0004)	R+*	
>> 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 Beam. If present shall have a value that is present in the Dose Reference Sequence.
>> Beam Dose	(300A,0084)	-/R+ R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it.
>> Beam Dose	(300A,0082)	R+	

Attribute	Tag	Type	Attribute Note
Specification Point			
>> Beam Meterset	(300A,0086)	R+	
>> Beam Dose Type	(300A,0090)	R+	Shall be present

7.4.4 Plan-Related Modules in Planning

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

7.4.4.1 Specific RT BeamType Specifications

7.4.4.1.1 RT Beams Module for Basic Static Beam

7.4.4.1.1.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.1.2 Module Definition

Attribute	Tag	Beam Technique	
		Basic Static	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall be 2 jaws, MLC shall not be present
>> Leaf Position Boundaries	(300A,00BE)	O+*	NA (no MLC) May or may not be present for jaws, may be ignored for jaws

Attribute	Tag	Beam Technique	
		Basic Static	
		Presence	Specific Rules
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0 or 1. If 1, see Compensator Beam Modifier.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	O+	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.

Attribute	Tag	Beam Technique	
		Basic Static	
		Presence	Specific Rules
< *Insert Control Point Sequence Fixed Attributes List* > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.2 RT Beams Module for Basic Static MLC Beam

7.4.4.1.2.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.2.2 Module Definition

Attribute	Tag	Beam Technique	
		Basic Static MLC	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall have at least 1 MLC
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.

Attribute	Tag	Beam Technique	
		Basic Static MLC	
		Presence	Specific Rules
> Number of Compensators	(300A,00E0)	R+*	Shall be 0 or 1. If 1, see Compensator Beam Modifier.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

2080 **7.4.4.1.3 RT Beams Module for Arc Beam**

7.4.4.1.3.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.3.2 Module Definition

Attribute	Tag	Beam Technique	
		Arc	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be DYNAMIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall be 2 jaws, MLC shall not be present
>> Leaf Position Boundaries	(300A,00BE)	O+*	NA (no MLC) May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	

Attribute	Tag	Beam Technique	
		Arc	
		Presence	Specific Rules
> Number of Control Points	(300A,0110)	R+*	Shall be 2. Skip arcs are not tested in this transaction.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be CW or CC for Control Point 0. Can be NONE for Control Point 1.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

2085

7.4.4.1.4 RT Beams Module for MLC Fixed Aperture Arc Beam

7.4.4.1.4.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.4.2 Module Definition

2090

Attribute	Tag	Beam Technique	
		MLC Fixed Aperture Arc	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be DYNAMIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall have at least 1 MLC.
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2. Skip arcs are not tested in this transaction.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	

Attribute	Tag	Beam Technique	
		MLC Fixed Aperture Arc	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be CW or CC for Control Point 0. Can be NONE for Control Point 1.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.5 RT Beams Module for MLC Variable Aperture Arc Beam

7.4.4.1.5.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.5.2 Module Definition

Attribute	Tag	Beam Technique	
		MLC Variable Aperture Arc	
		Presence	Specific Rules

Attribute	Tag	Beam Technique	
		MLC Variable Aperture Arc	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be DYNAMIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall be 2 jaws, or at least 1 jaw and 1 MLC.
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	If the Consumer has a limit, it shall document this and safely handle input that exceeds that limit.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	

Attribute	Tag	Beam Technique	
		MLC Variable Aperture Arc	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be constant (CW or CC) for all CP except last one. Can be NONE for final CP
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.6 RT Beams Module for Hard Wedge Beam

7.4.4.1.6.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.6.2 Module Definition

