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**Digital Imaging and Communications in Medicine (DICOM)**

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*Supplement 175: Second Generation Radiotherapy –  
C-Arm RT Treatment Modalities*

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**DICOM Standards Committee, Working Group 7, Radiation Therapy**

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160

## Foreword

162 This Supplement specifies additional IODs necessary to support the new Second Generation Radiotherapy IODs and operations.

164

## Scope and Field of Application

### Introduction

166 This Supplement introduces the RT Radiation IOD and the RT Radiation Set IOD. An RT Radiation  
168 Set IOD defines a Radiotherapy Treatment Fraction as a collection of instances of RT Radiation  
IODs. RT Radiation IODs represent different treatment modalities. This Supplement introduces the  
representation of the C-Arm techniques.

### General Architectural Principles

- 172 • Different types of treatment devices are supported by different IODs. For example, C-Arm  
174 devices, Tomotherapeutic devices, Multiple Fixed Source devices and Robotic devices are  
modeled separately. This allows more stringent conditions to be applied to the presence or  
absence of Attributes within those IODs, and thereby increases the potential for interoperability.
- 176 • The Second Generation RT Objects definitions provide the basis to support all current treatment  
modalities and be extensible for future modalities and new equipment.
- 178 • Compatibility with First-Generation IODs: It will be possible for the content of First Generation  
180 IODs to be represented in Second Generation IODs. However, information beyond the content of  
a First Generation SOP Instance will be needed to create a valid Second Generation SOP  
Instance.

182

**Editorial Note: All existing occurrences of the term Meterset in the current DICOM Standard should be capitalized.**

184

186

**Part 2 Addendum**

<b>Add new SOP Classes to PS3.2 Table A.1-2 UID Values:</b>
---

188

<b>UID Value</b>	<b>UID Name</b>	<b>Category</b>
1.2.840.10008.5.1.4.1.1.481.12	RT Radiation Set Storage	Transfer
1.2.840.10008.5.1.4.1.1.481.13	C-Arm Photon-Electron Radiation Storage	Transfer

190

## Part 3 Addendum

192

Add the following columns in PS3.3 Section A.1.4, Table A.1-4b COMPOSITE INFORMATION OBJECT MODULES OVERVIEW – RADIOTHERAPY

194

IODs Modules	<u>RT Rad Set</u>	<u>C-Arm Ph-EI Rad</u>
Patient	<u>M</u>	<u>M</u>
Clinical Trial Subject	<u>U</u>	<u>U</u>
General Study	<u>M</u>	<u>M</u>
Patient Study	<u>U</u>	<u>U</u>
Clinical Trial Study	<u>U</u>	<u>U</u>
General Series	<u>M</u>	<u>M</u>
Clinical Trial Series	<u>U</u>	<u>U</u>
Enhanced RT Series	<u>M</u>	<u>M</u>
General Equipment	<u>M</u>	<u>M</u>
Enhanced General Equipment	<u>M</u>	<u>M</u>
<b>Frame Of Reference</b>		<u>M</u>
Radiotherapy Common Instance	<u>M</u>	<u>M</u>
...		
<b>RT Radiation Set</b>	<u>M</u>	
<b>RT Dose Contribution</b>	<u>C</u>	
<b>RT Delivery Device Common</b>		<u>M</u>
<b>RT Radiation Common</b>		<u>M</u>
<b>C-Arm Photon- Electron Delivery Device</b>		<u>M</u>
<b>C-Arm Photon- Electron Beam</b>		<u>M</u>
...		
Common Instance Reference	<u>M</u>	<u>M</u>
SOP Common	<u>M</u>	<u>M</u>

196

Add the following to PS3.3 Chapter 10 Miscellaneous Macros:



**10.38 OUTLINE DEFINITION MACRO**

198 The Outline Definition Macro describes a 2D outline in a given coordinate system.

200

**Table 10.38-1  
OUTLINE DEFINITION MACRO ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Attribute Description</b>
Outline Shape Type	(0018,1630)	1	Type of shape of the outline. Enumerated values: RECTANGULAR CIRCULAR POLYGONAL See Section 10.38.1.1.
Outline Left Vertical Edge	(0018,1631)	1C	X-coordinate in mm of the left edge of the rectangular outline (parallel to the y-axis of the coordinate system). Required if Outline Shape Type (0018,1630) is RECTANGULAR. See Section 10.38.1.2.
Outline Right Vertical Edge	(0018,1632)	1C	X-coordinate in mm of the right edge of the rectangular outline (parallel to the y-axis of the coordinate system). Required if Outline Shape Type (0018,1630) is RECTANGULAR. See Section 10.38.1.2.
Outline Upper Horizontal Edge	(0018,1633)	1C	Y-coordinate in mm of the upper edge of the rectangular outline (parallel to the x-axis of the coordinate system). Required if Outline Shape Type (0018,1630) is RECTANGULAR. See Section 10.38.1.2.
Outline Lower Horizontal Edge	(0018,1634)	1C	Y-coordinate in mm of the lower edge of the rectangular outline (parallel to the x-axis of the coordinate system). Required if Outline Shape Type (0018,1630) is RECTANGULAR. See Section 10.38.1.2.
Center of Circular Outline	(0018,1635)	1C	Location (x,y) in mm of the center of the circular outline. Required if Outline Shape Type (0018,1630) is CIRCULAR. See Section 10.38.1.2.
Diameter of Circular Outline	(0018,1636)	1C	Diameter in mm of the circular

			outline. Required if Outline Shape Type (0018,1630) is CIRCULAR. See Section 10.38.1.2.
Number of Polygonal Vertices	(0018,1637)	1C	Number of Vertices in Vertices of the Polygonal Outline (0018,1638). Required if Outline Shape Type (0018,1630) is POLYGONAL.
Vertices of the Polygonal Outline	(0018,1638)	1C	A data stream of pairs of x and y in mm. Polygonal outlines are implicitly closed from the last vertex to the origin vertex and all edges shall be non-intersecting except at the vertices. Any given vertex shall occur only once in the data stream. Required if Outline Shape Type (0018,1630) is POLYGONAL. The number of pairs in this data stream shall equal the value of Number of Polygonal Vertices (0018,1637). See Section 10.38.1.2.

202 **10.38.1 Outline Definition Macro Attribute Description**

**10.38.1.1 Outline Shape Type**

204 When outline shape is a rectangle or a circle per design, the Outline Shape Type (0018,1630) shall  
206 have the value RECTANGULAR or CIRCULAR respectively and the outline shall not be represented  
as a polyline.

**10.38.1.2 Coordinate Definitions**

208 The values are defined in a plane that is declared in the invocation of the Macro.

**10.39 PATIENT TO EQUIPMENT RELATIONSHIP MACRO**

210 The Patient to Equipment Relationship Macro describes a position of the patient with respect to a  
212 device. The position is defined by means of a transformation matrix between a Patient Frame of  
Reference and an Equipment Frame of Reference.

**Table 10.39-1**

**PATIENT TO EQUIPMENT RELATIONSHIP MACRO ATTRIBUTES**

214

Attribute Name	Tag	Type	Attribute Description
Image to Equipment Mapping Matrix	(0028,9520)	1	A rigid, homogeneous 4x4 transformation matrix that maps the patient coordinate space in the Frame of Reference used for the patient model to the coordinate system defined by the equipment. Matrix elements shall be listed in row-major order. See Section 10.39.1.1, Section 10.39.1.2 and

			Section C.7.6.21.1.
Frame of Reference Transformation Comment	(3006,00C8)	3	Comments entered by a human operator about the relationship between the patient frame of reference and the equipment. For display purposes only, shall not be used for other purposes.
Patient Location Coordinates Sequence	(3006,00C9)	2	Specific points in the patient coordinate system which further characterize the position of the patient with respect to the equipment. Zero or more Items shall be included in this Sequence.
>3D Point Coordinate	(0068,6590)	1	Coordinate (x,y,z) in mm describing the location in the patient Frame of Reference that will be transformed to the Equipment Frame of Reference by using the Image to Equipment Mapping Matrix (0028,9520).
>Patient Location Coordinates Code Sequence	(3006,00CA)	1	Identifies the type of Patient Location Coordinate. One or more Items shall be included in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			CID is defined by invocation.
Patient Support Position Sequence	(3006,00CB)	2	Actual Patient Support Position parameters. Shall be consistent with the Image to Equipment Mapping Matrix (0028,9520). See Section 10.39.1.2. Zero or one Item shall be included in this Sequence.
>Include Table 10.40-1 "Patient Support Position Macro Attributes"			

## 216 10.39.1 Patient to Equipment Relationship Macro Attributes Description

### 10.39.1.1 Equipment Coordinate System

218 A piece of equipment has an Equipment Coordinate System which can be used for expressing  
220 geometric concepts such as locations and orientations. The coordinate system is characterized by  
the location of the origin and the orientation of coordinate axes with respect to the equipment. The  
Equipment Coordinate System is a right-handed coordinate system.

222 Equipment Coordinate Systems are typically based on a standardized definition of axes. The choice  
of origin is often device-specific or device-type-specific. It may be any significant location on the  
224 machine such as the manufacturer-dependent machine isocenter.

The Equipment Coordinate System can be used as the parent for derived coordinate systems.

### 226 10.39.1.2 Image to Equipment Mapping Matrix and Patient Support Position Macro

228 The Image to Equipment Mapping Matrix (0028,9520) describes the relationship between the Patient-  
oriented coordinate system and an Equipment Coordinate System. This matrix  ${}^A M_B$  describes a rigid  
transformation of a point  $({}^B x, {}^B y, {}^B z)$  with respect to the Patient coordinate system into  $({}^A x, {}^A y, {}^A z)$  with  
230 respect to the Equipment Coordinate System as defined in Section C.7.6.21.1.

232 The Equipment Coordinate System is identified by the Equipment Frame of Reference UID  
 234 (300A,0675). For further information on the definition of the Equipment Frame of Reference, see  
 Section 10.39.1.1. The patient-oriented coordinate system is identified by the Frame of Reference  
 234 UID (0020,0052) of the SOP Instance it is used within. Both coordinate systems are expressed in  
 millimeters.

236 The Patient Support Position Macro invoked by Patient Support Position Sequence (3006,00CB)  
 238 allows the exchange of device-specific parameters for the patient support device. Applications  
 designed to guide a specific patient support device will be able to de-compose the transformation into  
 240 device-specific parameters or derive a transformation matrix out of these parameters. Applications  
 that are unable to know the decomposition of the transformation to those parameters and vice versa  
 242 will still be able to display the native labels and numerical values of those parameters to human  
 readers.

244 The Patient Support Position Sequence (3006,00CB) may be present to annotate the matrix and  
 display the decomposed matrix contents. The content of the Patient Support Position Macro shall be  
 used for display purposes only. It shall not be used for other purposes. The content of this Macro  
 246 shall not be used as a substitute for the Image to Equipment Mapping Matrix (0028,9520). In general,  
 there is more than one way to reach the point in space that is described by the Image to Equipment  
 248 Mapping Matrix (0028,9520). Hence it is explicitly not implied how this position is reached.

250 In some cases (e.g. emergency treatments in Radiotherapy), the Patient Frame of Reference is not  
 defined by an image series. In this case an arbitrary Frame of Reference is used for the patient  
 coordinate system in the Frame of Reference Module of the SOP instance. The Image to Equipment  
 252 Mapping Matrix (0028,9520) has the same meaning as in the case of image-based Patient Frame of  
 Reference.

254 If the Image to Equipment Mapping Matrix (0028,9520) and the Patient Support Position Sequence  
 (3006,00CB) are both present, the information in both locations shall be consistent.

#### 256 10.40 PATIENT SUPPORT POSITION MACRO

This Macro provides the device-specific geometric settings for the Patient Support device.

258 The information is intended for display to human readers and to support non-image-based patient  
 positioning; however, the definition of the patient position with respect to the device is contained in  
 260 the Image to Equipment Mapping Matrix (0028,9520).

262 **Table 10.40-1**  
**PATIENT SUPPORT POSITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Patient Support Position Specification Method	(300A,065C)	1	Method of specification for patient support parameters. Enumerated Values ABSENT - no parameters are specified GLOBAL – parameters are specified using a globally known method, irrespective of the device in use DEVICE_SPECIFIC – parameters are specified using a device-specific method
Patient Support Position Device	(300A,065D)	1C	Translational and rotational parameters for Patient Support devices.

Attribute Name	Tag	Type	Attribute Description
Parameter Sequence			<p>Required if Patient Support Position Specification Method (300A,065C) does not equal ABSENT.</p> <p>One or more Items shall be included in this Sequence if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC.</p> <p>Only one Item shall be included in this Sequence if Patient Support Position Specification Method (300A,065C) equals GLOBAL.</p>
>Referenced Device Index	(300A,0607)	1C	<p>The value of Device Index (3010,0039) in Patient Support Devices Sequence (300A,0686) corresponding to the Patient Support Device in use.</p> <p>Required if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC.</p>
>Device Order Index	(300A,065E)	1C	<p>Index defining the order in which the Items in the Patient Support Position Device Parameter Sequence (300A,065D) are applied.</p> <p>The value shall start at 1 and increase monotonically by 1.</p> <p>Required if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC.</p> <p>See Section 10.40.1.</p>
>Patient Support Position Parameter Sequence	(300A,065B)	1	<p>Translational and rotational parameters for a particular Patient Support device.</p> <p>One or more Items shall be included in this Sequence.</p>
>>Patient Support Position Parameter Order Index	(300A,065F)	1C	<p>Index defining the order in which the Items in the Patient Support Position Parameter Sequence (300A,065B) are applied.</p> <p>The value shall start at 1 and increase monotonically by 1.</p> <p>Required if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC.</p> <p>See Section 10.40.1.</p>
>>Include Table 10-2 "Content Item Macro Attributes"			Defined TID is TID 15302 "Patient Support Position Parameters".

264 **10.40.1 Position Parameters and Order Index**

266 The Device Order Index (300A,065E) and the Patient Support Position Parameter Order Index  
 268 (300A,065F) are applied sequentially, meaning all the Items in a Patient Support Position Parameter  
 Device Parameter Sequence (300A,065D) specified by the next Device Order Index (300A,065E)  
 value.

270 A vendor may specify codes that are not included in TID 175001 and/or a set of codes which is not  
 272 identical with the set defined in Section 10.40.1.1 or Section 10.40.1.2. The vendor shall document  
 274 the codes used in this Macro in the Conformance Statement, as well as the corresponding  
 parameters, their geometric interpretation, and the order in which they will be applied. These  
 parameters shall use UCUM units of mm for lengths and degrees for angles.

**10.40.1.1 IEC 61217 Patient Support Device**

276 Devices using the IEC 61217 coordinate systems to define geometric settings for the Patient Support  
 278 device shall use the codes in Table 10.40-2 in the order specified in column Patient Support Position  
 Parameter Order Index (300A,065F). Other codes shall not be used.

280 **Table 10.40-2  
 Isocentric Patient Support Position Parameter Order Index**

<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>	<b>Patient Support Position Parameter Order Index (300A,065F)</b>
126801	IEC61217 Patient Support Continuous Yaw Angle	1
126806	IEC61217 Table Top Lateral Position	2
126807	IEC61217 Table Top Longitudinal Position	3
126808	IEC61217 Table Top Vertical Position	4
126802	IEC61217 Table Top Support Continuous Pitch Angle	5
126803	IEC61217 Table Top Support Continuous Roll Angle	6

282 **10.40.1.2 Isocentric Patient Support Device**

284 Devices using an isocentric representation to define geometric settings for the Patient Support device  
 shall use the codes in Table 10.40-3 in the order specified in column Patient Support Position  
 Parameter Order Index (300A,065F). Other codes shall not be used.

286 **Table 10.40-3  
 Isocentric Patient Support Position Parameter Order Index**

<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>	<b>Patient Support Position Parameter Order Index (300A,065F)</b>
126814	Isocentric Patient Support Continuous Yaw Angle	1
126812	Isocentric Patient Support Continuous Pitch Angle	2
126813	Isocentric Patient Support Continuous Roll Angle	3

<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>	<b>Patient Support Position Parameter Order Index (300A,065F)</b>
126815	Isocentric Patient Support Lateral Position	4
126816	Isocentric Patient Support Longitudinal Position	5
126817	Isocentric Patient Support Vertical Position	6

288

<b>Add the following to PS3.3 Annex A, in Figure A.86.1.1.1-1:</b>
--

290 **A.86 RT SECOND GENERATION****A.86.1. RT Second Generation Objects**

292 ...

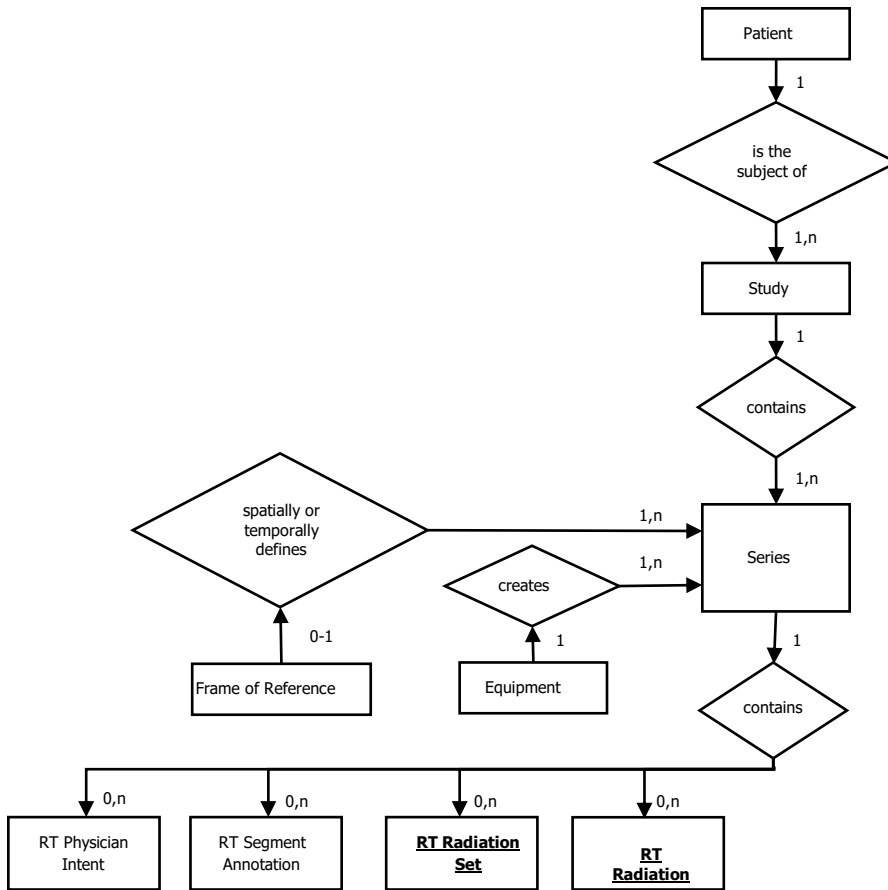
**A.86.1.1 RT Second Generation Common Information**

294 ...

**A.86.1.1.1 RT Second Generation Entity-Relationship Model**

296 The E-R Model in Figure A.86.1.1.1-1 depicts those components of the DICOM Information Model that are relevant to RT Second-Generation IODs.

298



300

**Figure A.86.1.1.1-1 – RT Second Generation IOD information model**

302

**Add the following Section to A.86.1:**

**A.86.1.4 RT Radiation Set Information Object Definition**

304

**A.86.1.4.1 RT Radiation Set IOD Description**

306

The RT Radiation Set IOD represents an RT Radiation Set, which is a set of radiation deliveries that are intended to be delivered together in a single fraction (see Section 7.14.5). The RT Radiation Set also contains a description of the fractionation pattern, the intended number of fractions and the associated dose contributions.

308

**A.86.1.4.2 RT Radiation Set IOD Entity-Relationship Model**

310

See Figure A.86.1.1.1-1.



**A.86.1.4.3 RT Radiation Set IOD Module Table**

312

**Table A.86.1.4-1  
RT RADIATION SET IOD MODULES**

<b>IE</b>	<b>Module</b>	<b>Reference</b>	<b>Usage</b>
Patient	Patient	C.7.1.1	M
	Clinical Trial Subject	C.7.1.3	U
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
	Clinical Trial Study	C.7.2.3	U
Series	General Series	C.7.3.1	M
	Clinical Trial Series	C.7.3.2	U
	Enhanced RT Series	C.36.3	M
Equipment	General Equipment	C.7.5.1	M
	Enhanced General Equipment	C.7.5.2	M
RT Radiation Set	General Reference	C.12.4	M
	RT Radiation Set	C.36.10	M
	RT Dose Contribution	C.36.11	C - Required if the dose delivered is tracked.
	SOP Common	C.12.1	M
	Common Instance Reference	C.12.2	M
	Radiotherapy Common Instance	C.36.4	M

314

**A.86.1.4.4 RT Radiation Set IOD Constraints****316 A.86.1.4.4.1 Modality Attribute**

The value of Modality (0008,0060) shall be RTRAD.

**318 A.86.1.4.4.2 RT Radiation Set and Referenced RT Radiation Instances**

320 The User Content Label (3010,0033) in each RT Radiation Instance shall be unique across all SOP Instances referenced by an Instance of the RT Radiation Set.

**A.86.1.4.4.3 Radiotherapy Common Instance Module**

322 The following Code Sequences shall have a value from the specified CID:

<b>Code Sequence</b>	<b>CID</b>
Author Identification Sequence (3010,0019)	Defined CID for Organizational Role Code Sequence (0044,010A) is CID 9555 "Radiotherapy Treatment Planning Person Roles"

324 **A.86.1.5 C-Arm Photon-Electron Radiation Information Object Definition****A.86.1.5.1 C-Arm Photon-Electron Radiation IOD Description**

326 The C-Arm Photon-Electron Radiation IOD describes a radiotherapy treatment to be performed on a C-Arm delivery device using photon or electron radiation.

328 **A.86.1.5.2 C-Arm Photon-Electron Radiation IOD Entity-Relationship Model**

See Figure A.86.1.1.1-1.

