ASTRO

Integrating the Healthcare Enterprise

IHE-Radiation Oncology Technical Framework Volume 2 - Transactions

Supplement Proposal for Advanced RT Objects Interoperability (re-planning and plan management)

Draft for Public Comment

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Contents

1 Preface to Volume 2

1.1 Intended Audience

The intended audience of this document is:

- Technical staff of vendors planning to participate in the IHE initiative
- IT departments of healthcare institutions
- Experts involved in standards development
- Anyone interested in the technical aspects of integrating healthcare information systems

1.2 How this Document is Organized

Section 1 is the preface, describing the intended audience, related resources, and organizations and conventions used within this document.

Section 2 provides an overview of the concepts of IHE actors and transactions used in IHE to define the functional components of a distributed healthcare environment.

Section 3 defines transactions in detail, specifying the roles for each actor, the standards employed, the information exchanged, and in some cases, implementation options for the transaction.

Section 4 defines a set of payload bindings with transactions.

Section 5 defines the high level content specifications used for the payloads of the transactions.

Section 6 defines the reusable sections of content payloads.

Section 7 defines the lower level building blocks used in various sections.

1.3 Conventions Used in this Volume

This document has adopted the following conventions for representing the framework concepts and specifying how the standards upon which the IHE Technical Framework is based should be applied.

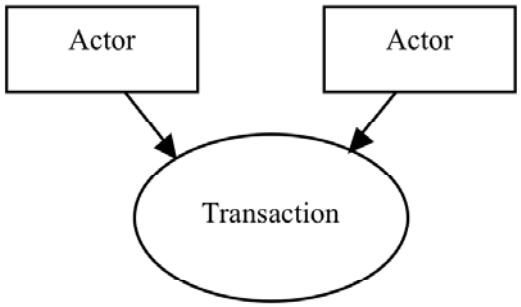
1.3.1 The Generic IHE Transaction Model

Transaction descriptions are provided in section 4. In each transaction description, the actors, the roles they play, and the transactions between them are presented as use cases.

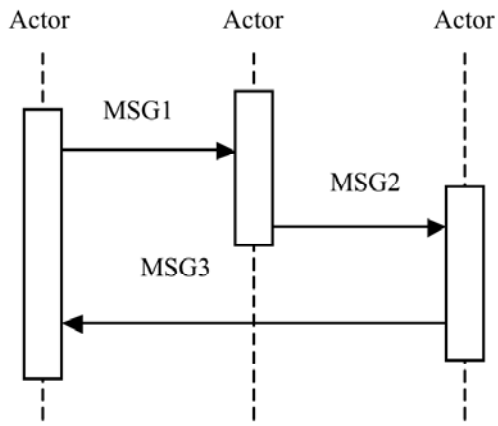
The generic IHE transaction description includes the following components:

- Scope: a brief description of the transaction.

- Use case roles: textual definitions of the actors and their roles, with a simple diagram relating them, e.g.:



- *Referenced Standards*: the standards (stating the specific parts, chapters or sections thereof) to be used for the transaction.
- *Interaction Diagram*: a graphical depiction of the actors and transactions, with related processing within an actor shown as a rectangle and time progressing downward, similar to:



The interaction diagrams used in the IHE Technical Framework are modeled after those described in Grady Booch, James Rumbaugh, and Ivar Jacobson, *The Unified Modeling Language User Guide*, ISBN 0-201-57168-4. Simple acknowledgment messages are omitted from the diagrams for brevity.

- *Message definitions*: descriptions of each message involved in the transaction, the events that trigger the message, its semantics, and the actions that the message triggers in the receiver.

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1.5 Comments

The IHE sponsors welcome comments on this document and the IHE initiative. They should be directed to the discussion server at http://forums.rsna.org or to:

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2 Introduction

This document, the IHE Radiation Oncology Technical Framework (RO-TF), defines specific implementations of established standards. These are intended to achieve integration goals that promote appropriate exchange of medical information to coordinate the optimal patient care among care providers in different care settings. It is expanded annually, after a period of public review, and maintained regularly through the identification and correction of errata. The latest version of the document is always available via the Internet at http://www.ihe.net/Technical_Framework/index.cfm , where the technical framework volumes specific to the various healthcare domains addressed by IHE may be found.

The IHE Radiation Oncology Technical Framework identifies a subset of the functional components of the healthcare enterprises and health information networks, called IHE actors, and specifies their interactions in terms of a set of coordinated, standards-based transactions.

The other domains within the IHE initiative also produce Technical Frameworks within their respective areas that together form the IHE Technical Framework. Currently, the following IHE Technical Framework(s) are available:

- IHE IT Infrastructure Technical Framework
- IHE Cardiology Technical Framework
- IHE Eye Care Technical Framework
- IHE Laboratory Technical framework
- IHE Radiology Technical Framework
- IHE Patient Care Coordination Technical Framework

Where applicable, references are made to other technical frameworks. For the conventions on referencing other frameworks, see the preface of this volume.

2.1 Relationship to Standards

The IHE Technical Framework identifies functional components of a distributed healthcare environment (referred to as IHE actors), solely from the point of view of their interactions in the healthcare enterprise. At its current level of development, it defines a coordinated set of transactions based on standards (such as HL7, IETF, ASTM, DICOM, ISO, OASIS, etc.) in order to accomplish a particular use case. As the scope of the IHE initiative expands, transactions based on other standards may be included as required.

In some cases, IHE recommends selection of specific options supported by these standards. However, IHE does not introduce technical choices that contradict conformance to these standards. If errors in or extensions to existing standards are

identified, IHE's policy is to report them to the appropriate standards bodies for resolution within their conformance and standards evolution strategy.

IHE is therefore an implementation framework, not a standard. Conformance claims for products must still be made in direct reference to specific standards. In addition, vendors who have implemented IHE integration capabilities in their products may publish IHE Integration Statements to communicate their products' capabilities. Vendors publishing IHE Integration Statements accept full responsibility for their content. By comparing the IHE Integration Statements from different products, a user familiar with the IHE concepts of actors and integration profiles can determine the level of integration between them. See http://www.ihe.net/Resources/upload/ihe_integration_statements.pdf for the format of IHE Integration Statements.

2.2 Relationship to Product Implementations

The IHE actors and transactions described in the IHE Technical Framework are abstractions of the real-world healthcare information system environment. While some of the transactions are traditionally performed by specific product categories (e.g. HIS, Clinical Data Repository, Electronic Health record systems, Radiology Information Systems, Clinical Information Systems or Cardiology Information Systems), the IHE Technical Framework intentionally avoids associating functions or actors with such product categories. For each actor, the IHE Technical Framework defines only those functions associated with integrating information systems. The IHE definition of an actor should therefore not be taken as the complete definition of any product that might implement it, nor should the framework itself be taken to comprehensively describe the architecture of a healthcare information system.

The reason for defining actors and transactions is to provide a basis for defining the interactions among functional components of the healthcare information system environment. In situations where a single physical product implements multiple functions, only the interfaces between the product and external functions in the environment are considered to be significant by the IHE initiative. Therefore, the IHE initiative takes no position as to the relative merits of an integrated environment based on a single, all-encompassing information system versus one based on multiple systems that together achieve the same end.

2.3 Relation of this Volume to the Technical Framework

The IHE Technical Framework is based on actors that interact through transactions.