Attribute	Tag	Beam Technique
		Hard Wedge

		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall have at least 2 jaws or at least 1 jaw and 1 MLC.
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs,. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 1.
>> Wedge Sequence	(300A,00D1)	R+*	Shall be present.
>> Wedge Type	(300A,00D3)	R+*	Shall be STANDARD (static)
>> Wedge ID	(300A,00D4)	R+	
>> Wedge Angle	(300A,00D5)	R+	
>> Wedge Orientation	(300A,00D8)	R+	
>> Source to Wedge Tray Distance	(300A,00DA)	R+	
> Number of Compensators	(300A,00E0)	R+*	Shall be 0 or 1. If 1, see Compensator Beam Modifier.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	

Attribute	Tag	Beam Technique	
		Hard Wedge	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall be present and consistent with the Wedge Sequence (300A,00D1).
>>> Wedge Position	(300A,0118)	R+*	Shall be IN.
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List >(See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.7 RT Beams Module for Virtual Wedge Beam

7.4.4.1.7.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.7.2 Module Definition

Attribute	Tag	Beam Technique

		Virtual Wedge	
		Presence	**Specific Rules**
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall have at least 2 jaws or at least 1 jaw and 1 MLC.
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs,. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 1 or 2. If 2, see Hard Wedge Beam Modifier.
>>Wedge Sequence	(300A,00D1)	R+*	Shall be present if number of wedges is non-zero
>> Wedge Type	(300A,00D3)	R+*	Shall be DYNAMIC. Optional Hard Wedge shall be STANDARD
>> Wedge ID	(300A,00D4)	R+	
>> Wedge Angle	(300A,00D5)	RC+	Shall be present if Wedge Type (300A,00D3) is STANDARD. May be present otherwise.
>>Effective Wedge Angle	(300A,00DE)	RC+/O+*	Shall be present if Wedge Type (300A,00D3) is DYNAMIC. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it
>> Wedge Orientation	(300A,00D8)	R+	
>> Source to Wedge Tray Distance	(300A,00DA)	RC+	Shall be present if Wedge Type (300A,00D3) is STANDARD.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0 or 1. If 1, see Compensator Beam Modifier.

Attribute	Tag	Beam Technique	
		Virtual Wedge	
		Presence	Specific Rules
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall be present and consistent with the Wedge Sequence (300A,00D1).
>>> Wedge Position	(300A,0118)	R+*	Shall be IN.
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.8 RT Beams Module for Motorized Wedge Beam

7.4.4.1.8.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.8.2 Module Definition

Attribute	Tag	Beam Technique	
		Motorized Wedge	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall have at least 2 jaws or at least 1 jaw and 1 MLC.
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs,. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 1 or 2. If 2, see also Hard Wedge Beam Modifier
> Wedge Sequence	(300A,00D1)	R+*	Shall be present.
>> Wedge Type	(300A,00D3)	R+*	Shall be MOTORIZED. Optional Hard Wedge shall be STANDARD
>> Wedge ID	(300A,00D4)	R+	

Attribute	Tag	Beam Technique	
		Motorized Wedge	
		Presence	Specific Rules
>> Wedge Angle	(300A,00D5)	RC+	Shall be present if Wedge Type (300A,00D3) is STANDARD. May be present otherwise.
>> Wedge Orientation	(300A,00D8)	R+	
>> Source to Wedge Tray Distance	(300A,00DA)	RC+	Shall be present if Wedge Type (300A,00D3) is STANDARD.
>>Effective Wedge Angle	(300A,00DE)	~~-/R+~~ RC+/O+*	Shall be present if Wedge Type (300A,00D3) is MOTORIZED.~~A TMS Actor is required to consume and process this value.~~ A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it
> Number of Compensators	(300A,00E0)	R+*	Shall be 0 or 1. If 1, see Compensator Beam Modifier.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 4.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall be present and consistent with the Wedge Sequence (300A,00D1).
>>> Wedge Position	(300A,0118)	R+*	For Motorized Wedge, shall be IN for CPs 0 and 1, OUT for CPs 2 and 3. Shall be IN for optional Hard Wedge

Attribute	Tag	Beam Technique	
		Motorized Wedge	
		Presence	Specific Rules
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.9 RT Beams Module for Basic Static Electron Beam

7.4.4.1.9.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.9.2 Module Definition

Attribute	Tag	Beam Technique	
		Basic Static Electron	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be ELECTRON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.