330 **A.86.1.5.3 C-Arm Photon-Electron Radiation IOD Module Table**332 **Table A.86.1.5-1  
C-ARM PHOTON-ELECTRON RADIATION IOD MODULES**

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
	Clinical Trial Subject	C.7.1.3	U
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
	Clinical Trial Study	C.7.2.3	U
Series	General Series	C.7.3.1	M
	Clinical Trial Series	C.7.3.2	U
	Enhanced RT Series	C.36.3	M
Equipment	General Equipment	C.7.5.1	M
	Enhanced General Equipment	C.7.5.2	M
Frame of Reference	Frame of Reference	C.7.4.1	M
RT Radiation	General Reference	C.12.4	M
	RT Delivery Device Common	C.36.12	M
	RT Radiation Common	C.36.13	M
	C-Arm Photon-Electron Delivery Device	C.36.14	M
	C-Arm Photon-Electron Beam	C.36.15	M
	SOP Common	C.12.1	M
	Common Instance Reference	C.12.2	M
	Radiotherapy Common Instance	C.36.4	M

334 **A.86.1.5.4 C-Arm Photon-Electron Radiation IOD Constraints****A.86.1.5.4.1 Modality Attribute**

336 The value of Modality (0008,0060) shall be RTRAD.

**A.86.1.5.4.2 RT Delivery Device Common Module**

338 The Equipment Frame of Reference UID (300A,0675) shall be 1.2.840.10008.1.4.3.1.

340 The Frame of Reference identifies the Patient Coordinate System used to define the geometric setup of the radiation beam with respect to the patient. The relationship of the patient-based coordinates to the Equipment Frame of Reference is specified by a transformation (see 10.39).

342 The following Code Sequences shall have a value from the specified CID:

Code Sequence	CID
Radiation Dosimeter Unit Sequence (300A,0658)	Defined CID 9552 “C-Arm Photon-Electron Dosimeter Units”

344 **A.86.1.5.4.3 RT Radiation Common Module**

The value of RT Record Flag (300A,0639) shall be NO.

346 The following code sequences shall have a value from the specified CID:

Code Sequence	CID
RT Treatment Technique Code Sequence (3010,0080)	Defined CID 9511 “General External Radiotherapy Procedure Techniques”
Treatment Machine Special Mode Code Sequence (300A,0635)	Defined CID 9543 “Radiotherapy Treatment Machine Modes”

348 **A.86.1.5.4.4 Radiotherapy Common Instance Module**

Code Sequence	CID
Author Identification Sequence (3010,0019)	Defined CID for Organizational Role Code Sequence (0044,010A) is CID 9555 “Radiotherapy Treatment Planning Person Roles”

350

352 **Extend the Equipment Module in PS3.3 Annex C, Section C.7.5:**

**C.7.5 Common Equipment IE Modules**

354 The following Equipment IE Module is common to all Composite IODs that reference the Equipment IE.

356 **C.7.5.1 General Equipment Module**

358 Table C.7-8 specifies the Attributes that identify and describe the piece of equipment that produced a Series of Composite Instances.

**Table C.7-8.General Equipment Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Manufacturer of the equipment that produced the composite instances.
Institution Name	(0008,0080)	3	Institution where the equipment that produced the composite instances is located.
Institution Address	(0008,0081)	3	Mailing address of the institution where the equipment that produced the composite instances is located.
Station Name	(0008,1010)	3	User defined name identifying the machine that produced the composite instances.
Institutional Department Name	(0008,1040)	3	Department in the institution where the equipment that produced the composite instances is located.
Manufacturer's Model Name	(0008,1090)	3	Manufacturer's model name of the equipment that produced the composite instances.
<b><u>Manufacturer's Device Class UID</u></b>	<b><u>(0018,100B)</u></b>	<b><u>3</u></b>	<b><u>Manufacturer's Unique Identifier (UID) for the class of the device.</u></b> <b><u>A class is a manufacturer-specific grouping concept with no DICOM-defined scope or criteria. A class is independent from a marketing-defined make, model or version.</u></b> <b><u>A class allows grouping of devices with a similar set of capabilities.</u></b> <b><u>This Attribute may be multi-valued if this device is a member of more than one class.</u></b>
Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the equipment that produced the composite instances.  Note This identifier corresponds to the device that actually created the images, such as a CR plate reader or a CT console, and may not be sufficient to identify all of the equipment in the imaging chain, such as the

Attribute Name	Tag	Type	Attribute Description
			generator or gantry or plate.
Software Versions	(0018,1020)	3	Manufacturer's designation of software version of the equipment that produced the composite instances. See Section C.7.5.1.1.3.
Gantry ID	(0018,1008)	3	Identifier of the gantry or positioner.
...			

360

<b>Add the following to PS3.3 Annex C:</b>
--

362 **C.7.3 Common Series IE Module**

...

364 **C.7.3.1 General Series Module**

...

366 **C.7.3.1.1 General Series Attribute Descriptions****C.7.3.1.1.1 Modality**

368 Defined Terms:

...

370 RTPLAN

Radiotherapy Plan

372 **RTRAD****RT Radiation**

374 RTRECORD

RT Treatment Record

376 ...

**C.36 RT SECOND GENERATION MODULES**

378 ...

**C.36.1 RT Second Generation Concepts**

380 ...

**C.36.1.1 RT Second Generation Radiation Concepts**382 **C.36.1.1.1 Control Points**

384 A Control Point represents the state of a delivery device in a sequence of states defined at a given Cumulative Meterset (300A,063C) value.

386 A Control Point contains geometric and radiological parameters. Control Points are used by the delivery device to implement a planned delivery and to record the actual delivery.

#### 388 **C.36.1.1.2 Nominal Energy**

388 Nominal energy characterizes the penetration of the beam into a material. The values are defined by the Manufacturer to label a specific beam spectrum. For photon beam delivery, the maximum energy of the delivered photon spectrum is typically used. For electron beam delivery, the most probable energy of the spectrum is typically used.

#### 392 **C.36.1.1.3 Meterset**

394 A Meterset is a single parameter from which the absorbed dose delivered can be calculated through a calibration procedure with additional information. The Meterset is used to measure the progress of radiation delivery during treatment, or report on progress after treatment.

396 See IEC 60601-2-64 for more information on using monitor units as the unit for the Meterset.

#### **C.36.1.1.4 Radiation Dose Point**

398 A point chosen in space, or in the patient treatment volume, to measure or plan for a specific amount of radiation. The point usually is placed at a significant location, such as within a tumor (where radiation will be delivered), or within healthy tissue (where radiation will be minimized) or where a measurement device can be positioned.

#### 402 **C.36.1.1.5 Continuous Rotation Angle**

A Continuous Rotation Angle is an angle in the range  $(-\infty, +\infty)$ .

404 Continuous Rotation Angle represent a rotation direction and magnitude. The magnitude is not limited to be between 0 and 360 degrees.

406 All rotations are defined in a right-handed coordinate system, thus the direction of a positive rotation is seen as clockwise when viewed in the positive direction of the axis of rotation.

#### 408 **C.36.1.1.6 External Contour**

410 The External Contour is the spatial extent that is taken into account for dose calculation. The External Contour includes the Patient Anatomy Model, Bolus, Patient Positioning Devices, Patient Immobilization Devices or other devices in the path of the radiation.

#### 412 **C.36.1.1.7 C-Arm LINAC**

414 A C-Arm LINAC is a linear accelerator that follows the coordinate definitions of IEC 61217 Edition 2.0 2011-12. Any hardware belonging to this category may or may not represent an actual C-Arm gantry.

#### **C.36.1.1.8 Virtual Simulation**

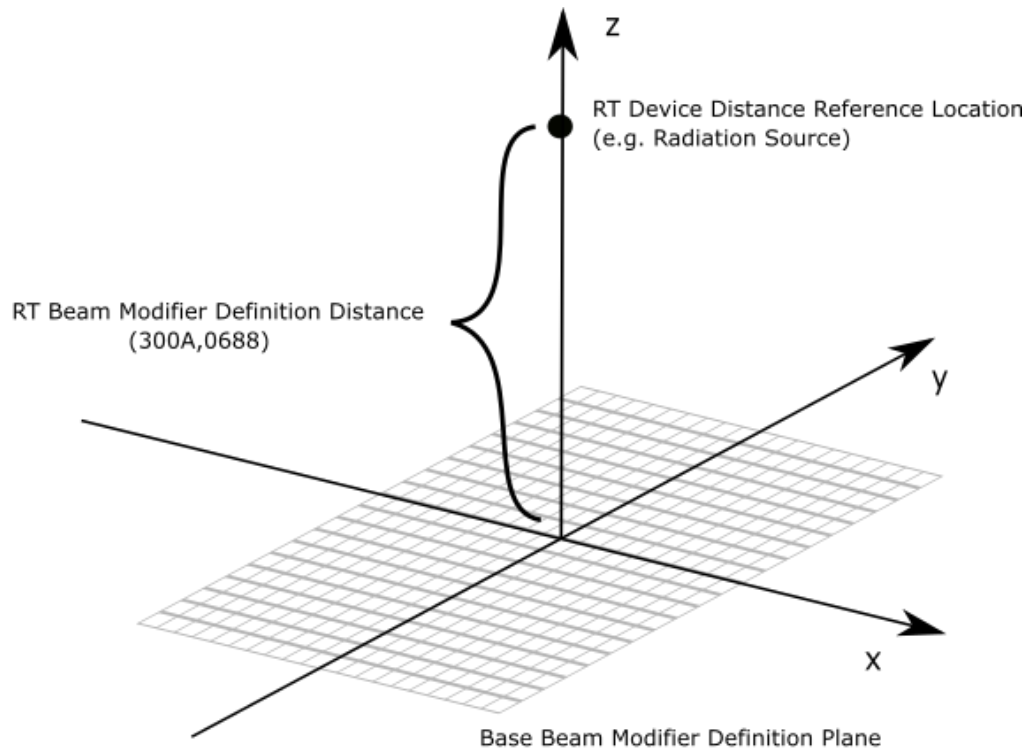
416 Virtual Simulation is a form of Radiotherapy treatment simulation that uses volumetric imaging studies in a computer to model the geometry of a radiation beam with respect to a patient's anatomy. 418 The spatial relationship between beam and anatomy is verified in Digitally Reconstructed Radiograph (DRR) images that conceptually represent actual beam portal images.

#### 420 **C.36.1.1.9 Beam Modifier Coordinate System**

422 Beam modifiers, e.g. beam limiting devices, compensators and blocks, are specified by geometric coordinates.

424 A Base Beam Modifier Coordinate System is defined with respect to the Equipment Coordinate System (see Section 10.39.1.1). The x/y plane of the Base Beam Modifier Coordinate System is referred to as the Base Beam Modifier Definition Plane. The orientation of the Base Beam Modifier

426 Coordinate System is such that the Base Beam Modifier Definition Plane is parallel to the x/y plane of  
 428 the Equipment Coordinate System. The origin of the Base Beam Modifier Coordinate System is offset  
 from the RT Device Distance Reference Location by the RT Beam Modifier Definition Distance  
 (300A,0688) as shown in Figure C.36.1-1.



430

**Figure C.36.1-1**  
**Base Beam Modifier Coordinate System**

432

Each beam modifier is defined in its own Beam Modifier Coordinate System with the following  
 434 characteristics:

- defined with respect to the Base Beam Modifier Coordinate System.
- 436 • right-handed Cartesian coordinate system, with the positive z-axis pointing towards the nominal  
 Radiation Source location.
- 438 • The Beam Modifier Coordinate System rotates about the z-axis of the Base Beam Modifier  
 440 Coordinate System. The orientation at a zero angle about the z-axis is the same as the Base  
 Beam Modifier Coordinate System, i.e. the x- and y-axes are aligned.
- 442 • the x/y plane of the Beam Modifier Coordinate System is referred to as the Beam Modifier  
 Definition Plane.

#### **C.36.1.1.10 Radiation Source**

444 A Radiation Source is a generalized source of radiation that encompasses linear accelerators,  
 446 brachytherapy sources, etc. Each source is associated with a nominal Radiation Source location  
 which is a point in space from which the radiation is considered to be emanating.

448 **C.36.2 RT Second Generation Macros****C.36.2.2 RT Second Generation Device Macros**450 **C.36.2.2.1 Treatment Device Identification Macro**

452 The Treatment Device Identification Macro identifies a device used to deliver radiation to the patient during a radiotherapy treatment session.

454 **Table C.36.2.2.1-1****TREATMENT DEVICE IDENTIFICATION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Treatment Device Identification Sequence	(300A,063A)	1	Identifies treatment device. Only a single Item shall be included in this Sequence.
<i>&gt;Include Table 10.35-1 "Device Model Macro Attributes"</i>			<i>Identifies the device model for the Treatment Device.</i>
>Manufacturer's Device Class UID	(0018,100B)	2	Manufacturer's Unique Identifier (UID) for the class of the device.  A class is a manufacturer-specific grouping concept with no DICOM-defined scope or criteria. A class is independent from a marketing-defined make, model or version.  A class allows definition of a group of devices with a similar set of capabilities.
<i>&gt;Include Table 10.36-1 "Device Identification Macro Attributes"</i>			<i>Defined CID 9551 "Treatment Delivery Device Types".</i>
>Institution Name	(0008,0080)	3	Institution where the equipment is located.
>Institution Address	(0008,0081)	3	Mailing address of the institution where the equipment is located.
>Institutional Department Name	(0008,1040)	3	Department in the institution where the equipment is located.

456 **C.36.2.2.2 RT Patient Support Devices Macro**

458 The RT Patient Support Devices Macro identifies a patient support device (table, table top, chair or similar) which shall be used for treatment.

460 **Table C.36.2.2.2-1****RT PATIENT SUPPORT DEVICES MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Description
Number of Patient Support Devices	(300A,0687)	1	Number of Patient Support Devices defined in the Patient Support Devices Sequence (300A,0686).
Patient Support Devices Sequence	(300A,0686)	1C	Patient support device definitions.  Required if the Number of Patient Support Devices



Attribute Name	Tag	Type	Description
			(300A,0687) is non-zero. The number of Items included in this Sequence shall equal the value of Number of Patient Support Devices (300A,0687).
>Device Index	(3010,0039)	1	Index of the Device in this Sequence. The value shall start at 1 and increase monotonically by 1.
<i>&gt;Include Table 10.35-1 "Device Model Macro Attributes"</i>			
<i>&gt;Include Table 10.36-1 "Device Identification Macro Attributes"</i>			<i>Defined CID 9505 "Fixation or Positioning Devices".</i>
>Conceptual Volume Sequence	(3010,0025)	2	References a conceptual volume that describes the geometry and properties of the patient support device. Zero or one Item shall be included in this Sequence.
<i>&gt;&gt;Include Table 10.34-1 "Conceptual Volume Segmentation Reference and Combination Macro Attributes"</i>			

462 **C.36.2.2.3 RT Accessory Device Identification Macro**

The RT Accessory Device Identification Macro identifies an RT accessory device and its location.

464

**Table C.36.2.2.3-1  
RT ACCESSORY DEVICE IDENTIFICATION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
<i>Include Table 10.35-1 "Device Model Macro Attributes"</i>			
<i>Include Table 10.36-1 "Device Identification Macro Attributes"</i>			<i>CID is defined by invocation.</i>
RT Accessory Device Slot ID	(300A,0615)	2C	Identifier for location (slot) of radiation modifier accessory where the current accessory is inserted. Required if accessory is located in a slot and Referenced RT Accessory Holder Device Index (300A,060E) is not present.

RT Accessory Slot Distance	(300A,0613)	2C	Distance in mm from the reference location as specified by RT Device Distance Reference Location Code Sequence (300A,0659) to the Accessory Slot.  Required if RT Accessory Device Slot ID (300A,0615) is present and has a value.
Referenced RT Accessory Holder Device Index	(300A,060E)	2C	The value of Device Index (3010,0039) of the Accessory Holder device in the RT Accessory Holder Definition Sequence (300A,0614).  Required if accessory is mounted on a holder device and RT Accessory Device Slot ID (300A,0615) is not present.
RT Accessory Holder Slot ID	(300A,0611)	2C	Identifier for location (slot) of radiation modifier in the Accessory Holding device where the current accessory is inserted.  Required if Referenced RT Accessory Holder Device Index (300A,060E) is present and has a value and the referenced Accessory Holder Device contains an RT Accessory Holder Slot Sequence (300A,0610).

466

**C.36.2.2.4 RT Treatment Position Macro**

468 The RT Treatment Position Macro establishes a connection between the patient's geometry and the  
 470 treatment delivery equipment to define the treatment position. When used in an RT Radiation object,  
 472 this treatment position is the prescribed position. When used in an RT Radiation Record object, this  
 treatment position is the record of the actual position.

472

**Table C.36.2.2.4-1  
 RT TREATMENT POSITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Description
Patient Orientation Code Sequence	(0054,0410)	1	Sequence that describes the orientation of the patient with respect to gravity. See Section C.8.4.6.1.1 for further explanation.  Only a single item shall be included in this Sequence.

Attribute Name	Tag	Type	Description
>Include Table 8.8-1 "Code Sequence Macro Attributes"			Defined CID 19 "Patient Orientation"
>Patient Orientation Modifier Code Sequence	(0054,0412)	1C	Patient Orientation Modifier. Required if needed to fully specify the orientation of the patient with respect to gravity. Only a single Item shall be included in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			Defined CID 20 "Patient Orientation Modifier"
Patient Equipment Relationship Code Sequence	(3010,0030)	1	Sequence describing the orientation of the patient with respect to equipment. Only a single Item shall be included in this Sequence.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			Defined CID 21 "Patient Equipment Relationship"
Patient Setup UID	(300A,0650)	1C	Identifies a conceptual patient setup that may or may not be realized by one or more RT Patient Setup Instances. Required if Referenced RT Patient Setup Sequence (300A,0632) is present. May be present otherwise.
Referenced RT Patient Setup Sequence	(300A,0632)	1C	References the RT Patient Setup SOP Instance that was used as the setup instruction for the patient prior to delivery of the radiation. Required if there was a Patient Setup SOP Instance defined providing the instructions to the delivery system. Only a single Item shall be included in this Sequence.
>Include Table 10-11 "SOP Instance Reference Macro Attributes"			
Treatment Position Sequence	(300A,063F)	1	Patient positions during treatment, being prescribed or recorded. One or more Items shall be included in this Sequence.
>Treatment Position Index	(300A,0606)	1	Index of this Item in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Include Table 10.39-1 "Patient to Equipment Relationship Macro Attributes"			Defined CID is 9553 "Treatment Points"

**C.36.2.2.5 RT Control Point General Macro**

476 This Macro specifies the base Attributes for the definition of an RT Radiation Control Point.

478

**Table C.36.2.2.5-1  
RT CONTROL POINT GENERAL MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
RT Control Point Index	(300A,0600)	1	The index of the RT Control Point within the Sequence where this Macro is included. RT Control Points shall be executed in the order of the RT Control Point Index. The value shall start at 1 and increase monotonically by 1 within the Sequence where this Macro is included.
Cumulative Meterset	(300A,063C)	1C	Meterset at the RT Control Point. The units are specified by Radiation Dosimeter Unit Sequence (300A,0658). For the Item with RT Control Point Index equal 1, the Cumulative Meterset shall be equal to 0.0. Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL or IDENT_ONLY or RT Record Flag (300A,0639) equals YES and if the conditions in Section C.36.2.2.5.1.1 are satisfied. May be present otherwise only if the conditions in Section C.36.2.2.5.1.1 are satisfied. See Section C.36.2.2.5.1.3.
Referenced Treatment Position Index	(300A,060B)	1C	The value of Treatment Position Index (300A,0606) from the Treatment Position Sequence (300A,063F) within this IOD that this RT Control Point refers to. Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.

480 **C.36.2.2.5.1 RT Control Point Attribute Concept**

482 The treatment-modality Modules use a common formalism to represent parameters that define the  
behaviour of a delivery device during delivery of radiation. These parameters are communicated as a  
484 sequence of values, organized as 'Control Points', see Section C.36.1.1.1, and represented as RT  
Control Points. The resolution of RT Control Points depends on the level of detail required to define  
the behaviour of the delivery device.

486 A Control Point is a point on a timeline of a delivery process. RT Control Points are sequenced using  
an index number starting with 1, e.g. 1, 2, 3, 4. The RT Control Point parameters reflect the state of  
488 the delivery device at that point in time. The Control Point Cumulative Meterset reflects the dose that  
has been delivered from the beginning of the delivery process up to that point in time.

490 For all beam deliveries there are at least two RT Control Points, corresponding to the start and end of  
 492 delivery. E.g. for a simple Static Beam delivery with a constant field aperture, only two RT Control  
 494 Points will be higher to provide enough detail to define the leaf movement with sufficient resolution to  
 achieve the radiation fluence distribution expected for the prescribed dose.

496 DICOM does not specify the behavior of the machine parameters between Control Points. The  
 498 planning system needs to know the hardware-specific characteristics of the delivery system for which  
 the plan is being created.

#### 500 **C.36.2.2.5.1.1 Requirements for Changing Values within RT Control Point Sequence Attributes**

This section specifies when individual attributes shall be present in a Sequence.

502 The RT Control Point Sequence specifies a certain order of execution.

504 At each RT Control Point the value of various Attributes may be specified as an explicit value (which  
 in the case of a type 2C attribute may be a null value) and if absent remain at the same value as  
 506 specified previously. There are physical and mechanical implications of specifying a new value as  
 opposed to staying at the same value, for example gear lash, floating point jitter, etc.

508 At the first Sequence Item in RT Control Point Sequences (i.e. with an RT Control Point Index  
 (300A,0600) equal to 1) all Attributes affected by this Section shall be present (whether Type 1C or  
 2C).

510 For Sequence Items other than the first Sequence Item, Attributes shall be present only if the value is  
 512 different from the previously populated value for the same Attribute (in the case of a type 2C attribute,  
 a null value is considered as a value). The previously populated value is the value from the Item  
 514 where the Attribute was present with the greatest value of RT Control Point Index (300A,0600) less  
 than the value of the RT Control Point Index (300A,0600) in the current Item.

516 This means that for an Item in which an Attribute is absent, the application stays at the value of the  
 previously populated Item.

518 For Sequences inside a RT Control Point Sequence Item, the Sequence shall be present if any of the  
 nested Attributes affected by this Section differ from the corresponding previously populated Item.

520 For multi-valued Attributes, such as Parallel RT Beam Delimiter Positions (300A,064A), all values  
 shall be present if any value changes.

#### 522 **C.36.2.2.5.1.2 Control Point Attribute Example**

The following examples illustrate RT Control Points:

1. Static Beam delivery:

RT Control Point Index (300A,0600)	Cumulative Meterset (300A,063C)	All other parameters
1	0	<defined>
2	76	<not present>

524

526 At completion this beam delivers 76 Monitor Units using a fixed static set of treatment parameters defined in RT Control Point 1.