Actors are information systems or components of information systems that produce, manage, or act on information associated with operational activities in the enterprise.

Transactions are interactions between actors that transfer the required information through standards-based messages.

The implementation of the transactions described in this volume support the specification of Integration Profiles defined in Volume 1. The role and implementation of these transactions require the understanding of the Integration profile they support.

2.4 IHE Usage Conventions (included for reference)

For some DICOM transactions described in this document, IHE has strengthened the requirements on the use of selected Type 2 and Type 3 attributes. These situations are explicitly documented in section 4 and in the appendices.

IHE specifically emphasizes that DICOM Type 2 attributes (for instance, Patient Name, Patient ID) shall be transmitted with zero length if the source system does not possess valid values for such attributes; in other words, the source system shall not assign default values to such attributes. The receiving system must be able to handle zero-length values for such attributes.

IHE has also defined requirements related to the support for and use of matching and return keys in DICOM queries by both Service Class Users (SCUs) and Service Class Providers (SCPs). Matching keys are used to select instances for inclusion in the response by the query SCP to the SCU, whereas return keys only return specific data and are not used for matching.

- Required matching key SCU:

  A key that the Query SCU shall have the ability to offer to its user as a selection criterion. The definition of the means offered to the user of the Query SCU to trigger the sending of a matching key in the Query request is beyond the scope of IHE (e.g. enter a value, select an entry).

- Required matching key SCP:

  An IHE required matching key is processed by the Query SCP just as if it were a DICOM-required matching key. In most cases, IHE-required matching keys are also DICOM-required matching keys.

- Required return key SCU:

  A key that the Query SCU requests from the Query SCP, receives in the query responses, and displays for the user, if required. The definition of the means offered to the user of the Query SCU to request a return key (e.g. by default, check a box) and to make it visible to the user is beyond the scope of IHE.

- Required return key SCP:

  IHE-required return keys specified within DICOM as type 1 or type 2 return keys are processed according to their DICOM type. IHE-required return keys specified within DICOM as type 3 will be processed as if they were type 2.

Query Key Requirement Tables in the framework use the following legend to specify requirements for SCUs and SCPs:

R Required O Optional

The following modifiers are also used:

R+ The requirement is an IHE extension of the DICOM requirements

R* The attribute is not required to be displayed

R+* The Requirement is an IHE extension of the DICOM requirements, but it is NOT required to be displayed

3 IHE Transactions

This section defines each IHE transaction in detail, specifying the standards used, and the information transferred.

Each of the transactions specified in this supplement are a variation of either RO-4 (Dosimetric Plan Storage) or RO-9 (Dosimetric Plan Retrieve), with the content of the plan, and especially the Beam Sequence (or Ion Beam Sequence) and its constituent beam modifiers being the key differentiator.

There is considerable specialization of treatment delivery techniques, which must be supported by products such as treatment planning systems, treatment management systems, and treatment delivery systems in order to effectively deliver the treatment to the patient.

Separation of "Beam Techniques" ***(insert cross-reference here to a definition of Beam Technique)*** and beam modifiers in to separate transactions was chosen as the means to enable the clinician to most easily evaluate a products ability to support a given "Beam Technique". In conjunction with defining separate actor pairs (producer and consumer) for each "Beam Technique", this separation into numerous transactions minimized the number of optional transactions for an actor. Hence, if a product supported an actor (as stated in an integration statement), there would be a minimum of mismatches between systems not supporting optional transactions.

A plan may contain multiple beams sequence items and these may be of distinct "Beam Techniques".

3.1 RO-ARTI-01: Basic Static Beam Storage

3.1.1 Scope

In the Basic Static Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.1.2 Use Case Roles

Actor: Basic Static Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Basic Static Beam Producer.

3.1.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.1.4 Interaction Diagram

3.1.4.1 Basic Static Beam Storage

3.1.4.1.1 Trigger Events

The **Basic Static Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.1.4.1.2 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.

3.1.4.1.2.1 Storage of RT Plan containing Basic Static Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.1-1 Required Attributes in Beams of Basic Static Technique

Attribute	Tag	Beam Technique	
		Basic Static	
		Presence	Specific Rules
Beam Sequence	(300A, 00B0)	R+*	
>Beam Number	(300A, 00C0)		
>Beam Name	(300A, 00C2)	R+	
>Beam Type	(300A, 00C4)	R+*	Value must be STATIC
>Radiation Type	(300A, 00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A, 00C7)	O+*	
>Treatment Machine Name	(300A, 00B2)	R+*	
>Primary Dosimeter Unit	(300A, 00B3)	R+	Value must be MU
>Source-Axis Distance	(300A, 00B4)	R+*	
>Beam Limiting Device Sequence	(300A, 00B6)		
>>RT Beam Limiting Device Type	(300A, 00B8)	R+*	At least 1 jaw, 1 MLC maybe present
>>Leaf Position Boundaries	(300A, 00BE)	R+*	
>Referenced Patient Setup Number	(300C, 006A)	R+*	
>Treatment Delivery Type	(300A, 00CE)	R+*	
>Number of Wedges	(300A, 00D0)	R+*	0
>Number of Compensators	(300A, 00E0)	R+*	0-1
>Compensator Sequence	(300A, 00E3)		
>>Compensator Type	(300A, 00EE)	R+*	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+*	Either PATIENT_SIDE or SOURCE_SIDE
>>Compensator Transmission Data	(300A, 00EB)	R+*	
>>Compensator Thickness Data	(300A, 00EC)	R+*	
>Number of Boli	(300A, 00ED)	R+*	0-1
>>Bolus ID	(300A, 00DC)	R+*	
>Number of Blocks	(300A, 00F0)	R+*	0-8
>Block Sequence	(300A, 00F4)		
>>Block Tray ID [1]	(300A, 00F5)	R+	
>>Source to Block Tray Distance	(300A, 00F6)	R+	
>>Block Divergence	(300A, 00FA)	R+*	
>>Block Mounting Position	(300A, 00FB)	R+	
>>Material ID	(300A, 00E1)	R+	
>>Block Thickness	(300A, 0100)	R+	
>>Block Number of Points	(300A, 0104)	R+*	
>>Block Data	(300A, 0106)	R+*	
>Applicator Sequence	(300A, 0107)	R+*	0
>Final Cumulative Meterset Weight	(300A, 010E)	O+*	
>Number of Control Points	(300A, 0110)	R+*	2
>Control Point Sequence	(300A, 0111)	R+*	

>>Cumulative Meterset Weight	(300A, 0134)	R+	
>>Referenced Dose Reference Sequence	(300C, 0050)	O+*	
>>Nominal Beam Energy	(300A, 0114)	R+	Value must be Constant across control points
>>Dose Rate Set	(300A, 0115)	R+	Value must be Constant across control points
>>Wedge Position Sequence	(300A, 0116)	O+*	Must not be present (Number of Wedges = 0)
>>Beam Limiting Device Position Sequence	(300A, 011A)	R+*	
>>Isocenter Position	(300A, 012C)	R+*	
>>Source to Surface Distance	(300A, 0130)		Required, if Patient Setup Technique (300A, 01B0) is FIXED_SSD

Note 1: There maybe 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.