Attribute	Tag	Beam Technique	
		Basic Static Electron	
		Presence	Specific Rules
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall be 2 jaws, MLC shall not be present
>> Leaf Position Boundaries	(300A,00BE)	O+*	NA (no MLC) May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0 or 1. If 1, see Compensator Beam Modifier.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall contain 1 item.
>> Applicator ID	(300A,0108)	R+	
>> Applicator Type	(300A,0109)	R+*	
>> Applicator Geometry Sequence	(300A,0431)	R+*	
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present

Attribute	Tag	Beam Technique	
		Basic Static Electron	
		Presence	Specific Rules
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.
>> Source to Surface Distance	(300A,0130)	-/R+ R+/O+*	A TMS Actor is required to consume and process this value. A beam consumer/producer actor (e.g., a TPS) may consume this value and is required to produce it if Patient Setup Technique (300A, 01B0) is FIXED_SSD.
>>Source to External Contour Distance	(300A,0132)	-/R+ R+/O+*	A TMS Actor is required to consume and process this value. A beam consumer/producer actor (e.g., a TPS) may consume this value and is required to produce it if Patient Setup Technique (300A, 01B0) is FIXED_SSD.

7.4.4.1.10 RT Beams Module for Step & Shoot Beam

7.4.4.1.10.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.10.2 Module Definition

Attribute	Tag	Beam Technique
		Step & Shoot

		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	At least 1 MLC shall be present
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0 or 1. If 1, see Hard Wedge Beam Modifier
> Number of Compensators	(300A,00E0)	R+*	Shall be 0..
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2n, where n is the number of unique field shapes composing the beam If the Consumer has a limit, it must document this and safely handle input that exceeds the limit
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	CP[0]=0.0 :: CP[2n + 1]=Cumulative Meterset Weight after completion of delivery of the field shape :: CP[2n+1] = CP[2n + 2]

Attribute	Tag	Beam Technique	
		Step & Shoot	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	See Hard Wedge Beam Modifier If present, may not be ignored
>>> Wedge Position	(300A,0118)	R+*	Shall be IN.
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.11 RT Beams Module for Sliding Window Beam

7.4.4.1.11.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.11.2 Module Definition

Attribute	Tag	Beam Technique	
		Sliding Window	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be DYNAMIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	At least 1 MLC shall be present
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0 or 1. If 1, see Hard Wedge Beam Modifier
> Number of Compensators	(300A,00E0)	R+*	Shall be 0..
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0-8. If > 0, see Block Beam Modifier.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall >2. If the Consumer has a limit, it must document this and safely handle input that exceeds the limit
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	

Attribute	Tag	Beam Technique	
		Sliding Window	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	See Hard Wedge Beam Modifier If present, may not be ignored
>>> Wedge Position	(300A,0118)	R+*	Shall be IN.
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.12 RT Beams Module for IMAT/VMAT Beam

7.4.4.1.12.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

2140

7.4.4.1.12.2 Module Definition

Attribute	Tag	Beam Technique	
		IMAT/VMAT	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be DYNAMIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	At least 1 MLC shall be present
>> Leaf Position Boundaries	(300A,00BE)	R+*	Shall be present for MLCs. May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0..
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0.
> Applicator Sequence	(300A,0107)	R+*	Shall not be present.
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be > 2. If the Consumer has a limit, it must document this and safely handle input that exceeds the limit
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	

Attribute	Tag	Beam Technique	
		IMAT/VMAT	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+* R+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be present as Nominal Dose Rate.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present.
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be constant (CW or CC) for all CP except the last CP, which can be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	If present, shall not be ignored.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.13 RT Beams Module for Photon Applicator Beam