2. Arc delivery:

RT Control Point Index (300A,0600)	Cumulative Meterset (300A,063C)	Source Roll Angle (300A,067A)	All other parameters
1	0	<initial angle>	<defined>
2	56	<final angle>	<not present>

528

530 At completion this delivers 56 Monitor Units while rotating the gantry from initial angle to final angle.

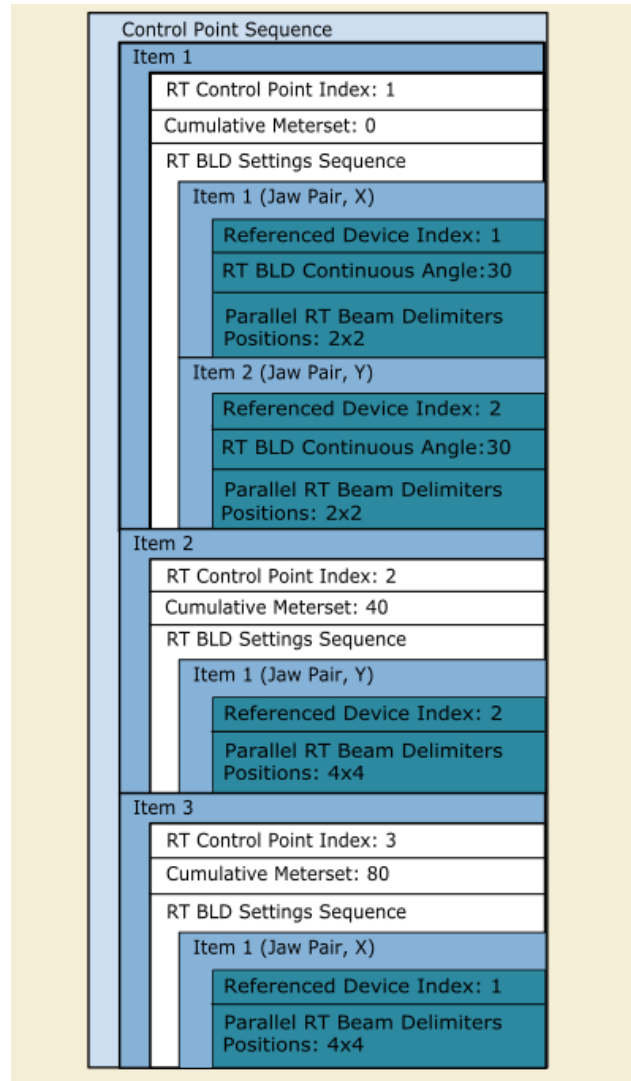
3. Dynamic delivery of two equally weighted segments:

RT Control Point Index (300A,0600)	Cumulative Meterset (300A,063C)	Parallel RT Beam Delimiter Positions (300A,064A) X Referenced Device Index 1	Parallel RT Beam Delimiter Positions (300A,064A) Y Referenced Device Index 2	RT Beam Limiting Device Angle (300A,0679)	All other parameters
1	0	2\2	2\2	30	<defined>
2	40	<not present>	4\4	<not present>	<not present>
3	80	4\4	<not present>	<not present>	<not present>

532

534 At completion this delivers 80 Monitor Units while first increasing the Y opening and then increasing the X opening, while the beam limiting device angle stays fixed. For the RT Beam Limiting Device Opening Sequence (300A,0656) this results in having three Items for the first Control Point and only one for Control Points 2 (Referenced Device Index 2 only) and 3 (Referenced Device Index 1 only). See also Figure C.36.2.2.5.1-1.

536



538

**Figure C.36.2.2.5.1-1  
Control Points Sub-Sequence Attribute Presence**

540

542 4. Dynamic Delivery of two unequally weighted segments with a step change of 5 degrees in the positive direction of the Patient Support Angle:

544 Note Patient Support Angle is represented by the Image to Equipment Mapping Matrix (0028,9520). The table contains the effective angle and not the complete matrix.

546

RT Control Point Index (300A,0600)	Cumulative Meterset (300A,063C)	Image to Equipment Mapping Matrix (0028,9520)	Source Roll Angle (300A,067A)	All other parameters
1	0	0	-90	<defined>

2	30	<not present>	<not present>	<not present>
3	<not present>	5	0	<not present>
4	90	<not present>	<not present>	<not present>

548 At completion this delivers 90 Monitor Units. Between RT Control Point 2 and 3 the Patient Support Angle and Source Roll Continuous Angle are changed and no radiation is delivered.

550 **C.36.2.2.5.1.3 Cumulative Meterset**

552 The Meterset at a given Control Point is specified by Cumulative Meterset (300A,063C). This value is specified in units defined by Radiation Dosimeter Unit Sequence (300A,0658) in the RT Delivery Device Common Module in Section C.36.12. The Meterset values are intended to correspond to the values produced by the primary or the single Meterset-measuring device of a RT Radiation Delivery Device.

556 **C.36.2.2.6 External Beam Control Point General Macro**

This Macro specifies the RT Control Point Attributes used to model external beam radiation.

558

**Table C.36.2.2.6-1  
EXTERNAL BEAM CONTROL POINT GENERAL MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
<i>Include Table C.36.2.2.5-1 "RT Control Point General Macro Attributes"</i>			
Delivery Rate	(300A,063D)	2C	The intended nominal rate of delivery of the specified Cumulative Meterset (300A,063C). Required if the conditions in Section C.36.2.2.5.1.1 are satisfied. See Section C.36.2.2.5.1.
Delivery Rate Unit Sequence	(300A,063E)	1C	The unit of the Delivery Rate (300A,063D). Required if Delivery Rate (300A,063D) is present. See Section C.36.2.2.5.1. Only a single Item shall be included in this Sequence.
<i>&gt;Include Table 8.8-1 'Code Sequence Macro'</i>			<i>CID is defined by invocation.</i>
Beam Area Limit Sequence	(300A,0689)	1C	Area within which the treatment beam must be contained, for example when using MLC tracking for a moving target. Only a single Item shall be included in this Sequence. Required if beam shall be limited. See Section C.36.2.2.5.1.
<i>&gt;Include Table 10.38-1 "Outline Definition Macro Attributes"</i>			<i>The Outline is defined on the Beam Modifier Definition Plane.</i>

560



**C.36.2.2.7 Radiation Generation Mode Macro**

562 The Radiation Generation Mode Macro contains Attributes required to generate radiation by a  
563 delivery device.

564 Treatment devices can produce a multitude of different beams with properties such as energy  
565 spectrum, depth dose, surface dose and beam profile. A particular combination of such properties is  
566 referred to as a Radiation Generation Mode. Such Radiation Generation Modes are created by the  
567 machine by using different primary electron / particle beams, flattening and scattering filters, etc.,  
568 creating a specific physical and geometric distribution of radiation. In many cases the Radiation  
569 Generation Mode characterizes the fluence just below the Monitor Chamber. Subsequently these  
570 primary beams may be modulated by beam modifiers such as Beam Limiting Devices, Wedges,  
571 Spreaders etc. While these beam modifiers are described in the Control Point Sequence, the primary  
572 beam is assumed to have fixed characteristics. In many cases, the Radiation Generation Mode will  
573 be constant throughout the radiation.

574 Radiation Generation Modes specify the beam fluence. To convey content other than the beam  
575 fluence, such as annotating the role of the beam in the clinical process or the usage of that beam  
576 during a treatment session, annotate treatment constraints, use other Attributes like RT Radiation Set  
577 Intent (300A,0637) in the RT Radiation Set Module and information provided by the workflow  
578 protocols.

**Table C.36.2.2.7-1  
RADIATION GENERATION MODE MACRO ATTRIBUTES**

580

Attribute Name	Tag	Type	Attribute Description
Number of Radiation Generation Modes	(300A,0685)	1	Number of Radiation Generation Modes defined in the Radiation Generation Mode Sequence (300A,067B). The Number shall be greater than zero.
Radiation Generation Mode Sequence	(300A,067B)	1	Radiation Generation Modes defining the type of radiation and characteristics of the beam generated. Radiation Generation Modes shall characterize different primary beam fluence. The number of Items included in this Sequence shall equal the value of Number of Radiation Generation Modes (300A,0685).
>Radiation Generation Mode Index	(300A,0601)	1	Index of this Item in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Radiation Generation Mode Label	(300A,067C)	1	User-defined label that identifies this Radiation Generation mode. See Section C.36.2.2.7.1.3.
>Radiation Generation Mode Description	(300A,067D)	2	User-defined description of the Radiation Generation mode.

>Radiation Generation Mode Machine Code Sequence	(300A,067E)	1C	<p>A vendor-specified machine-readable code that unambiguously identifies this Radiation Generation mode.</p> <p>Only a single Item shall be included in this Sequence.</p> <p>Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.</p> <p>See Section C.36.2.2.7.1.2.</p>
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			No Baseline CID is defined.
>Radiation Type Code Sequence	(300A,067F)	1	<p>Type of radiation for this Radiation Generation Mode.</p> <p>Only a single Item shall be included in this Sequence.</p>
>>Include Table 8.8-1 "Code Sequence Macro"			CID is defined by invocation.
>Energy Unit Code Sequence	(300A,0684)	1	<p>The unit of energy values specified in Nominal Energy (300A,0680), Minimum Nominal Energy (300A,0681), Maximum Nominal Energy (300A,0682).</p> <p>Only a single Item shall be included in this Sequence.</p>
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			CID is defined by invocation.
>Nominal Energy	(300A,0680)	1C	<p>The nominal beam energy in units as defined in the Energy Unit Code Sequence (300A,0684).</p> <p>Required if Minimum Nominal Energy (300A,0681) and Maximum Nominal Energy (300A,0682) are not present.</p> <p>See Section C.36.2.2.7.1.1.</p>
>Minimum Nominal Energy	(300A,0681)	1C	<p>The minimum nominal beam energy in units as defined in the Energy Unit Code Sequence (300A,0684).</p> <p>Required if Nominal Energy (300A,0680) is not present.</p> <p>See Section C.36.2.2.7.1.1.</p>
>Maximum Nominal Energy	(300A,0682)	1C	<p>The maximum nominal beam energy in units as defined in the Energy Unit Code Sequence (300A,0684).</p> <p>Required if Nominal Energy (300A,0680) is not present.</p> <p>See Section C.36.2.2.7.1.1.</p>

>Radiation Fluence Modifier Code Sequence	(300A,0683)	1	Identifies the type of fluence modifier of this Radiation Generation Mode. One or more Items shall be included in this Sequence.
>>Include Table 8.8-1 “Code Sequence Macro Attributes”			<i>CID is defined by invocation.</i>
>Radiation Device Configuration and Commissioning Key Sequence	(300A,065A)	2	Keys identifying the configuration and commissioning data used as input for treatment planning of this Instance. Value Type (0040,A040) is constrained to value UIDREF. Zero or more Items shall be included in this Sequence.
>>Include Table 10-2 “Content Item Macro Attributes”			<i>No Baseline CID defined.</i>

### 582 C.36.2.2.7.1 Radiation Generation Mode Macro Attribute Description

#### C.36.2.2.7.1.1 Energy Attributes

584 The Nominal Energy (300A,0680) parameter is provided for beams where a single discrete energy is  
 586 annotated by that value. Energy modulation can be used at the Control Point level (both discrete and  
 continuous), in which case the Minimal Nominal Energy (300A,0681) and Maximal Nominal Energy  
 (300A,0682) are used.

#### 588 C.36.2.2.7.1.2 Radiation Generation Mode Machine Code

When two Radiation Generation Modes differ in any value of Nominal Energy (300A,0680), Minimum  
 590 Nominal Energy (300A,0681), Maximum Nominal Energy (300A,0682) or any code value(s) of the  
 Radiation Type Code Sequence (300A,067F) or the Radiation Fluence Modifier Code Sequence  
 592 (300A,0683), the Radiation Generation Modes must have different values for Radiation Generation  
 Mode Machine Code. Even if all those attributes have the same values, the two modes may still have  
 594 a different value for Radiation Generation Mode Machine Code, e.g. when other device-specific beam  
 generation steering parameters differ.

#### 596 C.36.2.2.7.1.3 Radiation Generation Mode Label

Radiation Generation Mode Label (300A,067C) should uniquely identify a specific mode within a  
 598 treatment device. The label is intended only for display to human readers, while the authoritative  
 definition of the Radiation Generation Mode is contained in the other attributes of the Sequence.

### 600 C.36.2.2.8 RT Beam Limiting Devices Definition Macro

This Macro describes the configuration of Beam Limiting Devices which cannot vary during delivery.

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**Table C.36.2.2.8-1  
 RT BEAM LIMITING DEVICES DEFINITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of RT Beam Limiting Devices	(300A,0641)	1C	Number of RT Beam Limiting Devices in the RT Beam Limiting Device Definition Sequence (300A,064D). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638)

Attribute Name	Tag	Type	Attribute Description
			equals FULL. May be present otherwise.
RT Beam Limiting Device Definition Sequence	(300A,064D)	1C	Beam limiting device (collimator), such as jaw or leaf (element) sets. The number of Items included in this Sequence shall equal the value of Number of RT Beam Limiting Devices (300A,0641). Required if Number of RT Beam Limiting Devices (300A,0641) is present and has a non-zero value.
>Device Index	(3010,0039)	1	Index of the Device in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Referenced Defined Device Index	(300A,0602)	1C	Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same. The value is the index of a device in the RT Beam Limiting Device Definition Sequence (300A,064D) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631). Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.
<i>&gt;Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"</i>			<i>CID is defined by invocation.</i>
>Beam Modifier Orientation Angle	(300A,0645)	1	Angle in degrees of the Beam Modifier Coordinate System with respect to the Base Beam Modifier Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5. If Device Type Code Sequence (3010,002E) contains either (130331, DCM, "Leaf Pairs"), or (130333, DCM, "Single Leaves") the motion of the RT Beam Delimiters is along the x-axis of the Beam Modifier Definition Plane. See Section C.36.1.1.9
>RT Beam Limiting Device Proximal Distance	(300A,0642)	2	Distance in mm from the reference location as specified by RT Device Distance Reference Location Code Sequence (300A,0659) to the proximal end of beam limiting device (collimator) along the beam axis. See Section C.36.2.2.8.1.4.

Attribute Name	Tag	Type	Attribute Description
>RT Beam Limiting Device Distal Distance	(300A,0643)	2	Distance in mm from the reference location as specified by RT Device Distance Reference Location Code Sequence (300A,0659) to the distal end of beam limiting device (collimator) along the beam axis. See Section C.36.2.2.8.1.4.
>Parallel RT Beam Delimiter Device Sequence	(300A,0647)	1C	Device that uses parallel beam delimiters to limit the beam. Required if Device Type Code Sequence (3010,002E) contains either (130331, DCM, “Leaf Pairs”) or (130333, DCM, “Single Leaves”). Only a single Item shall be present in the Sequence.
>>Number of Parallel RT Beam Delimiters	(300A,0648)	1	Number of beam delimiters parallel to the axis of motion. E.g. a beam limiting device jaw pair is represented as 1 parallel delimiter, an MLC with 100 leaf pairs or with 100 single leaves is represented as 100 parallel delimiters. See Section C.36.2.2.8.1.3
>>Parallel RT Beam Delimiter Device Orientation Label Code Sequence	(300A,0644)	1	A code used to identify the orientation of the beam limiting device. Only a single Item shall be present in the Sequence.
>>>Include Table 8.8-1 “Code Sequence Macro Attributes”			Defined CID 9547 “RT Beam Limiting Device Orientation Labels” See Section C.36.2.2.8.1.1
>>Parallel RT Beam Delimiter Opening Mode	(300A,064E)	1	The operation mode of Parallel RT Beam Delimiters used to define a treatment aperture. Enumerated Values: BINARY leaf positions constrained to two states: open and closed VARIABLE any leaf position may be specified
>>Parallel RT Beam Delimiter Boundaries	(300A,0649)	1	Boundaries in mm of parallel beam delimiters. These are defined along the axis perpendicular to the motion of the delimiters of the RT Beam Limiting Device Type (300A,00B8) with respect to the Beam Modifier Coordinate System. The order of values shall increase monotonically. See Section C.36.2.2.8.1.2. N+1 values shall be provided, where N is the Number of Parallel RT Beam Delimiters (300A,0648).
>>Parallel RT Beam	(300A,064F)	1C	Specifies the mounting side identified by the

Attribute Name	Tag	Type	Attribute Description
Delimiter Leaf Mounting Side			<p>direction from the tip to the tail of the delimiter parallel to the axis specified by Device Type Code Sequence (3010,002E).</p> <p>Enumerated Values:</p> <p>P Positive mounting side. The axis intercept of the leaf tip is less than the axis intercept of the leaf tail</p> <p>N Negative mounting side. The axis intercept of the leaf tip is greater than the axis intercept of the leaf tail</p> <p>M values shall be provided, where M is the Number of Parallel RT Beam Delimiters (300A,0648), in the order of the Parallel RT Beam Delimiter Boundaries (300A,0649).</p> <p>Required if Device Type Code Sequence (3010,002E) contains (130333, DCM, "Single Leaves").</p> <p>See Section C.36.2.2.8.1.3.</p>
>Fixed RT Beam Delimiter Device Sequence	(300A,0646)	1C	<p>Device that uses a fixed aperture to limit the beam.</p> <p>Required if Device Type Code Sequence (3010,002E) is part of CID 9545 "Fixed Beam Limiting Device Types".</p> <p>Only a single Item shall be included in this Sequence.</p>
>>Include Table 10.38-1 "Outline Definition Macro Attributes"			<i>The Outline is defined on the Beam Modifier Definition Plane.</i>

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### C.36.2.2.8.1 RT Beam Limiting Device Definition Macro Attribute Description

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#### C.36.2.2.8.1.1 Parallel RT Beam Delimiter Device Orientation Label Code

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The value of Parallel RT Beam Delimiter Device Orientation Label Code Sequence (300A,0644) shall be chosen as follows:

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- When the value of Beam Modifier Orientation Angle (300A,0645) equals zero the code shall be (130334, DCM, "X Orientation").
- When the value of Beam Modifier Orientation Angle (300A,0645) equals 90 the code shall be (130335, DCM, "Y Orientation").
- When the value of Beam Modifier Orientation Angle (300A,0645) is not zero or 90, the label should be chosen to best reflect the user perception or another code may be used.

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#### C.36.2.2.8.1.2 Parallel RT Beam Delimiter Boundaries

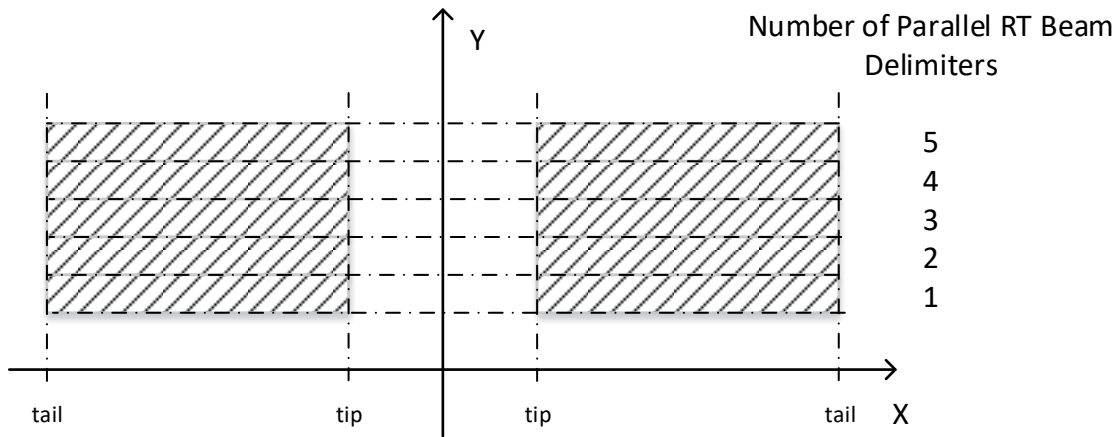
616

The Parallel RT Beam Delimiter Boundaries (300A,0649) shall be the positions of the mechanical boundaries (projected on the Beam Modifier Definition Plane defined by the RT Beam Modifier Definition Distance (300A,0688) ) between beam delimiter elements. These are fixed for a given

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620 beam limiting device. Parallel RT Beam Delimiter Positions (300A,064A) are values specific to a given Control Point, specifying the beam limiting device element openings.