3.2 RO-ARTI-02: Basic Static Beam Retrieval

3.2.1 Scope

In the Basic Static Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.2.2 Use Case Roles

Actor: Basic Static Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Basic Static Beam Consumer.

3.2.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.2.4 Interaction Diagram

3.2.4.1 Basic Static Beam Retrieve

3.2.4.1.1 Trigger Events

The archive transfers the plan to the **Basic Static Beam Consumer**.

3.2.4.1.2 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.

The requirements for the Basic Static Beam in this transaction are the same as defined in **Error! Reference source not found.**.

3.3 RO-ARTI-03: Motorized Wedge Beam Storage

3.3.1 Scope

In the Motorized Wedge Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.3.2 Use Case Roles

Actor: Motorized Wedge Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Motorized Wedge Beam Producer.

3.3.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.3.4 Interaction Diagram

3.3.4.1 Motorized Wedge Beam Storage

3.3.4.1.1 Trigger Events

The **Motorized Wedge Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.3.4.1.2 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.

3.3.4.1.2.1 Storage of RT Plan containing Motorized Wedge Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.3-1 Required Attributes in Beams of Motorized Wedge Technique

Attribute	Tag	Beam Technique	
		Motorized Wedge	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)	R+*	Value must be STATIC
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A,00C7)	O+*	
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	Value must be MU
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		
>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 jaw, 1 MLCs maybe present
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	1
>Wedge Sequence	(300A,00D1)		
>>Wedge Type	(300A,00D3)	R+*	Value must be MOTORIZED
>>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+*	0-1
>Compensator Sequence	(300A,00E3)		TBD: Tags details to be defined
>>Compensator Type	(300A,00EE)	R+*	STANDARD
>>Material ID	(300A,00E1)	R+*	
>>Compensator Mounting Position	(300A,02E1)		Either PATIENT_SIDE or SOURCE_SIDE
>Number of Boli	(300A,00ED)	R+	0-1
>Referenced Bolus Sequence	(300C,00B0)		
>>Referenced ROI Number	(3006,0084)		
>>Bolus ID	(300A,00DC)	R+*	
>Number of Blocks	(300A,00F0)	R+*	
>Block Sequence	(300A,00F4)		0-8
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	

>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	4
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	R+	
>>>Wedge Position	(300A,0118)		Wedge in for control point index 0 and 1, then wedge out in the control point index 2 and 3
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Isocenter Position	(300A,012C)	R+	
>>Source to Surface Distance	(300A,0130)		Required, if Patient Setup Technique (300A,01B0) is FIXED_SSD

Note 1: There maybe 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.

3.4 RO-ARTI-04: Motorized Wedge Beam Retrieval

3.4.1 Scope

In the Motorized Wedge Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.4.2 Use Case Roles

Actor: Motorized Wedge Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Motorized Wedge Beam Consumer.

3.4.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.4.4 Interaction Diagram

3.4.4.1 Motorized Wedge Beam Retrieve

3.4.4.1.1 Trigger Events

The archive transfers the plan to the **Motorized Wedge Beam Consumer**.

3.4.4.1.2 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.

The requirements for the Motorized Wedge Beam in this transaction are the same as defined in RO-ARTI-03: Motorized Wedge Beam Storage.

3.5 RO-ARTI-05: Hard Wedge Beam Storage

3.5.1 Scope

In the Hard Wedge Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.5.2 Use Case Roles

Actor: Hard Wedge Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Hard Wedge Beam Producer.

3.5.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.5.4 Interaction Diagram

3.5.4.1 Hard Wedge Beam Storage

3.5.4.1.1 Trigger Events

The **Hard Wedge Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.5.4.1.2 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.

3.5.4.1.2.1 Storage of RT Plan containing Hard Wedge Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.5-1 Required Attributes in Beams of Hard Wedge Technique

Attribute	Tag	Beam Technique	
		Hard Wedge	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)	R+*	Value must be STATIC
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A,00C7)	O+*	
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	Value must be MU
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		
>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 jaw (pair), 1 MLCs maybe present

>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	1
>Wedge Sequence	(300A,00D1)		
>>Wedge Type	(300A,00D3)	R+*	Value must 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+	
>Number of Compensators	(300A,00E0)	R+*	0-1
>Compensator Sequence	(300A,00E3)		TBD: Tags details to be defined
>>Compensator Type	(300A,00EE)	R+*	STANDARD
>>Material ID	(300A,00E1)	R+*	
>>Compensator Mounting Position	(300A,02E1)		Either PATIENT_SIDE or SOURCE_SIDE
>Number of Boli	(300A,00ED)	R+	0-1
>Referenced Bolus Sequence	(300C,00B0)		
>>Referenced ROI Number	(3006,0084)		
>>Bolus ID	(300A,00DC)	R+*	
>Number of Blocks	(300A,00F0)	R+*	

>Block Sequence	(300A,00F4)		0-8
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	2
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	R+	

>>>Wedge Position	(300A,0118)		IN
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Isocenter Position	(300A,012C)	R+	
>>Source to Surface Distance	(300A,0130)		Required, if Patient Setup Technique (300A,01B0) is FIXED_SSD

Note 1: There maybe 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.

3.6 RO-ARTI-06: Hard Wedge Beam Retrieval

3.6.1 Scope

In the Hard Wedge Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.6.2 Use Case Roles

Actor: Hard Wedge Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Hard Wedge Beam Consumer.

3.6.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.6.4 Interaction Diagram

3.6.4.1 Hard Wedge Beam Retrieve

3.6.4.1.1 Trigger Events

The archive transfers the plan to the **Hard Wedge Beam Consumer**.

3.6.4.1.2 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.

The requirements for the Hard Wedge Beam in this transaction are the same as defined in RO-ARTI-05: Hard Wedge Beam Storage.

3.7 RO-ARTI-07: Virtual Wedge Beam Storage

3.7.1 Scope

In the Virtual Wedge Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.7.2 Use Case Roles

Actor: Virtual Wedge Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Virtual Wedge Beam Producer.

3.7.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.7.4 Interaction Diagram

3.7.4.1 Virtual Wedge Beam Storage

3.7.4.1.1 Trigger Events

The **Virtual Wedge Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.7.4.1.2 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.

3.7.4.1.2.1 Storage of RT Plan containing Virtual Wedge Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.7-1 Required Attributes in Beams of Virtual Wedge Technique

Attribute	Tag	Beam Technique	
		Virtual Wedge	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)	R+*	Value must be STATIC
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A,00C7)	O+*	
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	Value must be MU
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		

>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 jaw, 1 MLCs maybe present
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	1
>Wedge Sequence	(300A,00D1)		
>>Wedge Type	(300A,00D3)	R+*	Value must be DYNAMIC
>>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+*	0-1
>Compensator Sequence	(300A,00E3)		TBD: Tags details to be defined
>>Compensator Type	(300A,00EE)	R+*	STANDARD
>>Material ID	(300A,00E1)	R+*	
>>Compensator Mounting Position	(300A,02E1)		Either PATIENT_SIDE or SOURCE_SIDE
>Number of Boli	(300A,00ED)	R+	0-1
>Referenced Bolus Sequence	(300C,00B0)		TBD: Tags details to be defined
>>Referenced ROI Number	(3006,0084)		
>>Bolus ID	(300A,00DC)	R+*	

>Number of Blocks	(300A,00F0)	R+*	
>Block Sequence	(300A,00F4)		0-8
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	2
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	R+	

>>>Wedge Position	(300A,0118)		
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Isocenter Position	(300A,012C)	R+	
>>Source to Surface Distance	(300A,0130)		Required, if Patient Setup Technique (300A,01B0) is FIXED_SSD

Note 1: There maybe 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.