7.4.4.1.13.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

2150 **7.4.4.1.13.2 Module Definition**

Attribute	Tag	Beam Technique	
		Photon Applicator	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be STATIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall be 2 jaws, MLC shall not be present
>> Leaf Position Boundaries	(300A,00BE)	O+*	NA (no MLC) May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0.
> Applicator Sequence	(300A,0107)	R+*	Shall contain 1 item.
>> Applicator ID	(300A,0108)	R+	
>> Applicator Type	(300A,0109)	R+*	Shall be PHOTON_CIRC
>> Applicator Geometry Sequence	(300A,0431)	R+*	
>>> Applicator Aperture Shape	(300A,0432)	R+	Shall be SYM_CIRCULAR
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	

Attribute	Tag	Beam Technique	
		Photon Applicator	
		Presence	Specific Rules
>> Cumulative Meterset Weight	(300A,0134)	R+	
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	Shall be constant.
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be NONE.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

7.4.4.1.14 RT Beams Module for Photon Applicator Arc Beam

7.4.4.1.14.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.1.14.2 Module Definition

Attribute	Tag	Beam Technique	
		Photon Applicator Arc	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Beam Number	(300A,00C0)	R+*	Shall be >= 1.
> Beam Name	(300A,00C2)	R+	
> Beam Type	(300A,00C4)	R+*	Shall be DYNAMIC.
> Radiation Type	(300A,00C6)	R+*	Shall be PHOTON.
> High-Dose Technique Type	(300A,00C7)	O+*	If present, must be handled safely
> Primary Fluence Mode Sequence	(3002,0050)	R+*	
>> Fluence Mode	(3002,0051)	D	
>> Fluence Mode ID	(3002,0052)	D	
> Treatment Machine Name	(300A,00B2)	R+*	Shall be constant.
> Primary Dosimeter Unit	(300A,00B3)	R+	Shall be MU.
> Source-Axis Distance	(300A,00B4)	R+*	
> Beam Limiting Device Sequence	(300A,00B6)	R+*	
>> RT Beam Limiting Device Type	(300A,00B8)	R+*	Shall be 2 jaws, MLC shall not be present
>> Leaf Position Boundaries	(300A,00BE)	O+*	NA (no MLC) May or may not be present for jaws, may be ignored for jaws
> Referenced Patient Setup Number	(300C,006A)	R+*	Shall be >= 1.
> Treatment Delivery Type	(300A,00CE)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 0.
> Number of Compensators	(300A,00E0)	R+*	Shall be 0.
> Number of Boli	(300A, 00ED)	R+*	Shall be >= 0. If > 0, see Bolus Beam Modifier.
> Number of Blocks	(300A,00F0)	R+*	Shall be 0.
> Applicator Sequence	(300A,0107)	R+*	Shall contain 1 item.
>> Applicator ID	(300A,0108)	R+	
>> Applicator Type	(300A,0109)	R+*	Shall be PHOTON_CIRC.
>> Applicator Geometry Sequence	(300A,0431)	R+*	
>> Applicator Aperture Shape	(300A,0432)	R+	Shall be SYM_CIRCULAR
> Final Cumulative Meterset Weight	(300A,010E)	R+*	
> Number of Control Points	(300A,0110)	R+*	Shall be 2.
> Control Point Sequence	(300A,0111)	R+*	
>> Cumulative Meterset Weight	(300A,0134)	R+	