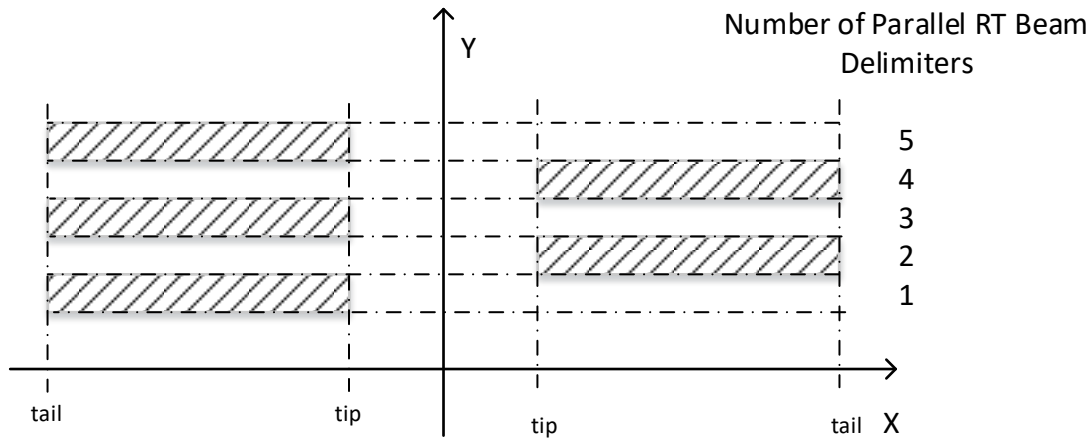
**C.36.2.2.8.1.3 Number of Parallel RT Beam Delimiters**



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**Figure C.36.2.2.8.1-1  
Number of Parallel RT Beam Delimiters for X Leaf Pairs**

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626

**Figure C.36.2.2.8.1-2  
Number of Parallel RT Beam Delimiters for X Single Leaves**

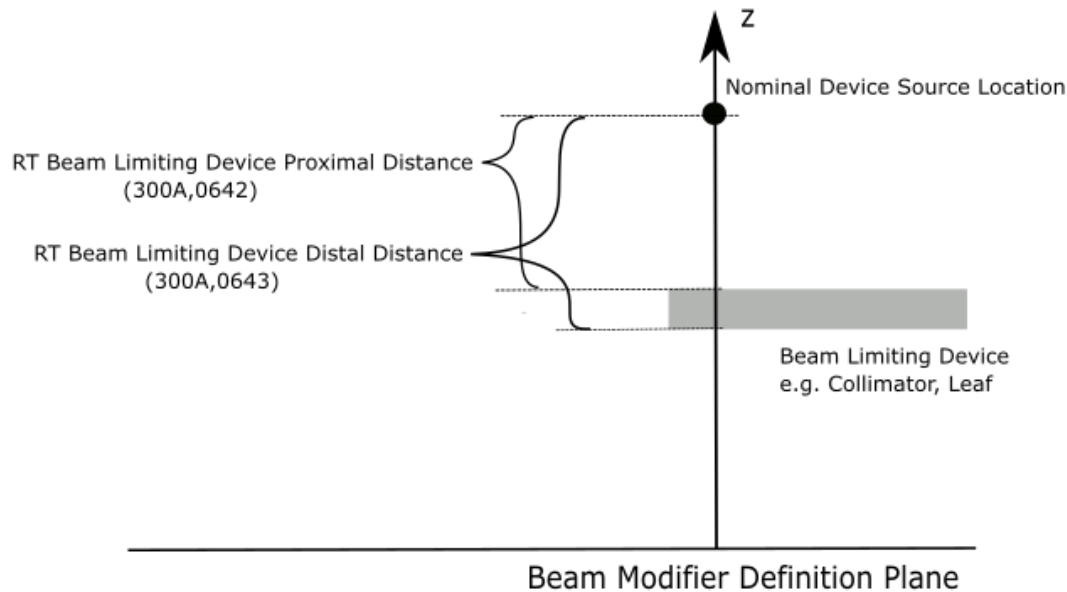
628 In example in Figure C.36.2.2.8.1-2 the delimiters labeled 1, 3 and 5 have a Parallel RT Beam  
630 Delimiter Leaf Mounting Side (300A,064F) value of N (negative direction) and the delimiters labeled 2  
and 4 have a Parallel RT Beam Delimiter Leaf Mounting Side value of P (positive direction).

**C.36.2.2.8.1.4 RT Beam Limiting Device Proximal Distance and RT Beam Limiting Device Distal Distance**

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634 The following figure shows the RT Beam Limiting Device Proximal Distance (300A,0642) and RT Beam Limiting Device Distal Distance (300A,0643).

636 In this example the reference location specified by the RT Device Distance Reference Location Code Sequence (300A,0659) has the value (130358, DCM, “Nominal Radiation Source Location”).



638 **Figure C.36.2.2.8.1-3**  
**RT Beam Limiting Device Proximal and Distal Distance**

640 **C.36.2.2.9 RT Beam Limiting Device Opening Macro**

642 This Macro defines the opening created by RT Beam Limiting Devices at a specific Control Point or set of Control Points.

644 **Table C.36.2.2.9-1**  
**RT BEAM LIMITING DEVICE OPENING MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of RT Beam Limiting Device Openings	(300A,0657)	1C	Number of RT Beam Limiting Device Openings in the RT Beam Limiting Device Opening Sequence (300A,0656). Required if Number of RT Beam Limiting Devices (300A,0641) is present and has a non-zero value.
RT Beam Limiting Device Opening Sequence	(300A,0656)	1C	Beam limiting device (collimator) settings defining the opening for the current Control Point.



Attribute Name	Tag	Type	Attribute Description
			<p>Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.</p> <p>The number of Items included in this Sequence shall equal the value of Number of RT Beam Limiting Device Openings (300A,0657).</p>
>Referenced Device Index	(300A,0607)	1	The value of Device Index (3010,0039) from the RT Beam Limiting Device Definition Sequence (300A,064D) corresponding to the Beam Limiting Device used in this Item.
>RT Beam Limiting Device Offset	(300A,064B)	1C	<p>The offsets (x,y) in mm of the Parallel RT Beam Delimiter Positions (300A,064A) from the central beam axis.</p> <p>See Section C.36.2.2.9.1.1 and Section C.36.2.2.8.1.2.</p> <p>Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.</p>
>Parallel RT Beam Delimiter Positions	(300A,064A)	1C	<p>One-dimensional positions of the tip in mm of beam delimiters.</p> <p>If Device Type Code Sequence (3010,002E) contains (130333, DCM, “Single Leaves”), N values shall be provided where N is the Number of Parallel RT Beam Delimiters (300A,0648).</p> <p>If Device Type Code Sequence contains (130330, DCM, “Jaw Pair”) or (130331, DCM, “Leaf Pairs”), 2N values shall be provided where N is the Number of Parallel RT Beam Delimiters (300A,0648). The values shall be grouped by the mounting side identified by the Parallel RT Beam Delimiter Leaf Mounting Side (300A,064F) with the values of RT Beam Delimiter Elements on the negative mounting side first.</p> <p>The order of values shall correspond to the order of the Parallel RT Beam Delimiter Boundaries (300A,0649).</p> <p>See Section C.36.2.2.9.1.1, Section C.36.2.2.9.1.2 and Section C.36.2.2.9.1.3.</p> <p>Required if the conditions in Section C.36.2.2.5.1.1 are satisfied and if Device Type Code Sequence contains (130330, DCM, “Jaw Pair”), (130331, DCM, “Leaf Pairs”) or (130333, DCM, “Single Leaves”).</p>
>RT Beam Delimiter Geometry Sequence	(300A,064C)	1C	<p>The outline of the Beam Limiting Device opening.</p> <p>Required if the conditions in Section C.36.2.2.5.1.1 are satisfied and if Device Type Code Sequence (3010,002E) contains (130332,</p>

Attribute Name	Tag	Type	Attribute Description
			DCM, “Variable Circular Collimator”). See Section C.36.2.2.9.1.1 and Section C.36.2.2.9.1.3. Only a single Item shall be included in this Sequence.
>>Include Table 10.38-1 “Outline Definition Macro Attributes”			<i>The Outline Shape Type (0018,1630) shall be CIRCULAR.</i> <i>The plane is defined in Section C.36.2.2.9.1.1.</i>

646 **C.36.2.2.9.1 RT Beam Limiting Device Opening Attribute Descriptions**

**C.36.2.2.9.1.1 Geometric Value Attributes**

648 All geometric values in Table C.36.2.2.9-1 are defined in the Beam Modifier Definition Plane.

**C.36.2.2.9.1.2 RT Beam Delimiter Element Positions**

650 For Device Type Code Sequence (3010,002E) values of (130330, DCM, “Jaw Pair”) or (130331, DCM, “Leaf Pairs”), the order of values are

652 N1, N2, ... Nn

P1, P2, ... Pn

654 where N denotes the negative mounting side, P the positive mounting side and the indices increasing corresponding to the order of the values of Parallel RT Beam Delimiter Boundaries (300A,0649).

656 **C.36.2.2.9.1.3 RT Beam Delimiter Geometry**

658 The definition of the tip positions in Parallel RT Beam Delimiter Positions (300A,064A) or delimiter outline in the RT Beam Delimiter Geometry Sequence (300A,064C) is as defined by the manufacturer and shall be documented in the Conformance Statement. Typically, this will be the radiological or physical edge.

**C.36.2.2.10 Wedges Definition Macro**

662 This Macro defines the geometric configuration elements which cannot vary during delivery.

664 **Table C.36.2.2.10-1  
WEDGES DEFINITION MACRO ATTRIBUTES**

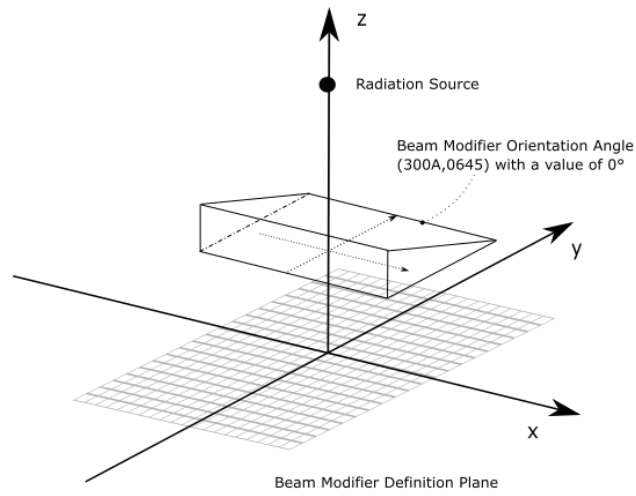
Attribute Name	Tag	Type	Attribute Description
Number of Wedges	(300A,00D0)	1C	Number of Wedges defined in the Wedge Definition Sequence (300A,0651). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.
Wedge Definition Sequence	(300A,0651)	1C	Treatment wedge definitions. Required if Number of Wedges (300A,00D0) is present and has a non-zero value. The number of Items included in this Sequence shall equal the value of Number of Wedges

Attribute Name	Tag	Type	Attribute Description
			(300A,00D0).
>Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"			Defined CID 9546 "Radiotherapy Wedge Types".
>Device Index	(3010,0039)	1	Index of this Item in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Referenced Defined Device Index	(300A,0602)	1C	Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same.  The value is the index of a device in the Wedges Definition Sequence (300A,0651) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631).  Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.
>Radiation Beam Wedge Angle	(300A,0652)	1	Nominal wedge angle in degrees. See Section C.36.2.2.10.1.1.
>Radiation Beam Effective Wedge Angle	(300A,0654)	2	Effective wedge angle in degrees. See Section C.8.8.14.14.
>Beam Modifier Orientation Angle	(300A,0645)	1	Angle in degrees of the Beam Modifier Coordinate System with respect to the Base Beam Modifier Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5.  The direction from thick edge to thin edge is along the positive y-axis of the Beam Modifier Definition Plane.  See Section C.36.1.1.9 and Section C.36.2.2.10.1.1.

666 **C.36.2.2.10.1 Wedges Definition Macro Attribute Description**

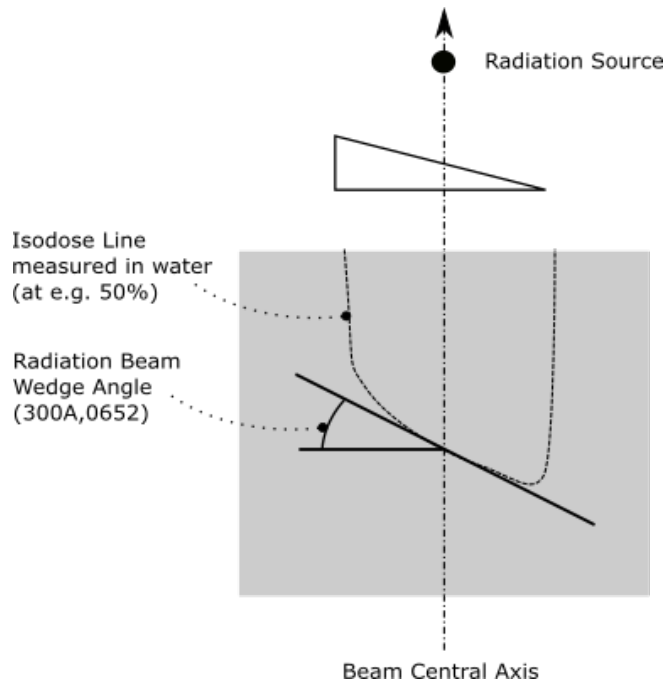
**C.36.2.2.10.1.1 Radiation Beam Wedge Orientation and Radiation Beam Wedge Angle**

668 For an Equipment Frame of Reference UID 1.2.840.10008.1.4.3.1 the wedge orientation has the  
670 value of 0 degree when the thin edge of the wedge is directed towards the positive direction of the y-axis of the Beam Modifier Coordinate system.



672

**Figure C.36.2.2.10.1-1  
Beam Modifier Orientation Angle**



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676

**Figure C.36.2.2.10.1-2  
Radiation Beam Wedge Angle**

678 **Update the following section in PS3.3 Annex C:**

#### C.8.8.14.14 Effective Wedge Angle

680 The Effective Wedge Angle (300A,00DE) **and Radiation Beam Effective Wedge Angle**  
 682 **(300A,0654)** describes the dosimetric angle of a motorized wedge accounting for the partial presence  
 684 of the wedge in the beam. The presence of the wedge in the beam is **either** specified by the Wedge  
 686 Position (300A,0118) in the Wedge Position Sequence (300A,0116) included in the Control Point  
 688 Sequence (300A,0111) of the current beam **or the RT Control Point Sequence of the current**  
 690 **Radiation**. When the wedge is in the beam throughout all control points, the Effective Wedge Angle  
**(300A,00DE) and Radiation Beam Effective Wedge Angle (300A,0654)** will have the same value  
 as the Wedge Angle (300A,00D5) **or Radiation Beam Wedge Angle (300A,0652)**. Otherwise the  
 Effective Wedge Angle **(300A,00DE) or Radiation Beam Effective Wedge Angle (300A,0654)** will  
 have a lower value than the Wedge Angle **(300A,00D5) or Radiation Beam Wedge Angle**  
**(300A,0652)**.

**Add the following section to PS3.3 Annex C:**

#### 692 C.36.2.2.11 Wedge Positions Macro

This Macro defines the positions of Wedges used in a specific Control Point or set of Control Points.

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**Table C.36.2.2.11-1**  
**WEDGE POSITIONS MACRO ATTRIBUTES**

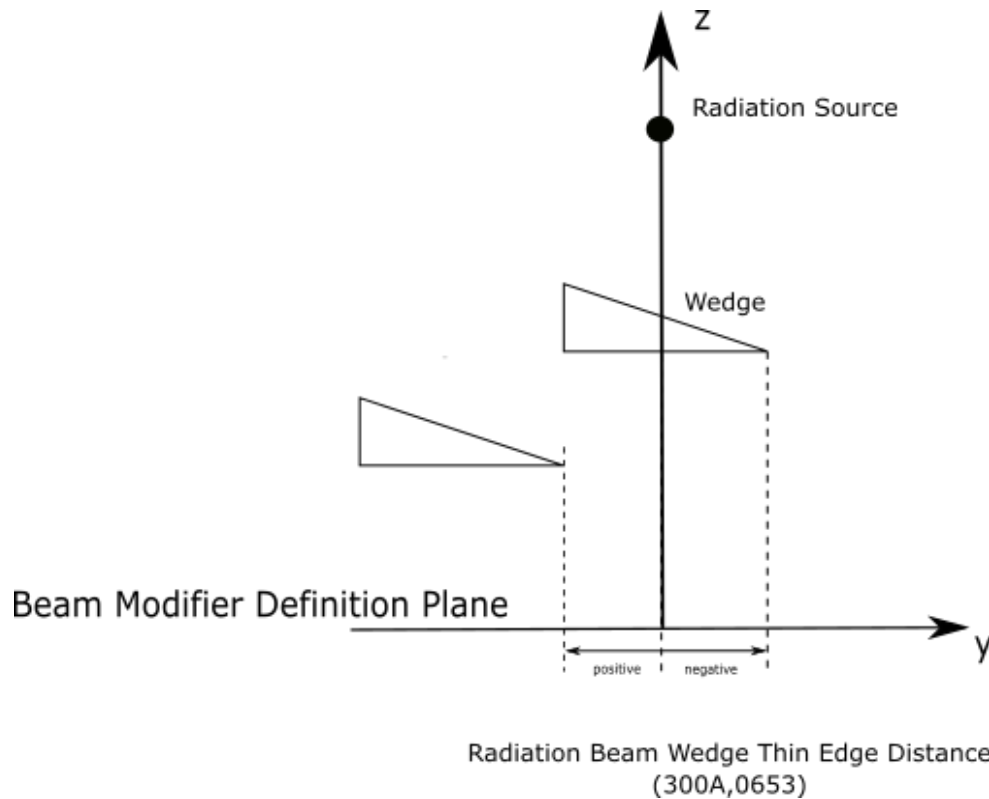
Attribute Name	Tag	Type	Attribute Description
Number of Wedge Positions	(300A,0655)	1C	Number of Wedge Positions defined in the Wedge Position Sequence (300A,0116). Required if Number of Wedges (300A,00D0) is present and has a non-zero value.
Wedge Position Sequence	(300A,0116)	1C	Position for each Wedge for the current Control Point. Required if the conditions in Section C.36.2.2.5.1.1 are satisfied. The number of Items included in this Sequence shall equal the value of Number of Wedge Positions (300A,0655).
>Referenced Device Index	(300A,0607)	1	The value of Device Index (3010,0039) in Wedge Definition Sequence (300A,0651) for the Wedge being used.
>Wedge Position	(300A,0118)	1	Position of Wedge at current Control Point. Enumerated Values: IN Wedge is in fully inserted position OUT Wedge is in fully retracted position PARTIAL Wedge is inserted only part of the way
>Radiation Beam Wedge Thin Edge Distance	(300A,0653)	1C	Closest distance in mm from the central axis of the beam along the wedge angle direction to the thin edge as projected on the Beam Modifier Definition Plane defined by the RT

Attribute Name	Tag	Type	Attribute Description
			Beam Modifier Definition Distance (300A,0688). The value is negative if the thin edge is located on the positive y-axis, and is positive otherwise. Required if Wedge Position (300A,0118) is PARTIAL. See Section C.36.2.2.11.1.1.

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**C.36.2.2.11.1 Wedge Positions Macro Attribute Description**

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**C.36.2.2.11.1.1 Radiation Beam Wedge Thin Edge Distance**

700

**Figure C.36.2.2.11.1-1**  
**Radiation Beam Wedge Thin Edge Position**

702

**C.36.2.2.12 Compensators Definition Macro**

704

This Macro defines the geometric configuration elements which cannot vary during delivery.

706

**Table C.36.2.2.12-1**  
**COMPENSATORS DEFINITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of	(300A,00E0)	1C	Number of Compensators defined in the

Attribute Name	Tag	Type	Attribute Description
Compensators			Compensator Definition Sequence (300A,0662). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.
Compensator Definition Sequence	(300A,0662)	1C	Treatment compensator definitions. Required if Number of Compensators (300A,00E0) is present and has a non-zero value. The number of Items included in this Sequence shall equal the value of Number of Compensators (300A,00E0).
<i>&gt;Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"</i>			<i>Defined CID 9542 "Compensator Device Types".</i>
>Device Index	(3010,0039)	1	Index of the Device in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Referenced Defined Device Index	(300A,0602)	1C	Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same. The value is the index of a device in the Compensator Definition Sequence (300A,0662) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631). Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.
>Beam Modifier Orientation Angle	(300A,0645)	1	Angle in degrees of the Beam Modifier Coordinate System with respect to the Base Beam Modifier Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5. See Section C.36.1.1.9.
>Compensator Base Plane Offset	(300A,0666)	1C	The distance in mm between the mounting plane and the base plane of the compensator. The value shall be positive when the base plane is farther away from the reference location (as specified by RT Device Distance Reference Location Code Sequence (300A,0659)) than the mounting plane. Required if RT Radiation Physical and

Attribute Name	Tag	Type	Attribute Description
			Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise. See Section C.36.2.2.12.1.2.
>Compensator Map Orientation	(300A,0663)	1C	Side of the compensator base that the compensator surface shape faces. Enumerated Values: PATIENT_SIDE the compensator surface shape is directed towards the patient. SOURCE_SIDE the compensator surface shape is directed towards the Radiation Source. DOUBLE_SIDED the compensator has two compensator surface shapes which are directed towards the patient and source respectively. Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.
>Compensator Shape Sequence	(300A,0668)	1C	Description of the shape of the Compensator and the fabrication parameters. Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise. Only one Item shall be present.
>>Compensator Divergence	(300A,02E0)	1	Whether or not the compensator is shaped according to the beam geometrical divergence. Enumerated Values: PRESENT the compensator is shaped according to the beam geometrical divergence. ABSENT the compensator is not shaped according to the beam geometrical divergence.
>>Material ID	(300A,00E1)	2	User-defined identifier for the material used to manufacture the Compensator.
>>Compensator Proximal Thickness Map	(300A,0664)	1C	A data stream of triplets of x, y and thickness in mm representing a map of the coordinates in the Beam Modifier Definition Plane and thicknesses from the compensator base plane. The order of triplets is not significant. Required if Compensator Map Orientation (300A,0663) is SOURCE_SIDE or DOUBLE_SIDED. See Section C.36.2.2.12.1.1 and Section C.36.2.2.12.1.3.
>>Compensator Distal Thickness Map	(300A,0665)	1C	A data stream of triplets of x, y and thickness in mm representing a map of the coordinates in the Beam Modifier Definition Plane and



Attribute Name	Tag	Type	Attribute Description
			thicknesses from the compensator base plane. The order of triplets is not significant. Required if Compensator Map Orientation (300A,0663) is PATIENT_SIDE or DOUBLE_SIDED. See Section C.36.2.2.12.1.1 and Section C.36.2.2.12.1.3.
>>Compensator Shape Fabrication Code Sequence	(300A,0667)	2	The method of fabrication, such as shape of tools to be used, surface modelling technique. Zero or more Items shall be included in this Sequence.
>>>Include Table 8.8-1 "Code Sequence Macro Attributes"			No Baseline CID is defined.
>>Radiation Beam Compensator Milling Tool Diameter	(300A,0669)	2	The diameter in mm of the milling tool to be used to create the compensator. The diameter is expressed as the actual physical size and not a size projected on the Beam Modifier Definition Plane.