3.8 RO-ARTI-08: Virtual Wedge Beam Retrieval

3.8.1 Scope

In the Virtual Wedge Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.8.2 Use Case Roles

Actor: Virtual Wedge Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Virtual Wedge Beam Consumer.

3.8.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.8.4 Interaction Diagram

3.8.4.1 Virtual Wedge Beam Retrieve

3.8.4.1.1 Trigger Events

The archive transfers the plan to the **Virtual Wedge Beam Consumer**.

3.8.4.1.2 Message Semantics

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

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

The requirements for the Virtual Wedge Beam in this transaction are the same as defined in RO-ARTI-07: Virtual Wedge Beam Storage.

3.9 RO-ARTI-09: Arc Beam Storage

3.9.1 Scope

In the Arc Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.9.2 Use Case Roles

Actor: Arc Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Arc Beam Producer.

3.9.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.9.4 Interaction Diagram

3.9.4.1 Arc Beam Storage

3.9.4.1.1 Trigger Events

The **Arc Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.9.4.1.2 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.

3.9.4.1.2.1 Storage of RT Plan containing Arc Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.9-1 Required Attributes in Beams of Arc Technique

Attribute	Tag	Beam Technique	
		Arc	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)		Value must be DYNAMIC
>Radiation Type	(300A,00C6)	R+*	TBD
>High-Dose Technique Type	(300A,00C7)	O+*	NORMAL, if present
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		two to three
>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 Collimator ASYM 1 MLC may be present
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	

>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	0
>Wedge Sequence	(300A,00D1)		
>>Wedge Number	(300A,00D2)		
>>Wedge Type	(300A,00D3)	R+*	
>>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+*	0
>Number of Boli	(300A,00ED)	R+	maybe present
>Number of Blocks	(300A,00F0)	R+*	
>Block Sequence	(300A,00F4)		0
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset	(300A,010E)	O+*	

Weight			
>Number of Control Points	(300A,0110)	R+*	2 This means, no skip arcs within one beam
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	O+*	
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>>Leaf/Jaw Positions	(300A,011C)		Value must be constant
>>Gantry Rotation Direction	(300A,011F)		CW or CC
>>Gantry Pitch Angle	(300A,014A)		
>>Beam Limiting Device Angle	(300A,0120)		Value must be constant
>>Patient Support Rotation Direction	(300A,0123)		Value must be NONE
>>Table Top Eccentric Rotation Direction	(300A,0126)		Value must be NONE
>> Table Top Pitch Rotation Direction	(300A,0142)		Value must be NONE
>> Table Top Roll Rotation Direction	(300A,0146)		Value must be NONE
>>Table Top Vertical Position	(300A,0128)		Value must be constant

>>Table Top Longitudinal Position	(300A,0129)		Value must be constant
>>Table Top Lateral Position	(300A,012A)		Value must be constant
>>Isocenter Position	(300A,012C)	R+	

Note 1: There maybe 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.

3.10 RO-ARTI-10: Arc Beam Retrieval

3.10.1 Scope

In the Arc Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.10.2 Use Case Roles

Actor: Arc Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Arc Beam Consumer.

3.10.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.10.4 Interaction Diagram

3.10.4.1 Arc Beam Retrieve

3.10.4.1.1 Trigger Events

The archive transfers the plan to the **Arc Beam Consumer**.

3.10.4.1.2 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.

The requirements for the Arc Beam in this transaction are the same as defined in RO-ARTI-09: Arc Beam Storage.

3.11 RO-ARTI-11: Conformal Arc Beam Storage

3.11.1 Scope

In the Conformal Arc Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the Archive.

3.11.2 Use Case Roles

Actor: Conformal Arc Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Conformal Arc Beam Producer.

3.11.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.11.4 Interaction Diagram

3.11.4.1 Conformal Arc Beam Storage

3.11.4.1.1 Trigger Events

The **Conformal Arc Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.11.4.1.2 Message Semantics

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

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

The **Conformal 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.

3.11.4.1.2.1 Storage of RT Plan containing Conformal Arc Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.11-1 Required Attributes in Beams of Conformal Arc Technique

Attribute	Tag	Beam Technique	
		Conformal Arc	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)		Value must be DYNAMIC
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A,00C7)	O+*	NORMAL, if present
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		two to three
>>RT Beam Limiting	(300A,00B8)		At least 1 Collimator ASYM, 1

Device Type			MLC
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	0
>Wedge Sequence	(300A,00D1)		
>>Wedge Number	(300A,00D2)		
>>Wedge Type	(300A,00D3)	R+*	
>>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+*	0
>Number of Boli	(300A,00ED)	R+	maybe present
>Number of Blocks	(300A,00F0)	R+*	
>Block Sequence	(300A,00F4)		0
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	

>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	TBD: Do we want to specify Upper Bound
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	O+*	0
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>>Leaf/Jaw Positions	(300A,011C)		TBD - what current systems support - and if there is an interoperability use case. 2 possibilities: Step-pandShoot style Sliding window style
>>Gantry Rotation Direction	(300A,011F)		CW or CC

>>Gantry Pitch Angle	(300A,014A)		
>>Beam Limiting Device Angle	(300A,0120)		TBD: constant
>>Patient Support Rotation Direction	(300A,0123)		Value must be NONE
>>Table Top Eccentric Rotation Direction	(300A,0126)		Value must be NONE
>> Table Top Pitch Rotation Direction	(300A,0142)		Value must be NONE
>> Table Top Roll Rotation Direction	(300A,0146)		Value must be NONE
>>Table Top Vertical Position	(300A,0128)		Value must be constant
>>Table Top Longitudinal Position	(300A,0129)		Value must be constant
>>Table Top Lateral Position	(300A,012A)		Value must be constant
>>Isocenter Position	(300A,012C)	R+	

Note 1: There maybe 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.

3.12 RO-ARTI-12: Conformal Arc Beam Retrieval

3.12.1 Scope

In the Conformal Arc Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.12.2 Use Case Roles

Actor: Conformal Arc Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Conformal Arc Beam Consumer.

3.12.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.12.4 Interaction Diagram

3.12.4.1 Conformal Arc Beam Retrieve

3.12.4.1.1 Trigger Events

The archive transfers the plan to the **Conformal Arc Beam Consumer**.

3.12.4.1.2 Message Semantics

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

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

The requirements for the Arc Beam in this transaction are the same as defined in RO-ARTI-11: Conformal Arc Beam Storage.

3.13 RO-ARTI-13: Step & Shoot Beam Storage

3.13.1 Scope

In the Step & Shoot Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.13.2 Use Case Roles

Actor: Step & Shoot Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Step & Shoot Beam Producer.

3.13.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.13.4 Interaction Diagram

3.13.4.1 Step & Shoot Beam Storage

3.13.4.1.1 Trigger Events

The **Step & Shoot Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.13.4.1.2 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.