Attribute	Tag	Beam Technique	
		Photon Applicator Arc	
		Presence	Specific Rules
>> Referenced Dose Reference Sequence	(300C,0050)	-/R+* R+/O+*	A TMS Actor is required to consume and process this value. A beam producer/consumer actor (e.g., a TPS) may consume this value and is required to produce it. Shall have at least one item for target dose accumulation.
>>> Cumulative Dose Reference Coefficient	(300A,010C)	R+*	Shall be present.
>> Nominal Beam Energy	(300A,0114)	R+	Shall be constant.
>> Dose Rate Set	(300A,0115)	R+	Shall be constant.
>> Wedge Position Sequence	(300A,0116)	R+*	Shall not be present
>> Beam Limiting Device Position Sequence	(300A,011A)	R+*	Shall be consistent with the Beam Limiting Device Sequence (300A,00B6).
>>>Leaf/Jaw Positions	(300A,011C)	R+*	
>> Gantry Angle	(300A,011E)	R+*	
>> Gantry Rotation Direction	(300A,011F)	R+*	Shall be CW or CC for Control Point 0 Can be NONE for Control Point 1.
>> Gantry Pitch Angle	(300A,014A)	O+*	If not present, shall be assumed to be in the zero position. If present, shall be zero.
>> Gantry Pitch Rotation Direction	(300A,014C)	O+*	If present, shall be NONE.
>> Beam Limiting Device Angle	(300A,0120)	R+*	Shall be constant.
>> Beam Limiting Device Rotation Direction	(300A,0121)	R+*	Shall be NONE.
< Insert Control Point Sequence Fixed Attributes List > (See 7.4.4.2.1)			
>> Isocenter Position	(300A,012C)	R+	Shall be constant for all CPs.

2160

7.4.4.2 General Beam Attribute Specifications

7.4.4.2.1 Control Point Fixed Attribute List Base Content

7.4.4.2.1.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.2.1.2 Required Attributes

The list of attributes and requirements below shall be included in all TPPC transactions as noted in the RT Beam Module specification associated with those transactions.

Attribute	Tag	Control Point Sequence	
		Fixed Attributes	
		Presence	Specific Rules
>> Patient Support Angle	(300A,0122)	R+*	Shall be constant.
>> Patient Support Rotation Direction	(300A,0123)	R+*	Shall be NONE.
>> Table Top Eccentric Axis Distance	(300A,0124)	O+*	If present, shall be constant.
>> Table Top Eccentric Angle	(300A,0125)	R+*	Shall be zero.
>>Table Top Eccentric Rotation Direction	(300A,0126)	R+*	Shall be NONE.
>> Table Top Pitch Angle	(300A,0140)	R+*	Shall be zero.
>> Table Top Pitch Rotation Direction	(300A,0142)	R+*	Shall be NONE.
>> Table Top Roll Angle	(300A,0144)	R+*	Shall be zero.
>> Table Top Roll Rotation Direction	(300A,0146)	R+*	Shall be NONE
>> Table Top Vertical Position	(300A,0128)	O+*	If value is present, shall be constant.
>> Table Top Longitudinal Position	(300A,0129)	O+*	If value is present, shall be constant.
>> Table Top Lateral Position	(300A,012A)	O+*	If value is present, shall be constant.

7.4.4.3 Beam Option Specifications

7.4.4.3.1 Bolus Beam Modifier Base Content

7.4.4.3.1.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.3.1.2 Required Attributes

One or more Boli may be optionally included in any of the Treatment Planning - Plan Content Storage and Retrieval transactions (Producer and Consumer actors).

For actors supporting the Bolus Beam Modifier, the attributes specified in the table below have these additional requirements if Number of Boli (300A,00ED) is greater than zero.

Attribute	Tag	Beam Modifier	
		Bolus	
		Presence	Specific Rules
> Number of Boli	(300A,00ED)	R+*	Shall be >=1.
> Referenced Bolus Sequence	(300A,00B0)	R+*	
>> Bolus ID	(300A,00DC)	R+*	Shall be present.

7.4.4.3.2 Block Beam Modifier Base Content

7.4.4.3.2.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.3.2.2 Required Attributes

One or more Blocks may be optionally included in some of the Treatment Planning - Plan Content Storage and Retrieval transactions (Producer and Consumer actors):

For actors supporting the Block Beam Modifier, the attributes specified in the table below have these additional requirements if Number of Blocks (300A,00F0) is greater than zero.