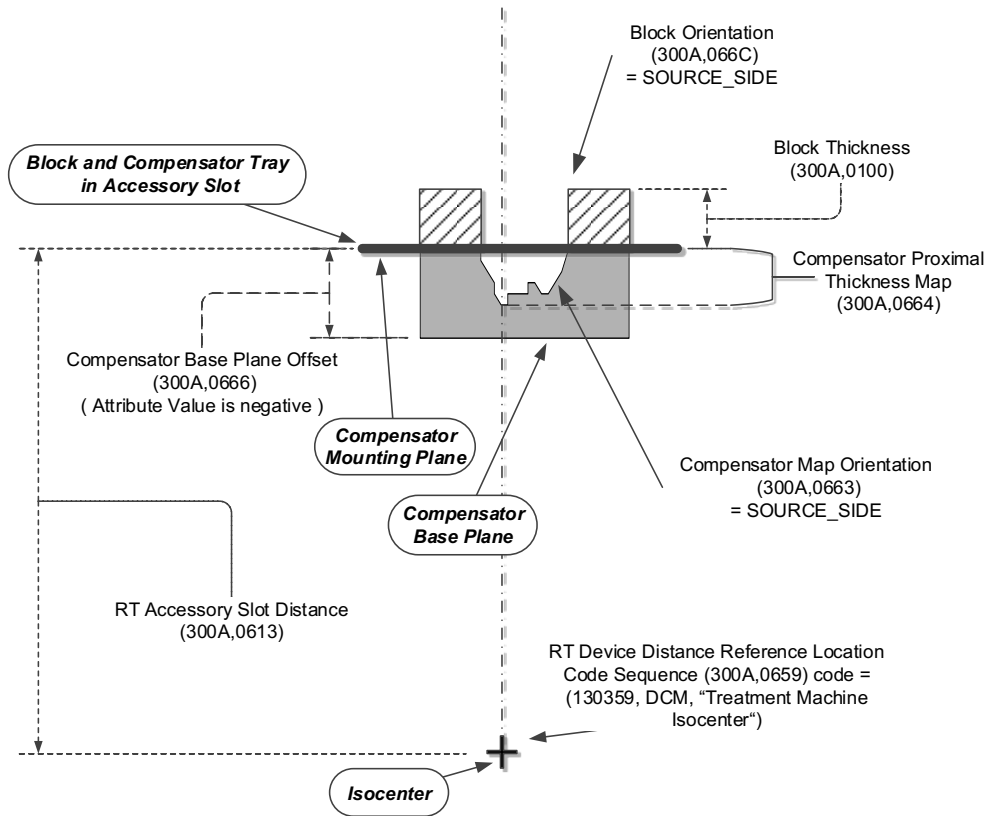
708 **C.36.2.2.12.1 Compensators Definition Macro Attribute Descriptions**

**C.36.2.2.12.1.1 Compensators Thickness Map and Tray Distance**

710 The thickness values stored in Compensator Proximal Thickness Map (300A,0664) and  
 712 Compensator Distal Thickness Map (300A,0665) shall be specified parallel to the radiation beam axis  
 if Compensator Divergence (300A,02E0) equals ABSENT, or specified according to the beam  
 geometrical divergence if Compensator Divergence (300A,02E0) equals PRESENT.

714 **C.36.2.2.12.1.2 Compensator Base Plane Offset**

716 The compensator base plane is the side of the compensator which is flat. In case of a double-sided  
 compensator, the base plane is the plane from which the compensator thickness is specified.



718

**Figure C.36.2.2.12.1-1  
Example of Block and Compensator Geometry**

720

**C.36.2.2.12.1.3 Compensator Thickness Data Direction**

722

The direction of the rows and columns in Compensator Proximal Thickness Map (300A,0664) and Compensator Distal Thickness Map (300A,0665) is defined as follows: The direction of rows goes along the positive X direction and the direction of the columns goes along the negative Y direction of the Beam Modifier Coordinate System.

724

**C.36.2.2.13 Blocks Definition Macro**

726

This Macro defines the geometric configuration elements which cannot vary during delivery.

728

**Table C.36.2.2.13-1  
BLOCKS DEFINITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of Blocks	(300A,00F0)	1C	Number of Blocks defined in the Block Definition Sequence (300A,066A). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) is FULL. May be present otherwise.
Block Definition Sequence	(300A,066A)	1C	Block definitions. Required if Number of Blocks (300A,00F0) is present and has a non-zero value.

Attribute Name	Tag	Type	Attribute Description
			<p>The number of Items included in this Sequence shall equal the value of Number of Blocks (300A,00F0).</p> <p>Only one Item in this Sequence shall have (130123, DCM, "Aperture Block") as the code value of Device Type Code Sequence (3010,002E).</p>
>Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"			<p>Defined CID 9517 "Radiotherapy Block Device Types".</p> <p>The Device Alternate Identifier (3010,001B) Attribute of the RT Accessory Device Identification Macro shall not contain a value when the Number of Block Slab Items (300A,0440) is non-zero.</p>
>Device Index	(3010,0039)	1	<p>Index of the Device in this Sequence.</p> <p>The value shall start at 1 and increase monotonically by 1.</p>
>Referenced Defined Device Index	(300A,0602)	1C	<p>Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same.</p> <p>The value is the index of a device in the Block Definition Sequence (300A,066A) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631).</p> <p>Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.</p>
>Beam Modifier Orientation Angle	(300A,0645)	1	<p>Angle in degrees of the Beam Modifier Coordinate System with respect to the Base Beam Modifier Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5.</p> <p>See Section C.36.1.1.9.</p>
>Material ID	(300A,00E1)	2	<p>User-defined identifier for material used to manufacture the Block.</p>
>Block Divergence	(300A,00FA)	1C	<p>Whether or not the block is shaped according to the beam geometrical divergence.</p> <p>Enumerated Values:</p> <p>PRESENT        block edges are shaped for beam divergence</p> <p>ABSENT         block edges are not shaped for beam divergence</p> <p>Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL.</p>

Attribute Name	Tag	Type	Attribute Description
			May be present otherwise.
>Block Orientation	(300A,066C)	1C	Specifies on which side of the block base the block extends. Enumerated Values: PATIENT_SIDE the block extends from its base towards the patient. SOURCE_SIDE the block extends from its base towards the Radiation Source. Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.
>Radiation Beam Block Thickness	(300A,066D)	2C	Physical thickness of block in mm parallel to the central radiation beam axis. Required if Material ID (300A,00E1) has a value. May be present otherwise.
>Block Edge Data Sequence	(300A,066F)	2	Block Edge Data streams. The polygons represented by the Block Edge Data (300A,066B) data streams in all Items in this Sequence shall be non-overlapping. Zero or more Items shall be included in this Sequence.
>>Block Edge Data	(300A,066B)	1	A data stream of coordinate pairs in mm representing a polygon which comprise the block edge. The polygon is implicitly closed from the last pair to the origin pair and all edges shall be non-intersecting except at the vertices. Any given coordinate pair shall only occur once in the data stream. Coordinates are projected on the Beam Modifier Definition Plane.
>Number of Block Slab Items	(300A,0440)	1C	Number of slabs composing the block if the block has been sliced parallel to the Beam Modifier Definition Plane. If the block has not been sliced the value shall be zero. Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.
>Block Slab Sequence	(300A,0441)	1C	Sequence of slab(s) that comprise the block. Required if Number of Block Slab Items (300A,0440) is present and has a value greater than 1. The number of Items included in this Sequence shall equal the value of Number of Block Slab Items (300A,0440).

Attribute Name	Tag	Type	Attribute Description
>>Block Slab Number	(300A,0043)	1	Identification number of the Block Slab. The value shall start at 1, and increase monotonically by 1. The number indicates the order of the slabs with respect to the source, where Number 1 corresponds to the slab nearest to the source.
>>Radiation Beam Block Slab Thickness	(300A,066E)	3	Physical thickness of block slab in mm in a direction parallel to the radiation beam axis. The sum of Radiation Beam Block Slab Thickness (300A,066E) values in all Items of this Sequence must equal the Radiation Beam Block Thickness (300A,066D) of the block.
>>Device Alternate Identifier	(3010,001B)	2	An identifier intended to be read by a device such as a bar code reader.
>>Device Alternate Identifier Type	(3010,001C)	1C	Defines the type of Device Alternate Identifier. Required if Device Alternate Identifier (3010,001B) is present. Defined Terms: BARCODE RFID
>>Device Alternate Identifier Format	(3010,001D)	1C	Description of the format in which the Device Alternate Identifier (3010,001B) is issued. Required if Device Alternate Identifier (3010,001B) is present. See Section 10.36.1.1.

730 **C.36.2.2.14 RT Accessory Holders Definition Macro**

732 This Macro defines the geometric configuration elements which cannot vary during delivery and which are used to hold accessories such as blocks or compensators.

734 **Table C.36.2.2.14-1  
RT ACCESSORY HOLDERS DEFINITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of RT Accessory Holders	(300A,0670)	1C	Number of RT Accessory Holders defined in the RT Accessory Holder Definition Sequence (300A,0614). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL. May be present otherwise.
RT Accessory Holder Definition Sequence	(300A,0614)	1C	Accessory Holder device definitions. Required if Number of RT Accessory Holders (300A,0670) is present and has a non-zero value. The number of Items included in this Sequence

Attribute Name	Tag	Type	Attribute Description
			shall equal the value of Number of RT Accessory Holders (300A,0670).
>Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"			Defined CID 9518 "Radiotherapy Accessory No-Slot Holder Device Types" and 9519 "Radiotherapy Accessory Slot Holder Device Types".
>Device Index	(3010,0039)	1	Index of the Device in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Referenced Defined Device Index	(300A,0602)	1C	Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same.  The value is the index of a device in the RT Accessory Holder Definition Sequence (300A,0614) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631).  Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.
>Beam Modifier Orientation Angle	(300A,0645)	1	Angle in degrees of the Beam Modifier Coordinate System with respect to the Base Beam Modifier Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5.  See Section C.36.1.1.9.
>RT Accessory Holder Water-Equivalent Thickness	(300A,060D)	2	Water-Equivalent thickness in mm of the Accessory Holder parallel to the radiation beam axis.
>RT Accessory Holder Slot Existence Flag	(300A,060F)	1	Indicates whether the RT Accessory Holder has slots in which other RT Accessory Holders or beam modifying devices can be inserted.  Enumerated Values: YES = The RT Accessory Holder has one or more slots NO = The RT Accessory Holder has no slots.
>RT Accessory Holder Slot Sequence	(300A,0610)	1C	Slots being available in this Accessory Holder. Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638) equals FULL and RT Accessory Holder Slot Existence Flag (300A,060F) has the value YES..  May be present if RT Accessory Holder Slot Existence Flag (300A,060F) has the value YES.

Attribute Name	Tag	Type	Attribute Description
			One or more Items shall be included in this Sequence.
>>RT Accessory Holder Slot ID	(300A,0611)	1	The ID of the slot where accessories are inserted.
>>RT Accessory Holder Slot Distance	(300A,0612)	2	Distance in mm from the reference location as specified by RT Device Distance Reference Location Code Sequence (300A,0659) to the slot along the radiation beam axis.

#### 736 C.36.2.2.14.1 RT Accessory Holders Description

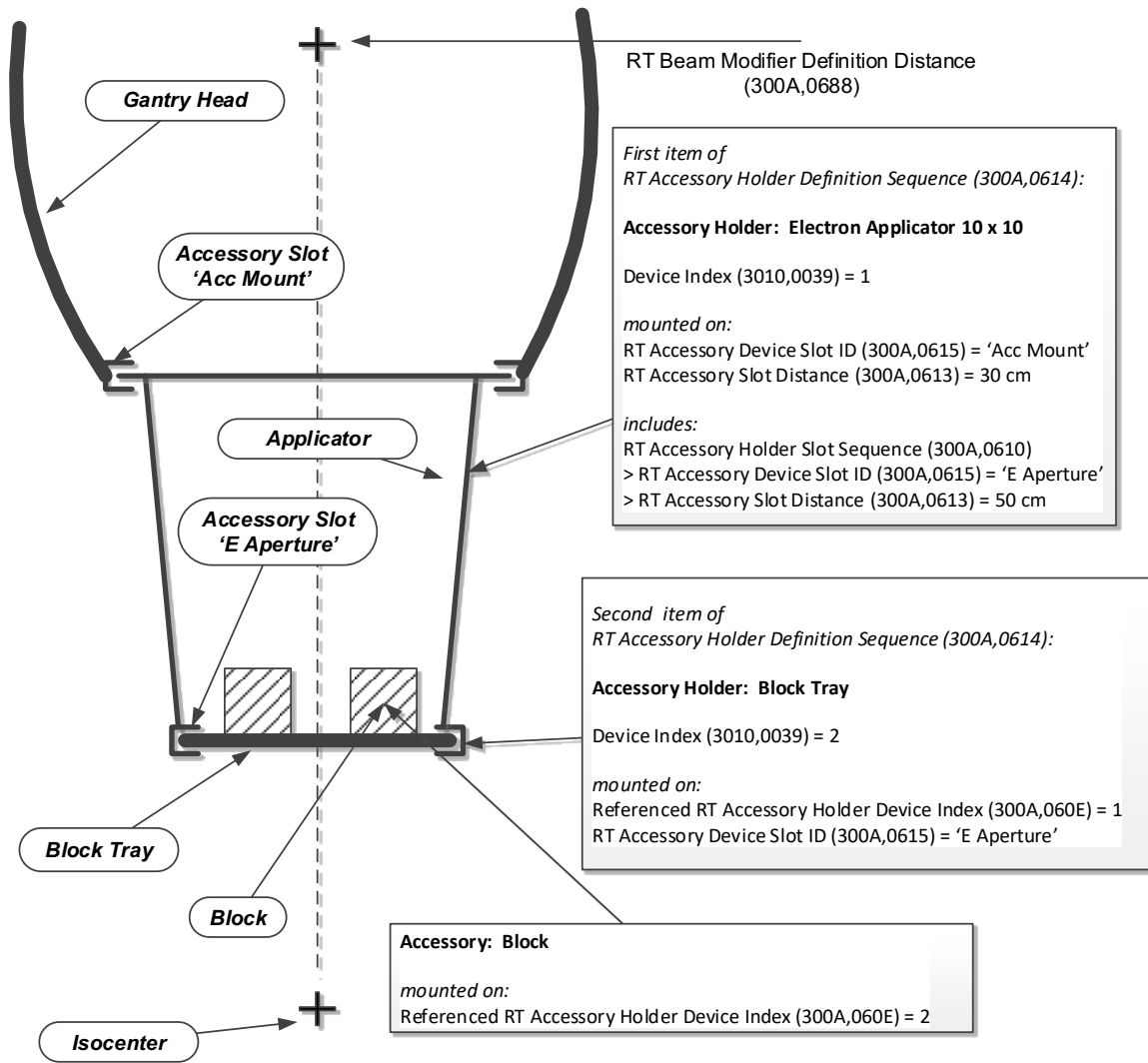
738 A treatment delivery unit may allow the attachment of one or more accessory holders within which the user may install various devices for applying the beam to the patient. These installed devices may include, but not be limited to, one or more of the following items:

- 740 • custom blocks for patient-specific lateral collimation (beam limiting),
- pre-collimators for general lateral collimation (beam limiting),
- 742 • uniform thickness range shifter for modifying the range uniformly across the beam,
- two-dimensional range shifters (custom boluses) for modifying the range differentially across the
- 744 defined field,
- ridge filters for creating multiple ranges within the beam,
- 746 • cross-wires for aligning the patient with the beam,
- a mirror or camera for aligning or viewing the irradiated area,
- 748 • beam monitoring detectors,
- applicator sealer for preventing fluids from entering the applicator.

750 The following example illustrates the use of the RT Accessory Holders Macro and the RT Accessory Device Identification Macro:

- 752 • The gantry head has a slot called 'Acc Mount'.
- In this example, an electron applicator is mounted in that slot. The electron applicator itself has a
- 754 slot called 'E Aperture', where other accessories can be mounted. Therefore the electron applicator is an RT Accessory Holder, which includes a slot sequence to model that slot.
- 756 • In this example, a block tray is mounted in the 'E Aperture' slot. The block tray can support blocks, therefore it is an RT Accessory Holder, but the slot sequence is absent in the block tray
- 758 definition, since the tray has no slots.
- The block is an RT Accessory, which is mounted in the block tray.

760



762

**Figure C.36.2.2.14.1-1  
RT Accessory Holders**

764

**C.36.2.2.15 General Accessories Definition Macro**

766 This Macro defines the geometric configuration elements which cannot vary during delivery.

768

**Table C.36.2.2.15-1  
GENERAL ACCESSORIES DEFINITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of General Accessories	(300A,0672)	1C	Number of General Accessories defined in the General Accessory Definition Sequence (300A,0671). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638)



Attribute Name	Tag	Type	Attribute Description
			equals FULL. May be present otherwise.
General Accessory Definition Sequence	(300A,0671)	1C	General accessory devices. Required if the Number of General Accessories (300A,0672) is present and has a non-zero value. The number of Items included in this Sequence shall equal the value of Number of General Accessories (300A,0672).
>Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"			Baseline CID 9548 "General Accessory Device Types".
>Device Index	(3010,0039)	1	Index of the Device in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Referenced Defined Device Index	(300A,0602)	1C	Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same. The value is the index of a device in the General Accessory Definition Sequence (300A,0671) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631). Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.
>Beam Modifier Orientation Angle	(300A,0645)	1	Angle in degrees of the Beam Modifier Coordinate System with respect to the Base Beam Modifier Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5. See Section C.36.1.1.9.

770 **C.36.2.2.16 Boluses Definition Macro**

This Macro defines the geometric configuration elements which cannot vary during delivery.

772

**Table C.36.2.2.16-1  
BOLUSES DEFINITION MACRO ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Number of Boluses	(300A,0674)	1C	Number of boluses defined in the Bolus Definition Sequence (300A,0673). Required if RT Radiation Physical and Geometric Content Detail Flag (300A,0638)

Attribute Name	Tag	Type	Attribute Description
			equals FULL. May be present otherwise.
Bolus Definition Sequence	(300A,0673)	1C	Bolus device definitions. Required if Number of Boluses (300A,0674) is present and has a non-zero value. The number of Items included in this Sequence shall equal the value of Number of Boluses (300A,0674).
>Include Table C.36.2.2.3-1 "RT Accessory Device Identification Macro Attributes"			Defined CID 9516 "Radiotherapy Bolus Device Types".
>Device Index	(3010,0039)	1	Index of the Device in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Referenced Defined Device Index	(300A,0602)	1C	Device Index value that links the device defined by this Sequence Item to the corresponding device in an RT Radiation Instance. The description of the two devices may or may not be the same. The value is the index of a device in the Bolus Definition Sequence (300A,0673) within the single SOP Instance referenced by Referenced RT Instance Sequence (300A,0631). Required if the Instance referenced in Referenced RT Instance Sequence (300A,0631) contains the device that corresponds to the device defined by this Sequence Item.
>Conceptual Volume Sequence	(3010,0025)	2	References a Conceptual Volume that describes the geometry and properties of the bolus. See Section C.36.2.2.16.1.1. Zero or one Item shall be included in this Sequence.
>>Include Table 10.34-1 "Conceptual Volume Segmentation Reference and Combination Macro Attributes"			

774

### C.36.2.2.16.1 Boluses Definition Macro Attribute Description

#### 776 C.36.2.2.16.1.1 Conceptual Volume Sequence

778 The Conceptual Volume Sequence (3010,0025), if present, identifies the segmented Conceptual  
780 Volume used to define the bolus. The segment is defined by the Referenced Segment Reference  
Index (3010,0020) in the Conceptual Volume Segmentation Reference and Combination Macro (see  
10.34).

782 Alternatively, the bolus may not be associated with a Conceptual Volume. For example, a bolus may  
cover the entire area of radiation and not require a specific segmentation for definition.

**C.36.2.2.17 RT Tolerance Set Macro**

784 The RT Tolerance Set Macro contains information describing the maximum differences between  
 786 planned and delivered values. This information is used in the context of delivery of the RT Radiation  
 788 Set. If the absolute difference between a planned and delivered value exceeds the tolerance value,  
 then it is expected that the delivery of the RT Radiation Set will be inhibited unless an authorized  
 operator confirms that the tolerance may be exceeded.

790

**Table C.36.2.2.17-1  
 RT TOLERANCE SET MACRO ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Attribute Description</b>
RT Tolerance Set Label	(300A,062A)	1	User defined label for the Tolerance Set.
Attribute Tolerance Values Sequence	(300A,062B)	2	Tolerance values representing the allowed difference between the planned and actual values.  The Selector Attribute Macro identifies the Attributes for which the tolerances are specified.  Required if a tolerance value is specified for at least one Attribute which can be referenced by the Selector Attribute Macro.  See Section C.36.2.2.17.1.1.  Zero or more Items shall be included in this Sequence.
<i>&gt;Include Table 10-20 "Selector Attribute Macro Attributes"</i>			
>Tolerance Value	(300A,062C)	1	Maximum permitted difference between the planned and the delivered value. Units are those specified for the corresponding Attribute referenced by the Selector Attribute Macro.
Patient Support Position Specification Method	(300A,065C)	1	Method of specification for patient support parameters.  Enumerated Values ABSENT no parameters are specified GLOBAL parameters are specified irrespective of the devices in use DEVICE_SPECIFIC parameters are specified per device
Patient Support Position Device Tolerance Sequence	(300A,0660)	1C	Tolerance values for Patient Support devices.  Required if Patient Support Position Specification Method (300A,065C) does not equal ABSENT.  One or more Items shall be included in this Sequence if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC.  Only one Item shall be included in this Sequence if Patient Support Position

			Specification Method (300A,065C) equals GLOBAL. See Section C.36.2.2.17.1.2.
>Referenced Device Index	(300A,0607)	1C	The value of Device Index (3010,0039) in Patient Support Devices Sequence (300A,0686) corresponding to the Patient Support Device in use. Required if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC.
>Device Order Index	(300A,065E)	1C	Index defining the order in which the Items in the Patient Support Position Device Tolerance Sequence (300A,0660) are applied. The value shall start at 1 and increase monotonically by 1. Required if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC. See Section 10.40.1.
>Patient Support Position Tolerance Sequence	(300A,062D)	1	Tolerance values for a particular Patient Support device. One or more Items shall be included in this Sequence.
>>Patient Support Position Tolerance Order Index	(300A,0661)	1C	Index defining the order in which the Items in the Patient Support Position Tolerance Sequence (300A,062D) are applied. The value shall start at 1 and increase monotonically by 1. Required if Patient Support Position Specification Method (300A,065C) equals DEVICE_SPECIFIC. See Section 10.40.1.
>>>Include Table 10-2 "Content Item Macro Attributes"			<i>Baseline TID of Concept Name Code Sequence is TID 9541.</i> <i>Content items shall use UCUM units of mm and degrees where applicable.</i>

792 **C.36.2.2.17.1 RT Tolerance Set Attribute Description****C.36.2.2.17.1.1 Attribute Tolerance Values Sequence**

794 The Attribute Tolerance Values Sequence (300A,062B) allows for the reference to any numerical  
796 value for this parameter. The reference specification is conveyed by the Selector Attribute Macro,  
798 which allows reference to a tag on any level of nested Sequences, and to refer to specific Items in the  
Sequence. The unit of the tolerance value is the unit as specified by the data element tag referenced  
in the Selector Attribute (0072,0026).