3.13.4.1.2.1 Storage of RT Plan containing Step & Shoot Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.13-1 Required Attributes in Beams of Step & Shoot Technique

Attribute	Tag	Beam Technique	
		Step & Shoot	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)	R+*	Value must be STATIC
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A,00C7)	O+*	NORMAL, if present
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	

>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		two to three
>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 Collimator ASYM, 1 MLC
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	TBD
>>Wedge Type	(300A,00D3)	R+*	
>>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+*	0
>Number of Boli	(300A,00ED)	R+	0-1
>Referenced	(300C,00B0)		

Bolus Sequence			
>>Bolus ID	(300A,00DC)	R+*	
>Block Sequence	(300A,00F4)		0-8
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	2n where n is the number of unique field shapes composing the beam. TBD: Do we want to specify Upper Bound

>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	CP[0]=0.0 :: CP[2m + 1]=Cumulative Meterset Weight after completion of delivery of the field shape :: CP[2m+1] = CP[2m + 2]
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	O+*	
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Gantry Rotation Direction	(300A,011F)		Value must be NONE
>>Beam Limiting Device Angle	(300A,0120)		TBD: Value must be constant
>>Patient Support Rotation Direction	(300A,0123)		Value must be NONE
>>Table Top Eccentric Rotation Direction	(300A,0126)		Value must be NONE

>> Table Top Pitch Rotation Direction	(300A,0142)		Value must be NONE
>> Table Top Roll Rotation Direction	(300A,0146)		Value must be NONE
>>Table Top Vertical Position	(300A,0128)		Value must be constant
>>Table Top Longitudinal Position	(300A,0129)		Value must be constant
>>Table Top Lateral Position	(300A,012A)		Value must be constant
>>Isocenter Position	(300A,012C)	R+	

Note 1: There maybe 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.

3.14 RO-ARTI-14: Step & Shoot Beam Retrieval

3.14.1 Scope

In the Step & Shoot Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.14.2 Use Case Roles

Actor: Step & Shoot Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Step & Shoot Beam Consumer.

3.14.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.14.4 Interaction Diagram

3.14.4.1 Step & Shoot Beam Retrieve

3.14.4.1.1 Trigger Events

The archive transfers the plan to the **Step & Shoot Beam Consumer**.

3.14.4.1.2 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.

The requirements for the Step & Shoot Beam in this transaction are the same as defined in RO-ARTI-13: Step & Shoot Beam Storage.

3.15 RO-ARTI-15: Sliding Window Beam Storage

3.15.1 Scope

In the Sliding Window Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.15.2 Use Case Roles

Actor: Sliding Window Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Sliding Window Beam Producer.

3.15.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.15.4 Interaction Diagram

3.15.4.1 Sliding Window Beam Storage

3.15.4.1.1 Trigger Events

The **Sliding Window Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.15.4.1.2 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.

3.15.4.1.2.1 Storage of RT Plan containing Sliding Window Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.15-1 Required Attributes in Beams of Sliding Window Technique

Attribute	Tag	Beam Technique	
		Sliding Window	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)	R+*	Value must be DYNAMIC
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON
>High-Dose Technique Type	(300A,00C7)	O+*	NORMAL, if present
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	
>Referenced Tolerance Table Number	(300C,00A0)		
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		two to three
>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 Collimator ASYM, 1 MLC
>>Leaf	(300A,00BE)	R+*	

Position Boundaries			
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	TBD
>>Wedge Type	(300A,00D3)	R+*	
>>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+*	0
>Number of Boli	(300A,00ED)	R+	0-1
>Referenced Bolus Sequence	(300C,00B0)		
>>Bolus ID	(300A,00DC)	R+*	
>Block Sequence	(300A,00F4)		0-8
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	

>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)		0
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	> 2 TBD: Do we want to specify Upper Bound
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant

>>Wedge Position Sequence	(300A,0116)	O+*	
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Gantry Rotation Direction	(300A,011F)		Value must be NONE
>>Beam Limiting Device Angle	(300A,0120)		Value must be constant
>>Patient Support Rotation Direction	(300A,0123)		Value must be NONE
>>Table Top Eccentric Rotation Direction	(300A,0126)		Value must be NONE
>> Table Top Pitch Rotation Direction	(300A,0142)		Value must be NONE
>> Table Top Roll Rotation Direction	(300A,0146)		Value must be NONE
>>Table Top Vertical Position	(300A,0128)		Value must be constant
>>Table Top Longitudinal Position	(300A,0129)		Value must be constant
>>Table Top Lateral Position	(300A,012A)		Value must be constant

>>Isocenter Position	(300A,012C)	R+	

Note 1: There maybe 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.

3.16 RO-ARTI-16: Sliding Window Beam Retrieval

3.16.1 Scope

In the Sliding Window Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.16.2 Use Case Roles

Actor: Sliding Window Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Sliding Window Beam Consumer.

3.16.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.16.4 Interaction Diagram

3.16.4.1 Sliding Window Beam Retrieve

3.16.4.1.1 Trigger Events

The archive transfers the plan to the **Sliding Window Beam Consumer**.

3.16.4.1.2 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.

The requirements for the Sliding Window Beam in this transaction are the same as defined in RO-ARTI-15: Sliding Window Beam Storage.

3.17 RO-ARTI-17: Static Electron Beam Storage

3.17.1 Scope

In the Static Electron Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.17.2 Use Case Roles

Actor: Static Electron Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Static Electron Beam Producer.

3.17.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.17.4 Interaction Diagram

3.17.4.1 Static Electron Beam Storage

3.17.4.1.1 Trigger Events

The **Static Electron Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.17.4.1.2 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.

3.17.4.1.2.1 Storage of RT Plan containing Static Electron Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.17-1 Required Attributes in Beams of Electron Technique

Attribute	Tag	Beam Technique	
		Electron	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Beam Type	(300A,00C4)	R+*	Value must be STATIC
>Radiation	(300A,00C6)		Value must be ELECTRON

Type			
>High-Dose Technique Type	(300A,00C7)	O+*	
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	
>Referenced Tolerance Table Number	(300C,00A0)		
>Source-Axis Distance	(300A,00B4)	R+*	
>Beam Limiting Device Sequence	(300A,00B6)		one or two collimators, no MLC
>>RT Beam Limiting Device Type	(300A,00B8)		
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	0
>>Wedge Type	(300A,00D3)	R+*	

>>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+*	
>Number of Boli	(300A,00ED)	R+	0-1
>Referenced Bolus Sequence	(300C,00B0)		
>>Bolus ID	(300A,00DC)	R+*	
>Block Sequence	(300A,00F4)		0-8
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray Distance	(300A,00F6)	R+	
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	

>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)	R+*	1
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	2
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant
>>Dose Rate Set	(300A,0115)	R+	Value must be constant
>>Wedge Position Sequence	(300A,0116)	O+*	
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Gantry Rotation Direction	(300A,011F)		Value must be NONE

>>Beam Limiting Device Angle	(300A,0120)		Value must be constant
>>Patient Support Rotation Direction	(300A,0123)		Value must be NONE
>>Table Top Eccentric Rotation Direction	(300A,0126)		Value must be NONE
>> Table Top Pitch Rotation Direction	(300A,0142)		Value must be NONE
>> Table Top Roll Rotation Direction	(300A,0146)		Value must be NONE
>>Table Top Vertical Position	(300A,0128)		Value must be constant
>>Table Top Longitudinal Position	(300A,0129)		Value must be constant
>>Table Top Lateral Position	(300A,012A)		Value must be constant
>>Isocenter Position	(300A,012C)	R+	

Note 1: There maybe 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.