Attribute	Tag	Beam Modifier	
		Block	
		Presence	Specific Rules
> Number of Blocks	(300A,00F0)	R+*	Photon Beams: Shall be 0 - 8. Electron Beams: Shall be 0 or 1.
> Block Sequence	(300A,00F4)	R+*	
>> Block Tray ID	(300A,00F5)	R+	See Note 1.
>> Source to Block Tray Distance	(300A,00F6)	R+	
>> Block Divergence	(300A,00FA)	R+*	
>> Block Mounting Position	(300A,00FB)	R+	Shall be present, and shall be handled safely for enumerated values not supported.
>> Material ID	(300A,00E1)	R+	
>> Block Thickness	(300A,0100)	R+	

Attribute	Tag	Beam Modifier	
		Block	
		Presence	Specific Rules
>> Block Number of Points	(300A,0104)	R+*	
>> Block Data	(300A,0106)	R+*	

Note 1:

Photon Beams: There may be multiple blocks with the same Block Tray ID (i.e., placed on the same Tray, e.g., an aperture block and a shield block). If/when Treatment Delivery Verification is taking place, it is essentially the Block Tray that is verified, not the individual blocks on the tray, so one would expect the same Accessory ID to be reused for the same Block Tray ID. This is why Block Name is not made Mandatory (R+*) for the profile. Only a single Block Tray ID shall be supported for a given beam.

Electron Beams: The Block Tray ID defines the electron insert which is checked by the TDD.

7.4.4.3.3 Compensator Beam Modifier Base Content

7.4.4.3.3.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.3.3.2 Required Attributes

A single Compensator may be optionally included in some of the Treatment Planning - Plan Content Storage and Retrieve transactions (Producer and Consumer actors):

For actors supporting the Compensator Beam Modifier, the attributes specified in the table below have these additional requirements: if Number of Compensators (300A,00E0) is equal to one.

Attribute	Tag	Beam Modifier	
		Compensator	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Number of Compensators	(300A,00E0)	R+*	Shall be 1.
> Compensator Sequence	(300A,00E3)	R+*	
>> Compensator Type	(300A,00EE)	R+*	Shall be STANDARD.
>> Material ID	(300A,00E1)	R+*	
>> Compensator ID	(300A,00E5)	R+*	
>> Source to Compensator Tray Distance	(300A,00E6)	R+*	
>> Compensator Divergence	(300A,02E0)	R+*	
>> Compensator Mounting Position	(300A,02E1)	R+*	Shall be PATIENT_SIDE or SOURCE_SIDE.
>> Compensator Transmission Data	(300A,00EB)	R+*	
>> Compensator Thickness Data	(300A,00EC)	R+*	

7.4.4.3.4 Hard Wedge Beam Modifier Base Content

7.4.4.3.4.1 Referenced Standards

DICOM ~~2015a~~2018e Edition PS 3.3

7.4.4.3.4.2 Required Attributes

A single Hard Wedge may be optionally included in some of the Treatment Planning - Plan Content Storage and Retrieve transactions (Producer and Consumer actors):

For actors supporting the Hard Wedge Beam Modifier, the attributes specified in the table below have these additional requirements if Number of Wedges (300A,00D0) is greater than 0.

Attribute	Tag	Beam Modifier	
		Hard Wedge	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
> Number of Wedges	(300A,00D0)	R+*	Shall be 1 or 2; if 2, one will be Hard and the other will be either Motorized or Virtual
> Wedge Sequence	(300A,00D1)	R+*	
>> Wedge Type	(300A,00D3)	R+*	Shall be STANDARD.
>> Wedge ID	(300A,00D4)	R+	
>> Wedge Angle	(300A,00D5)	R+	
>> Wedge Orientation	(300A,00D8)	R+	
>> Source to Wedge Tray Distance	(300A,00DA)	R+	
…			
> Control Point Sequence	(300A,0111)	R+*	
>> Wedge Position Sequence	(300A,0116)	R+*	If present may not be ignored.
>>> Wedge Position	(300A,0118)	R+*	Shall be IN.