800 **C.36.2.2.17.1.2 Patient Support Position Tolerance Sequence**

802 When describing a tolerance for a specific patient support position value, the patient support device parameter is defined using the same code used in the Patient Support Position Macro in Section 10.40.

804 **C.36.3 Enhanced RT Series Module**

...

806 **C.36.3.1 Enhanced RT Series Attribute Descriptions**

**C.36.3.1.1 Modality**

808 The Modality (0008,0060) is defined for each IOD including the Enhanced RT Series Module.

Enumerated Values:

810 RTINTENT

RTSEGANN

812 **RTRAD**

814 **C.36.10 RT Radiation Set Module**

816 The RT Radiation Set Module describes treatment fractions that contain a set of beams or  
 818 brachytherapy setups used within a treatment session to help achieve the dosimetric requirements of  
 820 a given Treatment Phase. The Module references a set of RT Radiation instances that describe the  
 geometric and physical parameters that define the delivery of dose for a single fraction. In addition,  
 the overall number of treatment fractions is defined, as well as possibly the fractionation scheme  
 according to which, fractions will be delivered.

822 A Treatment Phase is achieved by delivering one or more RT Radiation Sets. The chronological  
 relationships between RT Radiation Sets (the actual start of each set, the order or timing among sets,  
 etc.) are recorded in Attributes outside the RT Radiation Set Module.

824

**Table C.36.10-1  
 RT RADIATION SET MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Description
<i>Include Table 10.9.1-1 "Enhanced Content Identification Macro Attributes"</i>			
Intended Number of Fractions	(300A,0636)	1C	Number of Fractions for which this RT Radiation Set is intended to be repeated.  Required if Referenced RT Physician Intent Sequence (300A,063B) is empty. May be present otherwise.  See Section C.36.10.1.4.
<i>Include Table C.36.2.1.1-1 "Radiation Fraction Pattern Macro Attributes"</i>			<i>See Section C.36.10.1.4.</i>
Referenced RT Physician Intent Sequence	(300A,063B)	2	RT Physician Intent Instance this Radiation Set is based upon.  Zero or more Items shall be included in this Sequence.
<i>&gt;Include Table 10-11 "SOP Instance Reference Macro Attributes"</i>			
>Referenced RT Prescription Sequence	(300A,0636)	1	Sequence of RT Prescription Prescription Indices.  One or more Items shall be included in this Sequence.
>>Referenced RT Prescription Index	(3010,0041)	1	Value of RT Prescription Index (3010,003C) in the RT Prescription Sequence (3010,006B) specifying the prescription to which this RT Radiation Set is related.
RT Radiation Set Intent	(300A,0637)	1	A general indication of the type of information contained within this RT Radiation Set.  See Section C.36.10.1.1.

Attribute Name	Tag	Type	Description
Treatment Position Group Sequence	(300A,060A)	2	Treatment Position Groups defined for the included Radiation Instances. Zero or more Items shall be included in this Sequence. See Section C.36.10.1.3.
>Treatment Position Group UID	(300A,0609)	1	Unique identifier of the Treatment Position Group.
>Treatment Position Group Label	(300A,0608)	1	User-defined label of the Treatment Position Group.
>Referenced RT Radiation Sequence	(300A,0630)	1	RT Radiation Instances that belong to the Treatment Position Group. Each referenced Radiation Instance shall appear once and only once in the Treatment Position Group Sequence (300A,060A). One or more Items shall be included in this Sequence.
<i>&gt;&gt;Include Table 10-11 "SOP Instance Reference Macro Attributes"</i>			
RT Radiation Sequence	(300A,0616)	1	RT Radiation instances which are referenced by this RT Radiation Set. One or more Items shall be included in this Sequence. See Section C.36.10.1.2.
<i>&gt;Include Table 10-11 "SOP Instance Reference Macro Attributes"</i>			

826

**C.36.10.1 RT Radiation Set Attribute Description**

828

**C.36.10.1.1 RT Radiation Set Intent**

Defined Terms for RT Radiation Set Intent (300A,0637) are

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**Table C.36.10-2  
DEFINED TERMS OF RT RADIATION SET INTENT (300A,0637)**

Defined Term	Definition
TREATMENT	The RT Radiation Set is for the purpose of treatment delivery. This does not constitute an approval for treatment. All parameters necessary to guide the delivery of RT Radiations are included.
PLAN_QA	The RT Radiation Set is for validating the patient-specific dose. For example, by delivering the RT Radiations to a phantom and comparing the calculated dose to the phantom with actual measurements made in the phantom.
MACHINE_QA	The RT Radiation Set is for system quality assurance and calibration (geometric, dosimetric or both) procedures of the delivery machine and is not patient-specific.
RESEARCH	The RT Radiation Set is for performing research and is not delivered to a patient.

SERVICE	The RT Radiation Set is for diagnostics and assessment for machine repair or to perform measurements for a maintenance or calibration operation by a service technician.
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### 832 **C.36.10.1.2 RT Radiation Sequence**

834 All SOP Instances referenced in this Sequence shall

- 836 • share the same Frame of Reference (defined by the Frame of Reference UID (0020,0052) in the Frame Of Reference Module), and
- 838 • be defined for the same treatment device (specified by the Treatment Device Identification Macro within the RT Delivery Device Common Module).

The SOP Classes referenced in this Sequence shall contain the following Modules:

- 840 • Enhanced RT Series specified in Section C.36.3.
- Radiotherapy Common Instance Module specified in Section C.36.4.
- 842 • RT Delivery Device Common Module specified in Section C.36.12.
- RT Radiation Common Module specified in Section C.36.13.

### 844 **C.36.10.1.3 Treatment Position Groups**

846 Radiation Instances that share a fixed spatial relation and thus can share the result of a position verification can be assigned to the same Treatment Position Group because the relationship of positions in one Instance to those in other Instances in the Treatment Position Group can be known with sufficient certainty to allow deterministic movement.

850 Whether it is reasonable to put Instances together in Treatment Position Group can depend on several factors and may involve a degree of judgment.

For example,

- 852 1) In a Radiation Set treating a single target with two beams at the same spatial location, both Radiation Instances belong to the same Treatment Position Group.
- 854 2) In a Radiation Set treating two targets in different anatomical regions (e.g. lung and pelvis), typically the Radiation Instances belong to different Treatment Position Groups, because a separate setup verification is required to establish the treatment position for each Radiation.
- 856
- 858 3) In a Radiation Set treating two targets whose spatial relationship is fixed such that a single setup verification is sufficient, the Radiation Instances may belong to the same Treatment Position Group, but the planner may choose to assign them to different Treatment Position Groups.
- 860

### 862 **C.36.10.1.4 Intended Number of Fractions and Radiation Fraction Pattern Macro**

864 The values of Intended Number of Fractions (300A,0636) and the attributes in Radiation Fraction Pattern Macro provide information about the planned treatment at the time the RT Radiation Set Instance was created.



**C.36.11 RT Dose Contribution Module**

866 The RT Dose Contribution Module contains information about the contribution of dose of the RT  
 868 Radiations referenced by this RT Radiation Set IOD. Dose contributions refer to the RT Radiations  
 delivering the dose and to anatomical structures receiving the dose.

870 Note that an anatomical structure (as defined by the Conceptual Volume Macro) can either be a  
 872 textually tagged definition, or a reference to a Conceptual Volume defined in the RT Segment  
 Annotation IOD. In all cases, Conceptual Volumes are identified by a UID which allows accumulation  
 of dose to a given Conceptual Volume across RT Radiation Sets and comparison with prescribed  
 Dosimetric Objectives.

874 Dose contributions are defined using Meterset values. The definition points in the Meterset to Dose  
 876 Mapping Sequence may or may not align with the Meterset values at the Control Points of the RT  
 Radiation SOP Instance. For example, where a dose deposition between Control Points cannot be  
 878 determined individually per segment or where this definition is not useful, the lookup table may just  
 contain the Meterset of first and last Control Points. The Meterset and dose contribution of the first  
 Control Point are always zero. For further details see Section C.36.11.1.1.

880 Where dose contributions are not available at the time of RT Radiation Set definition and application  
 882 (e.g. for emergency treatments) this Module may be absent. This does not exclude retrospective  
 dose calculation and creation of associated RT Dose Image objects.

884 **Table C.36.11-1  
 RT DOSE CONTRIBUTION MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Description
Radiation Dose Identification Sequence	(300A,0618)	1	Parameters to identify and scope the dose values that are delivered by this RT Radiation Set SOP Instance. One or more Items shall be included in this Sequence.
>Radiation Dose Identification Index	(300A,0603)	1	Index of this Item in this Sequence. The value shall start at 1 and increase monotonically by 1.
>Radiation Dose Identification Label	(300A,0619)	1	Label of this Radiation Dose for the user.
>Reference Dose Type	(300A,061A)	1	Type of reference dose. Defined terms: PER_RADIATION Dose values are calculated individually for each referenced RT Radiation SOP Instance. NOMINAL Dose values are calculated on the Fraction level and assigned to individual RT Radiation SOP Instances without instance-specific calculations.

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Description</b>
>Reference Dose Point Coordinates	(300A,061E)	1C	The x, y, and z coordinates, in mm of the reference dose point in the DICOM Patient Coordinate System at which the dose values are calculated.  Required if dose is calculated at a point.
>Conceptual Volume Sequence	(3010,0025)	1	Reference to a Conceptual Volume that receives dose.  See Section C.36.11.1.2.  Only a single Item shall be included in this Sequence.  Each Conceptual Volume UID (3010,0006) shall appear only once in the Radiation Dose Identification Sequence (300A,0618).
<i>&gt;&gt;Include Table 10.34-1 "Conceptual Volume Segmentation Reference and Combination Macro Attributes"</i>			
Radiation Dose Sequence	(300A,0617)	1	Parameters that describe dose contributed by referenced RT Radiation SOP instances.  For every SOP instance referenced in RT Radiation Sequence (300A,0616) exactly one item shall be present in this Sequence.
>Referenced RT Radiation Sequence	(300A,0630)	1	References the RT Radiation SOP Instance that describes parameters for dose delivery.  Only a single Item shall be included in this Sequence.
<i>&gt;&gt;Include Table 10-11 "SOP Instance Reference Macro Attributes"</i>			
>Radiation Dose Values Parameters Sequence	(300A,061F)	1	Dose values of this RT Radiation with respect to the dose identification items defined in the Radiation Dose Identification Sequence (300A,0618).  The number of Items included in this Sequence shall be the same as the number of Items in the Radiation Dose Identification Sequence (300A,0618).

Attribute Name	Tag	Type	Description
>>Primary Dose Value Indicator	(300A,061B)	1	Whether the dose value serves as the primary dose indicator for the RT Radiation SOP Instance. Enumerated Values: YES NO Exactly one item in the Radiation Dose Values Parameters Sequence (300A,061F) shall have the value YES. See Section C.36.11.1.3.
>>Referenced Radiation Dose Identification Index	(300A,060C)	1	The value of Radiation Dose Identification Index (300A,0603) in the Radiation Dose Identification Sequence (300A,0618) identifying the dose contribution to which this Item in the Radiation Dose Values Parameters Sequence (300A,061F) applies.
>>Dose Values Sequence	(300A,061C)	1C	Dose values. Required if the Meterset to dose mapping is defined. One or more Items shall be present. Each Radiobiological Dose Effect Flag (3010,0002) value shall appear no more than once in this Sequence.
>>>Dose Value Purpose	(300A,061D)	1	Purpose(s) for which dose values in this Sequence Item are provided. Defined Terms: TRACKING – The dose values are used for tracking. QA – The dose values are used for quality assurance.
<i>&gt;&gt;&gt;Include Table C.36.2.1.5-1 “Radiobiological Dose Effect Description Macro Attributes”</i>			
>>>Meterset to Dose Mapping Sequence	(300A,0620)	1	Mapping of Cumulative Meterset (300A,063C) to Radiation Dose Value (300A,0625). See Section C.36.11.1.1. Two or more Items shall be included in this Sequence.
>>>>Cumulative Meterset	(300A,063C)	1	Cumulative Meterset where a dose value is delivered. See Section C.36.11.1.1.

Attribute Name	Tag	Type	Description
>>>>Radiation Dose Value	(300A,0625)	1	Dose value (in Gy) delivered at the corresponding Cumulative Meterset (300A,063C). See Section C.36.11.1.5.
>Expected In-Vivo Measurement Values Sequence	(300A,0621)	1C	Expected values against which in-vivo measurements may be compared. Required if expected values are calculated for in-vivo measurement for this RT Radiation SOP Instance. One or more Items shall be included in this Sequence.
>>Expected In-Vivo Measurement Value Index	(300A,0622)	1	Index of this Item in this Sequence. The value shall start at 1 and increase monotonically by 1.
>>Radiation Dose In-Vivo Measurement Label	(300A,0623)	1	Label to identify the in-vivo measurement point. See Section 10.31.1.1.
>>Radiation Dose Central Axis Displacement	(300A,0624)	1C	Displacement (x,y) in mm of the measurement point from the central axis along the x-axis and y-axis of the Beam Modifier Definition Plane. Required if a central beam axis is defined for the Treatment Delivery Device and the Radiation Dose Measurement Point Coordinates (300A,0627) is not present.
>>Radiation Dose Value	(300A,0625)	1	Dose Value in Gy at the measurement point.
>>Radiation Dose Source to Skin Distance	(300A,0626)	2	Distance in mm from the nominal Radiation Source location to the patient skin along the central beam axis from the source to the measurement point.
>>Radiation Dose Source to External Contour Distance	(300A,0628)	2	Distance in mm from the nominal Radiation Source location to the External Contour along the central beam axis from the source to the measurement point including devices associated with the patient anatomy model. For dosimetric purposes this value may differ from the Radiation Dose Source to Skin Distance (300A,0626). See Section C.36.11.1.4.

Attribute Name	Tag	Type	Description
>>Radiation Dose Measurement Point Coordinates	(300A,0627)	1C	Coordinates (x,y,z) in mm in the DICOM Patient Coordinate System of the measurement point. Required if Radiation Dose Central Axis Displacement (300A,0624) is not present.

### 886 C.36.11.1 RT Dose Contribution Attribute Description

#### C.36.11.1.1 Meterset to Dose Mapping Sequence

888 The Meterset to Dose Mapping Sequence (300A,0620) contains for each Meterset value the corresponding dose value.

890 In the first item, the value of Cumulative Meterset (300A,063C) and of Radiation Dose Value (300A,0625) shall be zero.

892 In the last item, the value of Cumulative Meterset (300A,063C) shall be the Meterset of the final Control Point. The value of Radiation Dose Value (300A,0625) in the last item represents the dose delivered to the referenced anatomy when one fraction is completely delivered.

894 Cumulative Meterset Values shall be strictly monotonically increasing. Radiation Dose Values shall be monotonically non-decreasing. The increase of dose between two adjacent points of the lookup table shall be interpreted as linear.

#### 898 C.36.11.1.2 Conceptual Volume Sequence

900 The Conceptual Volume Sequence (3010,0025) identifies a Conceptual Volume that defines a volume for which dose is tracked during treatments.

902 If the Conceptual Volume is associated with a segment, the segment is defined by the Referenced Segment Reference Index (3010,0020) in the Conceptual Volume Segmentation Reference and Combination Macro (see section 10.34).

904 Alternatively, the Conceptual Volume may not be associated with a segment. For example, dose tracking may specify a nominal dose to an anatomical region of interest and the tracking coefficients approximated by Meterset values.

#### C.36.11.1.3 Primary Dose Value Indicator

908 The Primary Dose Value Indicator (300A,061B) is intended to indicate the representative dose value out of the list of dose values which is used for display purposes. Typically this value refers to the primary target while the other non-primary values may refer to e.g. organs at risk.

#### C.36.11.1.4 Radiation Dose Source to External Contour Distance

912 The Radiation Dose Source to External Contour Distance (gggg, 9B7E) is the distance to the beam entry point, which may include Bolus, Patient Positioning Devices, Patient Immobilization Devices or other devices. This value is useful for including the attenuation effects of external devices on the dose calculation and for patient setup.

#### 916 C.36.11.1.5 Radiation Dose Value

918 The Radiation Dose Value (300A,0625) represents the cumulative dose delivered from the beginning of radiation delivery to the Cumulative Meterset (300A,063C).

**C.36.12 RT Delivery Device Common Module**

920 The RT Delivery Device Common Module contains general information pertaining to the physical device used to deliver the treatment.

922

**Table C.36.12-1  
RT DELIVERY DEVICE COMMON MODULE ATTRIBUTES**

<b>Attribute Name</b>	<b>Tag</b>	<b>Type</b>	<b>Description</b>
<i>Include Table C.36.2.2.1-1 "Treatment Device Identification Macro Attributes"</i>			
Radiation Dosimeter Unit Sequence	(300A,0658 )	1	Measurement units of the machine dosimeter. Only a single item shall be included in this Sequence.
<i>&gt;Include Table 8.8-1 "Code Sequence Macro Attributes"</i>			<i>CID is specified in the IOD</i>
RT Device Distance Reference Location Code Sequence	(300A,0659 )	1	Point of reference used for measuring the distance to various devices. Only a single item shall be included in this Sequence.
<i>&gt;Include Table 8.8-1 "Code Sequence Macro Attributes"</i>			<i>Defined CID 9544 "Radiotherapy Distance Reference Locations"</i>
RT Beam Modifier Definition Distance	(300A,0688 )	1	Absolute distance in mm along the z-axis of the Base Beam Modifier Coordinate System from the reference location as specified by RT Device Distance Reference Location Code Sequence (300A,0659) to the Beam Modifier Definition Plane. The value shall be greater than or equal to zero. See Section C.36.1.1.9.
Equipment Frame of Reference UID	(300A,0675 )	1	Frame of Reference identifier for the Treatment Delivery Device. See Section C.36.12.1.1.
Equipment Frame of Reference Description	(300A,0676 )	3	Description of Equipment Coordinate System identified by the Equipment Frame of Reference UID (300A,0675). See Section C.36.12.1.2.
Equipment Reference Point Coordinates Sequence	(300A,0677 )	2	Coordinates of device-specific reference points. Zero or more Items shall be included in this Sequence.
>3D Point Coordinate	(0068,6590)	1	Coordinates (x,y,z) in mm of the device-specific reference point in the Equipment Coordinate System.

Attribute Name	Tag	Type	Description
>Equipment Reference Point Code Sequence	(300A,0678 )	1	Identifies the type of reference point. Only a single Item shall be included in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			Defined CID 9554 "Equipment Reference Points"
Include Table C.36.2.2.2-1 "RT Patient Support Devices Macro Attributes"			

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### **C.36.12.1 RT Delivery Device Common Module Attribute Description**

#### **C.36.12.1.1 Equipment Frame of Reference UID**

926 The Equipment Frame of Reference UID (300A,0675) identifies the Equipment Coordinate System  
928 for a Treatment Delivery Device, see Section 10.39.1.1.

930 The RT Radiation SOP Classes are bound by the Standard to specific Well-known Frames of  
932 Reference as defined in PS3.6 Table A-2. For C-Arm based devices delivering radiation at a single  
932 machine isocenter this may be the IEC 61217 coordinate system. Devices are calibrated to a specific  
Well-known Frame of Reference and thus use the corresponding Well-known UID in Equipment  
Frame of Reference UID (300A,0675).

934 For RT Radiation SOP Classes the result of the transformation between the Patient-based  
936 Coordinate System and the Equipment Coordinate System is used to describe the intended treatment  
938 position. If two or more transformation matrices describe the relation between two or more Patient-  
based coordinate systems and a single Equipment Coordinate System, any calculations assuming  
transitivity via the Equipment Coordinate System must be performed with great care because the  
patient's anatomy may have changed.

940 For RT Radiation Record SOP Classes the result of the transformation between the Patient-based  
942 Coordinate System and the Equipment Coordinate System is used to describe the actual treatment  
944 position. In this case the transformation matrices between different Patient-Based coordinate  
Systems and a single Equipment Coordinate System shall not be considered transitive from an  
anatomical point of view and may only be used to compare different treatment positions with respect  
to the treatment delivery device.

#### **C.36.12.1.2 Equipment Frame of Reference Description**

946 The Equipment Frame of Reference Description (300A,0676) is informal and shall not be used for  
948 any normative description of the Equipment Coordinate System.

### **C.36.12.2 Well-known Frame of Reference for Equipment**

950 The following sections contain specifications of Well-known Frames of Reference used as the  
Equipment Frame of Reference.

#### **C.36.12.2.1 IEC 61217 Fixed Reference System Frame of Reference**

952 A value of 1.2.840.10008.1.4.3.1 for Equipment Frame of Reference UID (300A,0675) defines the  
954 IEC 61217 Fixed Coordinate System Frame of Reference as follows:

- the Equipment Coordinate System is the IEC 61217 FIXED coordinate system.
- the Base Beam Modifier Coordinate System for all beam modifiers is the IEC 61217 GANTRY coordinate system. However, RT Radiation SOP Classes allow each Beam

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958            Modifier Coordinate System to rotate independently from the Base Beam Modifier Coordinate System.

960            Note:    IEC 61217 refers to the X-axis, Y-axis and Z-axis of the various coordinate systems. When  
962            referenced in this Standard the capital X/Y/Z is preserved which is not otherwise a DICOM  
                 convention.



964 **C.36.13 RT Radiation Common Module**

966 The RT Radiation Common Module contains the Attributes shared by all RT Radiation IODs used for radiation treatment delivery.