3.18 RO-ARTI-18: Static Electron Beam Retrieval

3.18.1 Scope

In the Static Electron Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.18.2 Use Case Roles

Actor: Static Electron Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Static Electron Beam Consumer.

3.18.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.18.4 Interaction Diagram

3.18.4.1 Static Electron Beam Retrieve

3.18.4.1.1 Trigger Events

The archive transfers the plan to the **Static Electron Beam Consumer**.

3.18.4.1.2 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.

The requirements for the Static Electron Beam in this transaction are the same as defined in RO-ARTI-17: Static Electron Beam Storage.

3.19 RO-ARTI-19: Stereotactic Beam Storage

3.19.1 Scope

In the Stereotactic Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.19.2 Use Case Roles

Actor: Stereotactic Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Stereotactic Beam Producer.

3.19.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.19.4 Interaction Diagram

3.19.4.1 Stereotactic Beam Storage

3.19.4.1.1 Trigger Events

The **Stereotactic Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.19.4.1.2 Message Semantics

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

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

The **Stereotactic 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 Stereotactic Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.19-1 Required Attributes in Beams of Stereotactic Technique

Attribute	Tag	Beam Technique	
		Stereotactic	
		Presence	Specific Rules
Beam Sequence	(300A,00B0)	R+*	
>Beam Number	(300A,00C0)		
>Beam Name	(300A,00C2)	R+	
>Radiation Type	(300A,00C6)	R+*	
>High-Dose Technique Type	(300A,00C7)	O+*	
>Treatment Machine Name	(300A,00B2)	R+*	
>Primary Dosimeter Unit	(300A,00B3)	R+	
>Source-Axis Distance	(300A,00B4)	R+*	

>Beam Limiting Device Sequence	(300A,00B6)		
>>Leaf Position Boundaries	(300A,00BE)	R+*	
>Referenced Patient Setup Number	(300C,006A)	R+*	
>Treatment Delivery Type	(300A,00CE)	R+*	
>Number of Wedges	(300A,00D0)	R+*	
>>Wedge Type	(300A,00D3)	R+*	
>>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+*	
>Number of Boli	(300A,00ED)	R+	
>Block Sequence	(300A,00F4)		
>>Block Tray ID	(300A,00F5)	R+	
>>Source to Block Tray	(300A,00F6)	R+	

Distance			
>>Block Divergence	(300A,00FA)	R+*	
>>Block Mounting Position	(300A,00FB)	R+	
>>Material ID	(300A,00E1)	R+	
>>Block Thickness	(300A,0100)	R+	
>>Block Number of Points	(300A,0104)	R+*	
>>Block Data	(300A,0106)	R+*	
>Applicator Sequence	(300A,0107)	R+*	
>Final Cumulative Meterset Weight	(300A,010E)	O+*	
>Number of Control Points	(300A,0110)	R+*	
>Control Point Sequence	(300A,0111)	R+*	
>>Cumulative Meterset Weight	(300A,0134)	R+	
>>Referenced Dose Reference Sequence	(300C,0050)	O+*	
>>Nominal Beam Energy	(300A,0114)	R+	

>>Dose Rate Set	(300A,0115)	R+	
>>Wedge Position Sequence	(300A,0116)	O+*	
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*	
>>Isocenter Position	(300A,012C)	R+	

Note 1: There maybe 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.

3.20 RO-ARTI-20: Stereotactic Beam Retrieval

3.20.1 Scope

In the Stereotactic Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.20.2 Use Case Roles

Actor: Stereotactic Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Stereotactic Beam Consumer.

3.20.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.20.4 Interaction Diagram

3.20.4.1 Stereotactic Beam Retrieve

3.20.4.1.1 Trigger Events

The archive transfers the plan to the **Stereotactic 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 **Stereotactic Beam Consumer** is the DICOM Storage SCP.

The requirements for the Stereotactic Beam in this transaction are the same as defined in RO-ARTI-19: Stereotactic Beam Storage.

3.21 RO-ARTI-21: IMAT/VMAT Beam Storage

3.21.1 Scope

In the IMAT/VMAT Beam Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.21.2 Use Case Roles

Actor: IMAT/VMAT Beam Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from IMAT/VMAT Beam Producer.

3.21.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.21.4 Interaction Diagram

3.21.4.1 IMAT/VMAT Beam Storage

3.21.4.1.1 Trigger Events

The **IMAT/VMAT Beam Producer** transfers the plan to the archive, once the dose calculation is finished.

3.21.4.1.2 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.

3.21.4.1.2.1 Storage of RT Plan containing IMAT/VMAT Beam

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.21-1 Required Attributes in Beams of IMAT/VMAT Technique

Attribute	Tag	Beam Technique		
		IMAT/VMAT		
		Presence	Specific Rules	TBD

Beam Sequence	(300A,00B0)	R+* / R+*		
>Beam Number	(300A,00C0)			
>Beam Name	(300A,00C2)	R+ / R+		
>Beam Type	(300A,00C4)	R+*	Value must be DYNAMIC	
>Radiation Type	(300A,00C6)	R+*	Value must be PHOTON	
>High-Dose Technique Type	(300A,00C7)	O+*	if present, NORMAL or HDR	
>Treatment Machine Name	(300A,00B2)	R+*		
>Primary Dosimeter Unit	(300A,00B3)	R+	Value must be MU	
>Source-Axis Distance	(300A,00B4)	R+*		
>Beam Limiting Device Sequence	(300A,00B6)		two to three	
>>RT Beam Limiting Device Type	(300A,00B8)		At least 1 Collimator ASYM, 1 MLC	
>>Leaf Position Boundaries	(300A,00BE)	R+*		
>Referenced Patient Setup Number	(300C,006A)	R+*		
>Number of Wedges	(300A,00D0)	R+*	0	No wedge in Gplan, also not valid in IMRT and other

				inappropriate techniques
>Wedge Sequence	(300A,00D1)			
>>Wedge Type	(300A,00D3)	R+*		
>>Wedge ID	(300A,00D4)	R+		
>>Wedge Angle	(300A,00D5)	R+		
>>Wedge Orientation	(300A,00D8)	R+		
>>Source to Wedge Tray Distance	(300A,00DA)	R+		Verify if OK in general
>Number of Compensators	(300A,00E0)	R+*	0	
>Number of Boli	(300A,00ED)	R+	0-1	Shall be zero in a GPLan, up to 8 in a DPLan
>Number of Blocks	(300A,00F0)		0	
>Block Sequence	(300A,00F4)			
>>Block Tray ID	(300A,00F5)	R+		
>>Source to Block Tray Distance	(300A,00F6)	R+		
>>Block Divergence	(300A,00FA)	R+*		
>>Block Mounting Position	(300A,00FB)	R+		
>>Material ID	(300A,00E1)	R+		