968 **Table C.36.13-1  
RT RADIATION COMMON MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Description
<i>Include Table 10.9.1-1 "Enhanced User Content Identification Macro Attributes"</i>			
RT Radiation Physical and Geometric Content Detail Flag	(300A,0638)	1	<p>The level of detail of content within this SOP Instance.</p> <p>Enumerated Values:</p> <p><b>FULL</b> The physical and geometric parameters of all devices are fully defined and dosimetric information is present. This level of detail is typically present after volumetric planning.</p> <p><b>IDENT_ONLY</b> The physical and geometric parameters of all devices may not be fully specified, but the devices can be identified and dosimetric information is present. This level of detail is typically present after non-volumetric planning (e.g. "2D planning").</p> <p><b>GEOMETRY_ONLY</b> The geometric parameters of all devices are fully specified, but no dosimetric information is present. This level of detail is typically present after Virtual Simulation.</p>
RT Record Flag	(300A,0639)	1	<p>Whether or not device parameters about actual delivery of treatment to a patient have been recorded.</p> <p>Enumerated Values:</p> <p><b>YES</b> - Values in this Instance are a record of a delivered treatment, based on e.g. read-outs or measurements.</p> <p><b>NO</b> - Values in this Instance are a specification of a treatment to be delivered, e.g. by a treatment planning system.</p>
RT Treatment Technique Code Sequence	(3010,0080)	1	<p>Type of treatment technique.</p> <p>Only a single Item shall be included in this Sequence.</p> <p>See Section C.36.13.1.1.</p>

Attribute Name	Tag	Type	Description
>Include Table 8.8-1 "Code Sequence Macro Attributes"			CID is defined in the IOD including this Module.
Include Table C.36.2.2.4-1 "RT Treatment Position Macro Attributes"			See Section C.36.13.1.2.
RT Tolerance Set Sequence	(300A,0629)	3	A set of tolerance values to be applied to parameters used for delivery of the RT Radiation. Only a single Item is permitted in this Sequence.
>Include Table C.36.2.2.17-1 "RT Tolerance Set Macro Attributes"			
Treatment Time Limit	(300A,062E)	3	The maximum delivery time in seconds. See Section C.36.13.1.3.
Treatment Machine Special Mode Code Sequence	(300A,0635)	1C	A mode of operation on the treatment machine. Required if a special delivery mode is used for treatment. Only a single Item shall be included in this Sequence. See Section C.36.13.1.4.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			Defined CID is defined in the IOD including this Module.

970 **C.36.13.1 RT Radiation Common Attribute Description**

**C.36.13.1.1 Radiotherapy Procedure Technique Sequence**

972 The RT Treatment Technique Code Sequence (3010,0080) describes the treatment technique, i.e. how the radiation beam is shaped and targeted.

974 **C.36.13.1.2 RT Treatment Position Macro**

976 The RT Treatment Position Macro describes how the patient is to be positioned with respect to the delivery device for treatment.

978 The behavior of the machine regarding the patient position between specified Control Points is outside the scope of this Standard. Communicating devices shall agree on this behavior.

**C.36.13.1.3 Treatment Time Limit**

980 The Treatment Time Limit (300A,062E) is the maximum time span allowed to deliver a single fraction of this RT Radiation SOP instance. The behavior of the treatment delivery device on exceeding the  
982 Treatment Time Limit is up to the implementation. Treatment is expected to terminate upon reaching  
984 the Treatment Time Limit (300A,062E) independent of the Meterset and so this attribute should have a value that accommodates normal variations in delivery.

**C.36.13.1.4 Treatment Machine Special Mode Sequence**

986 The Treatment Machine Special Mode Code Sequence (300A,0635) contains a code, for example, (130341, DCM, "Total Body Irradiation") or (130342, DCM, "Total Skin Irradiation"), which selects a

988 set of vendor- and machine-specific parameters that alter the treatment parameters and/or safety constraints.

990 **C.36.14 C-Arm Photon-Electron Delivery Device Module**

992 The C-Arm Photon-Electron Delivery Device Module defines constant C-Arm-specific parameters pertaining to the physical device used to deliver photon and electron treatments, including geometrical parameters of the collimation system.

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**Table C.36.14-1  
C-ARM PHOTON-ELECTRON DELIVERY DEVICE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Description
Radiation Source-Axis Distance	(300A,0640)	1	Distance in mm from the nominal Radiation Source location to the gantry rotation axis.
<i>Include Table C.36.2.2.7-1 "Radiation Generation Mode Macro Attributes"</i>			<p>Defined CID for Radiation Type Code Sequence (300A,067F) is CID 9525 "Radiation Therapy Particle".</p> <p>Defined CID for Energy Unit Code Sequence (300A,0684) is CID 9521 "Radiotherapy Treatment Energy Unit".</p> <p>Defined CID for Radiation Fluence Modifier Code Sequence (300A,0683) is CID 9549 "Radiation Generation Mode Types".</p>
<i>Include Table C.36.2.2.8-1 "RT Beam Limiting Devices Definition Macro Attributes"</i>			Defined CID for Device Type Code Sequence (3010,002E) within 'RT Accessory Device Identification Macro' is CID 9541 "Beam Limiting Device Types".
<i>Include Table C.36.2.2.10-1 "Wedges Definition Macro Attributes"</i>			
<i>Include Table C.36.2.2.12-1 "Compensators Definition Macro Attributes"</i>			
<i>Include Table C.36.2.2.13-1 "Blocks Definition Macro Attributes"</i>			
<i>Include Table C.36.2.2.14-1 "RT Accessory Holders Definition Macro Attributes"</i>			
<i>Include Table C.36.2.2.15-1 "General Accessories Definition Macro Attributes"</i>			
<i>Include Table C.36.2.2.16-1 "Boluses Definition Macro Attributes"</i>			

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**C.36.15 C-Arm Photon-Electron Beam Module**

998 The C-Arm Photon-Electron Beam Module specifies how a C-Arm photon or electron treatment beam is to be delivered.

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**Table C.36.15-1  
C-ARM PHOTON-ELECTRON BEAM MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Description
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Attribute Name	Tag	Type	Description
Number of RT Control Points	(300A,0604)	1	Number of RT Control Points in the C-Arm Photon-Electron Control Point Sequence (300A,062F). The value shall be equal to or greater than 2.
C-Arm Photon-Electron Control Point Sequence	(300A,062F)	1	Control Points used to model the beam delivery. The number of Items included in this Sequence shall equal the value of Number of RT Control Points (300A,0604).
<i>&gt;Include Table C.36.2.2.6-1 "External Beam Control Point General Macro Attributes"</i>			<i>Defined CID 9550 "C-Arm Photon-Electron Delivery Rate Units"</i>
>Referenced Radiation Generation Mode Index	(300A,0605)	1C	The value of Radiation Generation Mode Index (300A,0601) in the Radiation Generation Mode Sequence (300A,067B) in this IOD that defines the Radiation Generation Mode used for this Control Point. Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.
<i>&gt;Include Table C.36.2.2.9-1 "RT Beam Limiting Device Opening Macro Attributes"</i>			
<i>&gt;Include Table C.36.2.2.11-1 "Wedge Positions Macro Attributes"</i>			
>Source Roll Angle	(300A,067A)	1C	Source roll angle in degrees of the Radiation Source at the Control Point with respect to the Equipment Coordinate System. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5. See Section C.36.15.1.1 and Section C.36.12.1.1. Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.
>RT Beam Limiting Device Angle	(300A,0679)	1C	Angle in degrees of the Base Beam Modifier Coordinate System about the z-axis relative to the parent coordinate system. The angle is a Continuous Rotation Angle, see Section C.36.1.1.5. See Section C.36.15.1.2. Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.

Attribute Name	Tag	Type	Description
>Source to Patient Surface Distance	(300A,0634)	2C	Distance in mm from the nominal Radiation Source location to the Patient surface (skin) along the central beam axis from the source.  Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.
>Source to External Contour Distance	(300A,0132)	2C	Distance in mm along the central beam axis from the nominal Radiation Source location to the external contour including devices associated with the patient anatomy model. For dosimetric purposes this value may differ from the Source to Patient Surface Distance (300A,0634).  See Section C.36.11.1.4.  Required if the conditions in Section C.36.2.2.5.1.1 are satisfied.

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### C.36.15.1 C-Arm Photon-Electron Beam Attribute Description

#### 1004 C.36.15.1.1 Source Roll Angle

1006 For an Equipment Frame of Reference UID (300A,0675) of 1.2.840.10008.1.4.3.1 (IEC 61217 Fixed Coordinate System Frame of Reference), the source roll angle is the rotation of the IEC 61217 GANTRY coordinate system about the Y-axis of the IEC 61217 FIXED coordinate system.

#### 1008 C.36.15.1.2 RT Beam Limiting Device Angle

1010 For an Equipment Frame of Reference UID (300A,0675) of 1.2.840.10008.1.4.3.1 (IEC 61217 Fixed Coordinate System Frame of Reference), the RT Beam Limiting Device Angle (300A,0679) is the rotation of the Base Beam Modifier Coordinate System about the Z-axis of the IEC 61217 GANTRY coordinate system.

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**Part 4 Addendum**

<b>Add the following to PS3.4, Appendix B.5, Table B.5-1</b>
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1016

<b>SOP Class Name</b>	<b>SOP Class UID</b>	<b>IOD Spec (defined in PS 3.3)</b>
<b><u>RT Radiation Set Storage</u></b>	<b><u>1.2.840.10008.5.1.4.1.1.481.12</u></b>	<b><u>RT Radiation Set IOD</u></b>
<b><u>C-Arm Photon-Electron Radiation Storage</u></b>	<b><u>1.2.840.10008.5.1.4.1.1.481.13</u></b>	<b><u>C-Arm Photon-Electron Radiation IOD</u></b>

1018

**Part 6 Addendum**

1020

Add the following data elements to PS3.6:

1022

**6 REGISTRY OF DICOM DATA ELEMENTS**

(0018,100B)	Manufacturer's Device Class UID	ManufacturersDeviceClassUID	UI	1-n
(0018,1630)	Outline Shape Type	OutlineShapeType	CS	1
(0018,1631)	Outline Left Vertical Edge	OutlineLeftVerticalEdge	FD	1
(0018,1632)	Outline Right Vertical Edge	OutlineRightVerticalEdge	FD	1
(0018,1633)	Outline Upper Horizontal Edge	OutlineUpperHorizontalEdge	FD	1
(0018,1634)	Outline Lower Horizontal Edge	OutlineLowerHorizontalEdge	FD	1
(0018,1635)	Center of Circular Outline	CenterOfCircularOutline	FD	2
(0018,1636)	Diameter of Circular Outline	DiameterOfCircularOutline	FD	1
(0018,1637)	Number of Polygonal Vertices	NumberOfPolygonalVertices	UL	1
(0018,1638)	Vertices of the Polygonal Outline	VerticesOfThePolygonalOutline	OF	1
(3006,00C9)	Patient Location Coordinates Sequence	PatientLocationCoordinatesSequence	SQ	1
(3006,00CA)	Patient Location Coordinates Code Sequence	PatientLocationCoordinatesCodeSequence	SQ	1
(3006,00CB)	Patient Support Position Sequence	PatientSupportPositionSequence	SQ	1
(300A,0600)	RT Control Point Index	RTControlPointIndex	US	1
(300A,0601)	Radiation Generation Mode Index	RadiationGenerationModeIndex	US	1
(300A,0602)	Referenced Defined Device Index	ReferencedDefinedDeviceIndex	US	1
(300A,0603)	Radiation Dose Identification Index	RadiationDoseIdentificationIndex	US	1
(300A,0604)	Number of RT Control Points	NumberOfRTControlPoints	US	1

(300A,0605)	Referenced Radiation Generation Mode Index	ReferencedRadiationGenerationModelIndex	US	1
(300A,0606)	Treatment Position Index	TreatmentPositionIndex	US	1
(300A,0607)	Referenced Device Index	ReferencedDeviceIndex	US	1
(300A,0608)	Treatment Position Group Label	TreatmentPositionGroupLabel	LO	1
(300A,0609)	Treatment Position Group UID	TreatmentPositionGroupUID	UI	1
(300A,060A)	Treatment Position Group Sequence	TreatmentPositionGroupSequence	SQ	1
(300A,060B)	Referenced Treatment Position Index	ReferencedTreatmentPositionIndex	US	1
(300A,060C)	Referenced Radiation Dose Identification Index	ReferencedRadiationDoseIdentificationIndex	US	1
(300A,060D)	RT Accessory Holder Water-Equivalent Thickness	RTAccessoryHolderWaterEquivalentThickness	FD	1
(300A,060E)	Referenced RT Accessory Holder Device Index	ReferencedRTAccessoryHolderDeviceIndex	US	1
(300A,060F)	RT Accessory Holder Slot Existence Flag	RTAccessoryHolderSlotExistenceFlag	CS	1
(300A,0610)	RT Accessory Holder Slot Sequence	RTAccessoryHolderSlotSequence	SQ	1
(300A,0611)	RT Accessory Holder Slot ID	RTAccessoryHolderSlotID	LO	1
(300A,0612)	RT Accessory Holder Slot Distance	RTAccessoryHolderSlotDistance	FD	1
(300A,0613)	RT Accessory Slot Distance	RTAccessorySlotDistance	FD	1
(300A,0614)	RT Accessory Holder Definition Sequence	RTAccessoryHolderDefinitionSequence	SQ	1
(300A,0615)	RT Accessory Device Slot ID	RTAccessoryDeviceSlotID	LO	1
(300A,0616)	RT Radiation Sequence	RTRadiationSequence	SQ	1
(300A,0617)	Radiation Dose Sequence	RadiationDoseSequence	SQ	1
(300A,0618)	Radiation Dose Identification Sequence	RadiationDoseIdentificationSequence	SQ	1
(300A,0619)	Radiation Dose Identification Label	RadiationDoseIdentificationLabel	LO	1
(300A,061A)	Reference Dose Type	ReferenceDoseType	CS	1
(300A,061B)	Primary Dose Value Indicator	PrimaryDoseValueIndicator	CS	1
(300A,061C)	Dose Values Sequence	DoseValuesSequence	SQ	1
(300A,061D)	Dose Value Purpose	DoseValuePurpose	CS	1-n



(300A,061E)	Reference Dose Point Coordinates	ReferenceDosePointCoordinates	FD	3
(300A,061F)	Radiation Dose Values Parameters Sequence	RadiationDoseValuesParametersSequence	SQ	1
(300A,0620)	Meterset to Dose Mapping Sequence	MetersetToDoseMappingSequence	SQ	1
(300A,0621)	Expected In-Vivo Measurement Values Sequence	ExpectedInVivoMeasurementValuesSequence	SQ	1
(300A,0622)	Expected In-Vivo Measurement Value Index	ExpectedInVivoMeasurementValueIndex	US	1
(300A,0623)	Radiation Dose In-Vivo Measurement Label	RadiationDoseInVivoMeasurementLabel	LO	1
(300A,0624)	Radiation Dose Central Axis Displacement	RadiationDoseCentralAxisDisplacement	FD	2
(300A,0625)	Radiation Dose Value	RadiationDoseValue	FD	1
(300A,0626)	Radiation Dose Source to Skin Distance	RadiationDoseSourceToSkinDistance	FD	1
(300A,0627)	Radiation Dose Measurement Point Coordinates	RadiationDoseMeasurementPointCoordinates	FD	3
(300A,0628)	Radiation Dose Source to External Contour Distance	RadiationDoseSourceToExternalContourDistance	FD	1
(300A,0629)	RT Tolerance Set Sequence	RTToleranceSetSequence	SQ	1
(300A,062A)	RT Tolerance Set Label	RTToleranceSetLabel	LO	1
(300A,062B)	Attribute Tolerance Values Sequence	AttributeToleranceValuesSequence	SQ	1
(300A,062C)	Tolerance Value	ToleranceValue	FD	1
(300A,062D)	Patient Support Position Tolerance Sequence	PatientSupportPositionToleranceSequence	SQ	1
(300A,062E)	Treatment Time Limit	TreatmentTimeLimit	FD	1
(300A,062F)	C-Arm Photon-Electron Control Point Sequence	CArmPhotonElectronControlPointSequence	SQ	1
(300A,0630)	Referenced RT Radiation Sequence	ReferencedRTRadiationSequence	SQ	1
(300A,0631)	Referenced RT Instance Sequence	ReferencedRTInstanceSequence	SQ	1
(300A,0632)	Referenced RT Patient Setup Sequence	ReferencedRTPatientSetupSequence	SQ	1
(300A,0634)	Source to Patient Surface Distance	SourceToPatientSurfaceDistance	FD	1

(300A,0635)	Treatment Machine Special Mode Code Sequence	TreatmentMachineSpecialModeCodeSequence	SQ	1
(300A,0636)	Intended Number of Fractions	IntendedNumberOfFractions	US	1
(300A,0637)	RT Radiation Set Intent	RTRadiationSetIntent	CS	1
(300A,0638)	RT Radiation Physical and Geometric Content Detail Flag	RTRadiationPhysicalAndGeometricContentDetailFlag	CS	1
(300A,0639)	RT Record Flag	RTRRecordFlag	CS	1
(300A,063A)	Treatment Device Identification Sequence	TreatmentDeviceIdentificationSequence	SQ	1
(300A,063B)	Referenced RT Physician Intent Sequence	ReferencedRTPhysicianIntentSequence	SQ	1
(300A,063C)	Cumulative Meterset	CumulativeMeterset	FD	1
(300A,063D)	Delivery Rate	DeliveryRate	FD	1
(300A,063E)	Delivery Rate Unit Sequence	DeliveryRateUnitSequence	SQ	1
(300A,063F)	Treatment Position Sequence	TreatmentPositionSequence	SQ	1
(300A,0640)	Radiation Source-Axis Distance	RadiationSourceAxisDistance	FD	1
(300A,0641)	Number of RT Beam Limiting Devices	NumberOfRTBeamLimitingDevices	US	1
(300A,0642)	RT Beam Limiting Device Proximal Distance	RTBeamLimitingDeviceProximalDistance	FD	1
(300A,0643)	RT Beam Limiting Device Distal Distance	RTBeamLimitingDeviceDistalDistance	FD	1
(300A,0644)	Parallel RT Beam Delimiter Device Orientation Label Code Sequence	ParallelRTBeamDelimiterDeviceOrientationLabelCodeSequence	SQ	1
(300A,0645)	Beam Modifier Orientation Angle	BeamsModifierOrientationAngle	FD	1
(300A,0646)	Fixed RT Beam Delimiter Device Sequence	FixedRTBeamDelimiterDeviceSequence	SQ	1
(300A,0647)	Parallel RT Beam Delimiter Device Sequence	ParallelRTBeamDelimiterDeviceSequence	SQ	1
(300A,0648)	Number of Parallel RT Beam Delimiters	NumberOfParallelRTBeamDelimiters	US	1
(300A,0649)	Parallel RT Beam Delimiter Boundaries	ParallelRTBeamDelimiterBoundaries	FD	2-n
(300A,064A)	Parallel RT Beam Delimiter Positions	ParallelRTBeamDelimiterPositions	FD	2-n

(300A,064B)	RT Beam Limiting Device Offset	RTBeamLimitingDeviceOffset	FD	2
(300A,064C)	RT Beam Delimiter Geometry Sequence	RTBeamDelimiterGeometrySequence	SQ	1
(300A,064D)	RT Beam Limiting Device Definition Sequence	RTBeamLimitingDeviceDefinitionSequence	SQ	1
(300A,064E)	Parallel RT Beam Delimiter Opening Mode	ParallelRTBeamDelimiterOpeningMode	CS	1
(300A,064F)	Parallel RT Beam Delimiter Leaf Mounting Side	ParallelRTBeamDelimiterLeafMountingSide	CS	1-n
(300A,0650)	Patient Setup UID	PatientSetupUID	UI	1
(300A,0651)	Wedge Definition Sequence	WedgeDefinitionSequence	SQ	1
(300A,0652)	Radiation Beam Wedge Angle	RadiationBeamWedgeAngle	FD	1
(300A,0653)	Radiation Beam Wedge Thin Edge Distance	RadiationBeamWedgeThinEdgeDistance	FD	1
(300A,0654)	Radiation Beam Effective Wedge Angle	RadiationBeamEffectiveWedgeAngle	FD	1
(300A,0655)	Number of Wedge Positions	NumberOfWedgePositions	US	1
(300A,0656)	RT Beam Limiting Device Opening Sequence	RTBeamLimitingDeviceOpeningSequence	SQ	1
(300A,0657)	Number of RT Beam Limiting Device Openings	NumberOfRTBeamLimitingDeviceOpenings	US	1
(300A,0658)	Radiation Dosimeter Unit Sequence	RadiationDosimeterUnitSequence	SQ	1
(300A,0659)	RT Device Distance Reference Location Code Sequence	RTDeviceDistanceReferenceLocationCodeSequence	SQ	1
(300A,065A)	Radiation Device Configuration and Commissioning Key Sequence	RadiationDeviceConfigurationAndCommissioningKeySequence	SQ	1
(300A,065B)	Patient Support Position Parameter Sequence	PatientSupportPositionParameterSequence	SQ	1
(300A,065C)	Patient Support Position Specification Method	PatientSupportPositionSpecificationMethod	CS	1
(300A,065D)	Patient Support Position Device Parameter Sequence	PatientSupportPositionDeviceParameterSequence	SQ	1
(300A,065E)	Device Order Index	DeviceOrderIndex	US	1
(300A,065F)	Patient Support Position Parameter Order Index	PatientSupportPositionParameterOrderIndex	US	1

(300A,0660)	Patient Support Position Device Tolerance Sequence	PatientSupportPositionDeviceTolerance Sequence	SQ	1
(300A,0661)	Patient Support Position Tolerance Order Index	PatientSupportPositionToleranceOrderIndex	US	1
(300A,0662)	Compensator Definition Sequence	CompensatorDefinitionSequence	SQ	1
(300A,0663)	Compensator Map Orientation	CompensatorMapOrientation	CS	1
(300A,0664)	Compensator Proximal Thickness Map	CompensatorProximalThicknessMap	OF	1
(300A,0665)	Compensator Distal Thickness Map	CompensatorDistalThicknessMap	OF	1
(300A,0666)	Compensator Base Plane Offset	CompensatorBasePlaneOffset	FD	1
(300A,0667)	Compensator Shape Fabrication Code Sequence	CompensatorShapeFabricationCodeSequence	SQ	1
(300A,0668)	Compensator Shape Sequence	CompensatorShapeSequence	SQ	1
(300A,0669)	Radiation Beam Compensator Milling Tool Diameter	RadiationBeamCompensatorMillingTool Diameter	FD	1
(300A,066A)	Block Definition Sequence	BlockDefinitionSequence	SQ	1
(300A,066B)	Block Edge Data	BlockEdgeData	OF	1
(300A,066C)	Block Orientation	BlockOrientation	CS	1
(300A,066D)	Radiation Beam Block Thickness	RadiationBeamBlockThickness	FD	1
(300A,066E)	Radiation Beam Block Slab Thickness	RadiationBeamBlockSlabThickness	FD	1
(300A,066F)	Block Edge Data Sequence	BlockEdgeDataSequence	SQ	1
(300A,0670)	Number of RT Accessory Holders	NumberOfRTAccessoryHolders	US	1
(300A,0671)	General Accessory Definition Sequence	GeneralAccessoryDefinitionSequence	SQ	1
(300A,0672)	Number of General Accessories	NumberOfGeneralAccessories	US	1
(300A,0673)	Bolus Definition Sequence	BolusDefinitionSequence	SQ	1
(300A,0674)	Number of Boluses	NumberOfBoluses	US	1
(300A,0675)	Equipment Frame of Reference UID	EquipmentFrameOfReferenceUID	UI	1
(300A,0676)	Equipment Frame of Reference Description	EquipmentFrameOfReferenceDescription	ST	1