>>Block Thickness	(300A,0100)	R+		
>>Block Number of Points	(300A,0104)	R+*		
>>Block Data	(300A,0106)	R+*		
>Applicator Sequence	(300A,0107)		0	
>Final Cumulative Meterset Weight	(300A,010E)	O+*		
>Number of Control Points	(300A,0110)	R+*	> 2 TBD: Do we want to specify Upper Bound	
>Control Point Sequence	(300A,0111)	R+*		
>>Cumulative Meterset Weight	(300A,0134)	R+		
>>Referenced Dose Reference Sequence	(300C,0050)	O+*		
>>Nominal Beam Energy	(300A,0114)	R+	Value must be constant	TBD, whether mutiple arcs (informal expression here) are represented in by several beams or within one beam
>>Dose Rate Set	(300A,0115)	R+	Maybe present as Nominal Dose Rate (1*)	

>>Wedge Position Sequence	(300A,0116)	O+*	Not Present	
>>Beam Limiting Device Position Sequence	(300A,011A)	R+*		
>>Gantry Angle	(300A,011E)		Different on all control points	Depend on question on line 120
>>Gantry Rotation Direction	(300A,011F)		CW or CCW	Depend on question on line 120
>>Gantry Pitch Angle	(300A,014A)		Not present	
>>Gantry Pitch Rotation Direction	(300A,014C)		Not present	
>>Beam Limiting Device Rotation Direction	(300A,0121)		NONE, CW, CCW	
>>Patient Support Rotation Direction	(300A,0123)		NONE	
>>Table Top Eccentric Rotation Direction	(300A,0126)		NONE	
>> Table Top Pitch Rotation Direction	(300A,0142)		NONE	
>> Table Top Roll Rotation Direction	(300A,0146)		NONE	

>>Table Top Vertical Position	(300A,0128)		Value must be constant	
>>Table Top Longitudinal Position	(300A,0129)		Value must be constant	
>>Table Top Lateral Position	(300A,012A)		Value must be constant	
>>Isocenter Position	(300A,012C)	R+(* or not *)	Value must be constant	

Note 1: There maybe 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.

Note 2: The Dose Rate may vary during time of actual delivery depending on the actual movement of the machine axis and is not an steering parameter on control point level.

3.22 RO-ARTI-22: IMAT/VMAT Beam Retrieval

3.22.1 Scope

In the IMAT/VMAT Beam Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) retrieves the plan from the archive.

3.22.2 Use Case Roles

Actor: IMAT/VMAT Beam Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to IMAT/VMAT Beam Consumer.

3.22.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.22.4 Interaction Diagram

3.22.4.1 IMAT/VMAT Beam Retrieve

3.22.4.1.1 Trigger Events

The archive transfers the plan to the **IMAT/VMAT 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 **IMAT/VMAT Beam Consumer** is the DICOM Storage SCP.

The requirements for the IMAT/VMAT Beam in this transaction are the same as defined in RO-ARTI-21: IMAT/VMAT Beam Storage.

3.23 RO-ARTI-23: Bolus Beam Modifier Storage

3.23.1 Scope

In the Bolus Beam Modifier Storage transaction, a Producer of an RT Plan (or RT Ion Plan) that incorporates the beam technique identified in (***put cross reference here***) stores the plan to the archive.

3.23.2 Use Case Roles

Actor: Bolus Beam Modifier Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Bolus Beam Modifier Producer.

3.23.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.23.4 Interaction Diagram

3.23.4.1 Bolus Beam Modifier Storage

3.23.4.1.1 Trigger Events

The **Bolus Beam Modifier Producer** transfers the plan to the archive, once the dose calculation is finished.

3.23.4.1.2 Message Semantics

The **Bolus Beam Modifier Producer** uses the DICOM C-STORE message to transfer the plan.

The **Bolus Beam Modifier Producer** is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The **Bolus Beam Modifier 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 Bolus Beam Modifier

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.23-1 Required Attributes in Beams containing Bolus Beam Modifier

Attribute	Tag	Beam Modifier		
		Bolus		
		Presence	Specific Rules	TBD
Beam Sequence	(300A,00B0)	R+* / R+*		

>Number of Boli	(300A,00ED)	R+	1	
>>Bolus ID	(300A,00DC)	R+*		

3.24 RO-ARTI-24: Bolus Beam Modifier Retrieval

3.24.1 Scope

In the Bolus Beam Modifier Retrieval transaction, a consumer of an RT Plan (or RT Ion Plan) that incorporates the beam modifier identified in (***put cross reference here***) retrieves the plan from the archive.

3.24.2 Use Case Roles

Actor: Bolus Beam Modifier Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Bolus Beam Modifier Consumer.

3.24.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.24.4 Interaction Diagram

3.24.4.1 Bolus Beam Modifier Retrieve

3.24.4.1.1 Trigger Events

The archive transfers the plan to the **Bolus Beam Modifier 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 **Bolus Beam Modifier Consumer** is the DICOM Storage SCP.

The requirements for the Bolus Beam Modifier in this transaction are the same as defined in RO-ARTI-23: Bolus Beam Modifier Storage.

3.25 RO-ARTI-25: Block Beam Modifier Storage

3.25.1 Scope

In the Block Beam Modifier Storage transaction, a Producer of an RT Plan that incorporates the beam modifier identified in (***put cross reference here***) stores the plan to the archive.

3.25.2 Use Case Roles

Actor: Block Beam Modifier Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Block Beam Modifier Producer.

3.25.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.25.4 Interaction Diagram

3.25.4.1 Block Beam Modifier Storage

3.25.4.1.1 Trigger Events

The **Block Beam Modifier Producer** transfers the plan to the archive, once the dose calculation is finished.

3.25.4.1.2 Message Semantics

The **Block Beam Modifier Producer** uses the DICOM C-STORE message to transfer the plan.

The **Block Beam Modifier Producer** is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The **Block Beam Modifier 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 Block Beam Modifier

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.25-1 Required Attributes in Block Beam Modifier

Attribute	Tag	Beam Modifier		
		Block		
		Presence	Specific Rules	TBD
Beam Sequence	(300A,00B0)	R+* / R+*		
>Number of Blocks	(300A,00F0)			
>Block Sequence	(300A,00F4)			
>>Block Tray ID	(300A,00F5)	R+		
>>Source to Block Tray Distance	(300A,00F6)	R+		
>>Block Divergence	(300A,00FA)	R+*		
>>Block Mounting Position	(300A,00FB)	R+		

>>Material ID	(300A,00E1)	R+		
>>Block Thickness	(300A,0100)	R+		
>>Block Number of Points	(300A,0104)	R+*		
>>Block Data	(300A,0106)	R+*		

Note 1: There maybe 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.

3.26 RO-ARTI-26: Block Beam Modifier Retrieval

3.26.1 Scope

In the Block Beam Modifier Retrieval transaction, a consumer of an RT Plan that incorporates the beam modifier identified in (***put cross reference here***) retrieves the plan from the archive.

3.26.2 Use Case Roles

Actor: Block Beam Modifier Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Block Beam Modifier Consumer.

3.26.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.26.4 Interaction Diagram

3.26.4.1 Block Beam Modifier Retrieve

3.26.4.1.1 Trigger Events

The archive transfers the plan to the **Block Beam Modifier 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 **Block Beam Modifier Consumer** is the DICOM Storage SCP.

The requirements for the Block Beam Modifier in this transaction are the same as defined in RO-ARTI-25: Block Beam Modifier Storage.

3.27 RO-ARTI-27: Compensator Beam Modifier Storage

3.27.1 Scope

In the Compensator Beam Modifier Storage transaction, a Producer of an RT Plan that incorporates the beam modifier identified in (***put cross reference here***) stores the plan to the archive.

3.27.2 Use Case Roles

Actor: Compensator Beam Modifier Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Compensator Beam Modifier Producer.

3.27.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.27.4 Interaction Diagram

3.27.4.1 Compensator Beam Modifier Storage

3.27.4.1.1 Trigger Events

The **Compensator Beam Modifier Producer** transfers the plan to the archive, once the dose calculation is finished.

3.27.4.1.2 Message Semantics

The **Compensator Beam Modifier Producer** uses the DICOM C-STORE message to transfer the plan.

The **Compensator Beam Modifier Producer** is the DICOM Storage SCU and the Archive is the DICOM Storage SCP.

The **Compensator Beam Modifier 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 Compensator Beam Modifier

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.27-1 Required Attributes in Compensator Beam Modifier

Attribute	Tag	Beam Modifier		
		Compensator		
		Presence	Specific Rules	TBD
Beam Sequence	(300A,00B0)	R+* / R+*		
>Number of Compensators	(300A, 00E0)	R+*	0-1	
>Compensator Sequence	(300A, 00E3)			

>>Compensator Type	(300A, 00EE)	R+*	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+*	Either PATIENT_SIDE or SOURCE_SIDE	
>>Compensator Transmission Data	(300A, 00EB)	R+*		
>>Compensator Thickness Data	(300A, 00EC)	R+*		

3.28 RO-ARTI-28: Compensator Beam Modifier Retrieval

3.28.1 Scope

In the Compensator Beam Modifier Retrieval transaction, a consumer of an RT Plan that incorporates the beam modifier identified in (***put cross reference here***) retrieves the plan from the archive.

3.28.2 Use Case Roles

Actor: Compensator Beam Modifier Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Compensator Beam Modifier Consumer.

3.28.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.28.4 Interaction Diagram

3.28.4.1 Block Beam Modifier Retrieve

3.28.4.1.1 Trigger Events

The archive transfers the plan to the **Compensator Beam Modifier 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 **Compensator Beam Modifier Consumer** is the DICOM Storage SCP.

The requirements for the **Compensator** Beam Modifier in this transaction are the same as defined in RO-ARTI-27: Compensator Beam Modifier Storage.

3.29 RO-ARTI-29: Hard Wedge Beam Modifier Storage

3.29.1 Scope

In the Hard Wedge Beam Modifier Storage transaction, a Producer of an RT Plan that incorporates the beam modifier identified in (***put cross reference here***) stores the plan to the archive.

3.29.2 Use Case Roles

Actor: Hard Wedge Beam Modifier Producer

Role: Transmits generated plan to archive

Actor: Archive

Role: Accept and store plan from Hard Wedge Beam Modifier Producer.

3.29.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.29.4 Interaction Diagram

3.29.4.1 Hard Wedge Beam Modifier Storage

3.29.4.1.1 Trigger Events

The **Hard Wedge Beam Modifier Producer** transfers the plan to the archive, once the dose calculation is finished.

3.29.4.1.2 Message Semantics

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

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

The **Hard Wedge Beam Modifier 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 Hard Wedge Beam Modifier

Systems supporting the Advanced RT Objects Interoperability 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 TF-RO Appendix A.3 (other than the RT Beams Module,which is specified below).

Table 3.29-1 Required Attributes in Compensator Beam Modifier

Attribute	Tag	Beam Modifier		
		Hard Wedge		
		Presence	Specific Rules	TBD
Beam Sequence	(300A,00B0)	R+* / R+*		
>Number of Wedges	(300A,00D0)	R+*	1	
>Wedge Sequence	(300A,00D1)			
>>Wedge Type	(300A,00D3)	R+*	Value must 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+		
>>>Wedge Position	(300A,0118)		IN	

3.30 RO-ARTI-30: Hard Wedge Beam Modifier Retrieval

3.30.1 Scope

In the Hard Wedge Beam Modifier Retrieval transaction, a consumer of an RT Plan that incorporates the beam modifier identified in (***put cross reference here***) retrieves the plan from the archive.

3.30.2 Use Case Roles

Actor: Hard Wedge Beam Modifier Consumer

Role: Accepts plan from archive

Actor: Archive

Role: Transmits plan to Hard Wedge Beam Modifier Consumer.

3.30.3 Referenced Standards

DICOM 2008, PS 3.3: RT Modules, PS 3.4: Storage Service Class.

3.30.4 Interaction Diagram

3.30.4.1 Hard Wedge Beam Modifier Retrieve

3.30.4.1.1 Trigger Events

The archive transfers the plan to the **Hard Wedge Beam Modifier 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 Modifier Consumer** is the DICOM Storage SCP.

The requirements for the Hard Wedge Beam Modifier in this transaction are the same as defined in RO-ARTI-29: Hard Wedge Beam Modifier Storage

Attribute Consistency Between Composite IODs

A.1 Radiation Oncology Critical Attribute Mapping

A.2 Radiation Oncology Critical Modules

A.3 Radiation Oncology Critical Attributes

(To be added to section A.3 of the Appendix in TF-RO)

All of the Radiation Oncology Critical Attributes identified here are applicable to all transactions in the Advanced RT Objects Interoperability profile.

RT Prescription Module

Attribute	Tag	Type	Attribute Note
Dose Reference Sequence	(300A, 0010)		For actors participating in the Advanced RT Objects Interoperability Profile
>Dose Reference UID	(300A, 0013)	R+*	For actors participating in the Advanced RT Objects Interoperability Profile
>Dose Reference Description	(300A, 0016)	R+	For actors participating in the Advanced RT Objects Interoperability Profile

RT Patient Setup Module

Attribute	Tag	Type	Attribute Note
Patient Setup Sequence	(300A, 0180)		For actors participating in the Advanced RT Objects Interoperability Profile
>Table Top Vertical Setup Displacement	(300A, 01D2)	TBD (see December 2008 TC meeting minutes)	For actors participating in the Advanced RT Objects Interoperability Profile
>Table Top Longitudinal Setup Displacement	(300A, 01D4)	TBD (see December 2008 TC meeting minutes)	For actors participating in the Advanced RT Objects Interoperability Profile
>Table Top Lateral Setup Displacement	(300A, 01D6)	TBD (see December 2008 TC meeting minutes)	For actors participating in the Advanced RT Objects Interoperability Profile

RT Fraction Scheme Module 1

Attribute	Tag	Type	Attribute Note
Fraction Group Sequence	(300A, 0070)		For actors participating in the Advanced RT Objects Interoperability Profile
>Number of Fractions Planned	(300A, 0078)	R+	For actors participating in the Advanced RT Objects Interoperability Profile
>Referenced Beam Sequence	(300C, 0004)		For actors participating in the Advanced RT Objects Interoperability Profile
>>Beam Dose	(300A, 0084)	R+	For actors participating in the Advanced RT Objects Interoperability Profile

RT Plan Module 1

Attribute	Tag	Type	Attribute Note
Plan Intent	(300A, 000A)	R+	For actors participating in the Advanced RT Objects Interoperability Profile

General Equipment Module 1

Attribute	Tag	Type	Attribute Note
Software Versions	(0018, 1020)	R+	For actors participating in the Advanced RT Objects Interoperability Profile