(300A,0677)	Equipment Reference Point Coordinates Sequence	EquipmentReferencePointCoordinatesSequence	SQ	1
(300A,0678)	Equipment Reference Point Code Sequence	EquipmentReferencePointCodeSequence	SQ	1
(300A,0679)	RT Beam Limiting Device Angle	RTBeamLimitingDeviceAngle	FD	1
(300A,067A)	Source Roll Angle	SourceRollAngle	FD	1
(300A,067B)	Radiation Generation Mode Sequence	RadiationGenerationModeSequence	SQ	1
(300A,067C)	Radiation Generation Mode Label	RadiationGenerationModeLabel	SH	1
(300A,067D)	Radiation Generation Mode Description	RadiationGenerationModeDescription	ST	1
(300A,067E)	Radiation Generation Mode Machine Code Sequence	RadiationGenerationModeMachineCodeSequence	SQ	1
(300A,067F)	Radiation Type Code Sequence	RadiationTypeCodeSequence	SQ	1
(300A,0680)	Nominal Energy	NominalEnergy	DS	1
(300A,0681)	Minimum Nominal Energy	MinimumNominalEnergy	DS	1
(300A,0682)	Maximum Nominal Energy	MaximumNominalEnergy	DS	1
(300A,0683)	Radiation Fluence Modifier Code Sequence	RadiationFluenceModifierCodeSequence	SQ	1
(300A,0684)	Energy Unit Code Sequence	EnergyUnitCodeSequence	SQ	1
(300A,0685)	Number of Radiation Generation Modes	NumberOfRadiationGenerationModes	US	1
(300A,0686)	Patient Support Devices Sequence	PatientSupportDevicesSequence	SQ	1
(300A,0687)	Number of Patient Support Devices	NumberOfPatientSupportDevices	US	1
(300A,0688)	RT Beam Modifier Definition Distance	RTBeamModifierDefinitionDistance	FD	1
(300A,0689)	Beam Area Limit Sequence	BeamAreaLimitSequence	SQ	1

Add the following to PS3.6 Annex A:
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1026

**ANNEX A            REGISTRY OF DICOM UNIQUE IDENTIFIERS (UID) (NORMATIVE)**

1028

**Table A-1 UID Values**

UID Value	UID NAME	UID TYPE	Part
...			
<u>1.2.840.10008.5.1.4.1.1.481.12</u>	<u>RT Radiation Set Storage</u>	<u>SOP Class</u>	<u>PS3.4</u>
<u>1.2.840.10008.5.1.4.1.1.481.13</u>	<u>C-Arm Photon-Electron Radiation Storage</u>	<u>SOP Class</u>	<u>PS3.4</u>
<u>1.2.840.10008.1.4.3.1</u>	<u>IEC 61217 Fixed Coordinate System Frame of Reference</u>	<u>Well-known Frame of Reference</u>	<u>PS3.3</u>

1030

**Table A-2 Well-known Frames of Reference**

1032

UID Value	UID Name	Normative Reference
...		
<u>1.2.840.10008.1.4.3.1</u>	<u>IEC 61217 Fixed Coordinate System Frame of Reference</u>	<u>Fixed coordinate system ("f") of IEC 61217, Edition 2.0, 2011-12 "Radiotherapy equipment – Coordinates, movements and scales" and PS3.3 Section C.36.12.2.1.</u>

1034

**Table A-3 Context Group UID Values**

Context UID	Context Identifier	Context Group Name
...		
<u>1.2.840.10008.6.1.1288</u>	<u>9541</u>	<u>Beam Limiting Device Types</u>
<u>1.2.840.10008.6.1.1289</u>	<u>9542</u>	<u>Compensator Device Types</u>
<u>1.2.840.10008.6.1.1290</u>	<u>9543</u>	<u>Radiotherapy Treatment Machine Modes</u>
<u>1.2.840.10008.6.1.1291</u>	<u>9544</u>	<u>Radiotherapy Distance Reference Locations</u>
<u>1.2.840.10008.6.1.1292</u>	<u>9545</u>	<u>Fixed Beam Limiting Device Types</u>
<u>1.2.840.10008.6.1.1293</u>	<u>9546</u>	<u>Radiotherapy Wedge Types</u>
<u>1.2.840.10008.6.1.1294</u>	<u>9547</u>	<u>RT Beam Limiting Device Orientation Labels</u>

<b><u>1.2.840.10008.6.1.1295</u></b>	<b><u>9548</u></b>	<b><u>General Accessory Device Types</u></b>
<b><u>1.2.840.10008.6.1.1296</u></b>	<b><u>9549</u></b>	<b><u>Radiation Generation Mode Types</u></b>
<b><u>1.2.840.10008.6.1.1297</u></b>	<b><u>9550</u></b>	<b><u>C-Arm Photon-Electron Delivery Rate Units</u></b>
<b><u>1.2.840.10008.6.1.1298</u></b>	<b><u>9551</u></b>	<b><u>Treatment Delivery Device Types</u></b>
<b><u>1.2.840.10008.6.1.1299</u></b>	<b><u>9552</u></b>	<b><u>C-Arm Photon-Electron Dosimeter Units</u></b>
<b><u>1.2.840.10008.6.1.1300</u></b>	<b><u>9553</u></b>	<b><u>Treatment Points</u></b>
<b><u>1.2.840.10008.6.1.1301</u></b>	<b><u>9554</u></b>	<b><u>Equipment Reference Points</u></b>
<b><u>1.2.840.10008.6.1.1302</u></b>	<b><u>9555</u></b>	<b><u>Radiotherapy Treatment Planning Person Roles</u></b>

1036

1038

**Part 15 Addendum**

**Table E.1-1. Application Level Confidentiality Profile Attributes**





1040

1042

**Part 16 Addendum**1044 **Update TID 1004 in PS3.16, Annex A:****TID 1004 DEVICE OBSERVER IDENTIFYING ATTRIBUTES**

1046 This Template (derived from the Section C.7.5.1 “General Equipment Module” in PS3.3) contains identifying (and optionally descriptive) attributes of devices that are observers.

1048 **Type: Extensible****Order: Significant**1050 **Root: No****Table TID 1004. Device Observer Identifying Attributes**

1052

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			UIDREF	EV (121012, DCM, "Device Observer UID")	1	M		
2			TEXT	EV (121013, DCM, "Device Observer Name")	1	U		Defaults to value of Station Name (0008,1010) in General Equipment Module
3			TEXT	EV (121014, DCM, "Device Observer Manufacturer")	1	U		Defaults to value of Manufacturer (0008,0070) in General Equipment Module
4			TEXT	EV (121015, DCM, "Device Observer Model Name")	1	U		Defaults to value of Manufacturer's Model Name (0008,1090) in General Equipment Module
5			TEXT	EV (121016, DCM, "Device Observer Serial Number")	1	U		Defaults to value of Device Serial Number (0018,1000) in General Equipment Module
6			TEXT	EV (121017, DCM, "Device Observer Physical Location During Observation")	1	U		
7			CODE	EV (113876, DCM, "Device Role in Procedure")	1-n	U		BCID 7445 "Device Participating Roles"

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
8			TEXT	EV (110119, DCM, "Station AE Title")	1	U		
9			<u>UIDREF</u>	<u>EV (121061, DCM, "Device Observer Manufacturer Class UID")</u>	<u>1-n</u>	<u>U</u>		<u>Defaults to value of Manufacturer's Device Class UID (0018,100B) in General Equipment Module</u>

1054

**Update CID 9403 in PS3.16, Annex B:**

1056

See also in Annex D below for the corresponding update in "DICOM Controlled Terminology Definitions (Normative)"

**CID 9403 IEC 61217 PATIENT SUPPORT POSITION PARAMETERS**

1058

**Context ID 9403**

**IEC61217 Patient Support Position Parameters**

1060

**Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

**Type: Extensible**

1062

**Version: 20130518**

**UID: 1.2.840.10008.6.1.1025**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	126801	IEC61217 Patient Support Continuous <u>Yaw</u> Angle
...	...	...

1064

**Add the following new CIDs to PS3.16, Annex B:**

1066

**CID 9541 BEAM LIMITING DEVICE TYPES**

**Context ID 9541**

1068

**Beam Limiting Device Types**

**Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1070

**Type: Non-Extensible**

**Version: 20190715**

1072

**UID: 1.2.840.10008.6.1.1288**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130330	Jaw Pair
DCM	130331	Leaf Pairs
DCM	130332	Variable Circular Collimator
DCM	130333	Single Leaves
<i>Include CID 9545 "Fixed Beam Limiting Device Types"</i>		

1074 **CID 9542 COMPENSATOR DEVICE TYPES**

Context ID 9542

1076 **Compensator Device Types**

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML

1078 **Type: Extensible**

Version: 20190715

1080 **UID: 1.2.840.10008.6.1.1289**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130340	Physical Compensator

1082 **CID 9543 RADIOTHERAPY TREATMENT MACHINE MODES**

Context ID 9543

1084 **Radiotherapy Treatment Machine Modes**

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML

1086 **Type: Extensible**

Version: 20190715

1088 **UID: 1.2.840.10008.6.1.1290**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130341	Total Body Irradiation
DCM	130342	Total Skin Irradiation

1090 **CID 9544 RADIOTHERAPY DISTANCE REFERENCE LOCATIONS**

Context ID 9544

1092 **Radiotherapy Distance Reference Locations**

**Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1094

**Type: Non-Extensible****Version: 20190715**

1096

**UID: 1.2.840.10008.6.1.1291**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130358	Nominal Radiation Source Location
DCM	130359	Treatment Machine Isocenter

1098

**CID 9545****FIXED BEAM LIMITING DEVICE TYPES****Context ID 9545**

1100

**Fixed Beam Limiting Device Types****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1102

**Type: Extensible****Version: 20190715**

1104

**UID: 1.2.840.10008.6.1.1292**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
<i>Include CID 9517 "Radiotherapy Block Device Types"</i>		
DCM	130343	Electron Fixed Aperture
DCM	130344	Photon Fixed Aperture
DCM	130345	Intraoperative Fixed Aperture

1106

**CID 9546****RADIOTHERAPY WEDGE TYPES****Context ID 9546**

1108

**Radiotherapy Wedge Types****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1110

**Type: Extensible****Version: 20190715**

1112

**UID: 1.2.840.10008.6.1.1293**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130346	Hard Wedge
DCM	130347	Motorized Wedge

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130348	Dynamic Wedge

1114 **CID 9547 RT BEAM LIMITING DEVICE ORIENTATION LABELS**

Context ID 9547

1116 **RT Beam Limiting Device Orientation Labels**

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML

1118 **Type: Extensible**

Version: 20190715

1120 **UID: 1.2.840.10008.6.1.1294**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130334	X Orientation
DCM	130335	Y Orientation

1122 **CID 9548 GENERAL ACCESSORY DEVICE TYPES**

Context ID 9548

1124 **General Accessory Device Types**

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML

1126 **Type: Extensible**

Version: 20190715

1128 **UID: 1.2.840.10008.6.1.1295**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130349	Graticule
DCM	130350	Reticle
DCM	130351	Image Detector
DCM	130352	Film Holder
DCM	130353	Winston-Lutz Pointer
DCM	130354	Bowtie Filter

1130 **CID 9549 RADIATION GENERATION MODE TYPES**

Context ID 9549

1132

**Radiation Generation Mode Types****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1134

**Type: Extensible****Version: 20190715**

1136

**UID: 1.2.840.10008.6.1.1296**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130355	Flattening Filter Beam
DCM	130356	Non-Flattening Filter Beam
DCM	130357	Partial Flattening Filter Beam

1138

**CID 9550****C-ARM PHOTON-ELECTRON DELIVERY RATE UNITS****Context ID 9550**

1140

**C-Arm Photon-Electron Delivery Rate Units****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1142

**Type: Non-Extensible****Version: 20190715**

1144

**UID: 1.2.840.10008.6.1.1297**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
UCUM	{MU}/s	Monitor Units / Second

1146

**CID 9551****TREATMENT DELIVERY DEVICE TYPES****Context ID 9551**

1148

**Treatment Delivery Device Types****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1150

**Type: Extensible****Version: 20190715**

1152

**UID: 1.2.840.10008.6.1.1298**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130361	Radiotherapy Treatment Device

1154

**CID 9552****C-ARM PHOTON-ELECTRON DOSIMETER UNITS****Context ID 9552**

1156

**C-Arm Photon-Electron Dosimeter Units**



**Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1158

**Type: Non-Extensible****Version: 20190715**

1160

**UID: 1.2.840.10008.6.1.1299**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
UCUM	{MU}	Monitor Units

1162

**CID 9553****TREATMENT POINTS****Context ID 9553**

1164

**Treatment Points****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1166

**Type: Extensible****Version: 20190715**

1168

**UID: 1.2.840.10008.6.1.1300**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
DCM	130073	Isocentric Treatment Location Point

1170

**CID 9554****EQUIPMENT REFERENCE POINTS****Context ID 9554**

1172

**Equipment Reference Points****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1174

**Type: Extensible****Version: 20190715**

1176

**UID: 1.2.840.10008.6.1.1301**

<b>Coding Scheme Designator (0008,0102)</b>	<b>Code Value (0008,0100)</b>	<b>Code Meaning (0008,0104)</b>
<i>Include CID 9544 "Radiotherapy Distance Reference Locations"</i>		
DCM	130360	Fixed Laser Setup Point

1178

**CID 9555****RADIOTHERAPY TREATMENT PLANNING PERSON ROLES****Context ID 9555**

1180

**Radiotherapy Treatment Planning Person Roles****Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML**

1182

**Type: Extensible**

Version: 20190715

UID: 1.2.840.10008.6.1.1302

1184

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	SNOMED-RT Concept ID	UMLS Concept Unique ID
SCT	158965000	Medical Practitioner	J-0016E	C1306754
SCT	309343006	Physician	J-004E8	C0031831
NCIt	C93176	Dosimetrist		C2985479
SCT	405277009	Resident	J-005E6	C1320928
UMLS	C1441532	Consulting Physician		C1441532
UMLS	C2985483	Radiation Physicist		C2985483
DCM	128678	Physics Assistant		
UMLS	C1708969	Medical Physicist		C1708969

1186

Add the following template to PS3.16, Annex C:

**TID 15302 PATIENT SUPPORT POSITION PARAMETERS**

1188

TID 15302

**Patient Support Position Parameters**

1190

**Type: Extensible Order: Non-Significant**

	Value Type	Concept Name	VM	Req Type	Condition	Value Set Constraint
1	NUMERIC	EV (126802, DCM, "IEC61217 Table Top Continuous Pitch Angle")	1	U		Units = EV (deg, UCUM, "deg")
2	NUMERIC	EV (126803, DCM, "IEC61217 Table Top Continuous Roll Angle")	1	U		Units = EV (deg, UCUM, "deg")
3	NUMERIC	EV (126801, DCM, "IEC61217 Patient Support Continuous Yaw Angle")	1	U		Units = EV (deg, UCUM, "deg")
4	NUMERIC	EV (126804, DCM, "IEC61217 Table Top Eccentric Axis Distance")	1	U		Units = EV (mm, UCUM, "mm")
5	NUMERIC	EV (126805, DCM, "IEC61217 Table Top Continuous Eccentric Angle")	1	U		Units = EV (deg, UCUM, "deg")
6	NUMERIC	EV (126806, DCM, "IEC61217 Table Top Lateral Position")	1	U		Units = EV (mm, UCUM, "mm")

7	NUMERIC	EV (126807, DCM, "IEC61217 Table Top Longitudinal Position")	1	U		Units = EV (mm, UCUM, "mm")
8	NUMERIC	EV (126808, DCM, "IEC61217 Table Top Vertical Position")	1	U		Units = EV (mm, UCUM, "mm")
9	NUMERIC	EV (126812, DCM, "Isocentric Patient Support Continuous Pitch Angle")	1	U		Units = EV (deg, UCUM, "deg")
10	NUMERIC	EV (126813, DCM, "Isocentric Patient Support Continuous Roll Angle")	1	U		Units = EV (deg, UCUM, "deg")
11	NUMERIC	EV (126814, DCM, "Isocentric Patient Support Continuous Yaw Angle")	1	U		Units = EV (deg, UCUM, "deg")
12	NUMERIC	EV (126815, DCM, "Isocentric Patient Support Lateral Position")	1	U		Units = EV (mm, UCUM, "mm")
13	NUMERIC	EV (126816, DCM, "Isocentric Patient Support Longitudinal Position")	1	U		Units = EV (mm, UCUM, "mm")
14	NUMERIC	EV (126817, DCM, "Isocentric Patient Support Vertical Position")	1	U		Units = EV (mm, UCUM, "mm")

1192

1194

1196

**Add the following codes to the table in PS3.16, Annex D:**

1198

**Editorial Note: Additionally, update the existing code (126801, DCM, “IEC61217 Patient Support Continuous Angle”) to (126801, DCM, “IEC61217 Patient Support Continuous Yaw Angle”) and adapt the description.**

1200

#### **ANNEX D            DICOM CONTROLLED TERMINOLOGY DEFINITIONS (NORMATIVE)**

1202

<b>Code Value</b>	<b>Code Meaning</b>	<b>Definition</b>	<b>Notes</b>
126801	IEC61217 Patient Support Continuous <b>Yaw</b> Angle	Patient Support Continuous <b>Yaw</b> Angle in IEC PATIENT SUPPORT Coordinate System [IEC 61217] <b>about the Z-axis of the IEC FIXED REFERENCE coordinate system.</b>	
121061	Device Observer Manufacturer Class UID	Manufacturer-provided Class UID(s) of device that created the observations.	
130330	Jaw Pair	RT beam limiting device jaw pair	
130331	Leaf Pairs	RT beam limiting device multi-element leaf pairs	
130332	Variable Circular Collimator	A circular, aperture size adjustable beam limiting device for an RT treatment device.	
130333	Single Leaves	RT beam limiting device multi-element unpaired leaves	
130334	X Orientation	Oriented in the X direction of a defined coordinate system.	
130335	Y Orientation	Oriented in the Y direction of a defined coordinate system.	
130340	Physical Compensator	Physical RT external beam compensator to compensate for inhomogeneity.	
130341	Total Body Irradiation	RT Treatment irradiating the body of the Patient in part or in whole.	
130342	Total Skin Irradiation	RT Treatment irradiating the surface of the skin of the Patient in part or in whole.	
126812	Isocentric Patient Support Continuous Pitch Angle	Patient Support Continuous Pitch Angle at the isocenter position about the x-axis of the Equipment Coordinate System.	
126813	Isocentric Patient Support Continuous Roll Angle	Patient Support Continuous Roll Angle at the isocenter position about the y-axis of the Equipment Coordinate System.	

<b>Code Value</b>	<b>Code Meaning</b>	<b>Definition</b>	<b>Notes</b>
126814	Isocentric Patient Support Continuous Yaw Angle	Patient Support Continuous Yaw Angle at the isocenter position about the z-axis of the Equipment Coordinate System.	
126815	Isocentric Patient Support Lateral Position	Patient Support Lateral Position along the x-axis of the Equipment Coordinate System.	
126816	Isocentric Patient Support Longitudinal Position	Patient Support Longitudinal Position along the y-axis of the Equipment Coordinate System.	
126817	Isocentric Patient Support Vertical Position	Patient Support Vertical Position along the z-axis of the Equipment Coordinate System.	
130343	Electron Fixed Aperture	A type of device (or “cone”) for electron treatments that attaches to the applicator carriage of an RT treatment device for the purpose of holding an aperture and a bolus close to the patient's skin. Several beam applicators may be available to reduce the weight of apertures lifted by therapists, decrease the aperture/bolus-to-skin distance, and reduce leakage radiation.	
130344	Photon Fixed Aperture	A type of device (or “cone”) for photon treatments that is attached to the radiation head of an RT treatment device into which beam modifiers are installed.	
130345	Intraoperative Fixed Aperture	A type of device which is used to delimit the radiation of an RT treatment device in case of an intraoperative radiotherapeutic treatment.	
130346	Hard Wedge	A physical device placed inside the radiation head used to modify the fluence distribution across the field.	
130347	Motorized Wedge	A physical device manually placed between the radiation head and the patient used to modify the fluence distribution across the field. It is motorized and can be inserted/extracted from the beam path.	
130348	Dynamic Wedge	An effective wedge generated by the movement of a jaw across the treatment field while delivering radiation.	
130349	Graticule	Mechanical grid to embed scaling information in a radiographic image	
130350	Reticle	Mechanical crosshair to embed a crosshair representing axes and scaling information in a radiographic image	
130351	Image Detector	An electronic radiographic imaging device	

<b>Code Value</b>	<b>Code Meaning</b>	<b>Definition</b>	<b>Notes</b>
130352	Film Holder	Mechanical device to hold imaging film	
130353	Winston-Lutz Pointer	A spherical mechanical indicator used for alignment	
130354	Bowtie Filter	A bowtie-shaped filter used in imaging	
130355	Flattening Filter Beam	Beam that uses a filter to produce a nearly uniform intensity profile.	
130356	Non-Flattening Filter Beam	Beam that does not use a filter to produce a nearly uniform intensity profile.	
130357	Partial Flattening Filter Beam	Beam that uses a filter to produce a nearly uniform region across part of the intensity profile.	
128678	Physics Assistant	A medical professional capable of developing a radiotherapy plan from a Physician's prescription and assisting in radiation machine calibration and other radiotherapy quality assurance work under supervision of a Medical Physicist.	
130358	Nominal Radiation Source Location	The point location defined as the nominal source of radiation.	
130359	Treatment Machine Isocenter	The center point of the treatment machine through which all beam central axes pass under all gantry angles.	
130360	Fixed Laser Setup Point	A fixed point at which initial patient setup is performed based on lasers.	
130361	Radiotherapy Treatment Device	A device delivering radiotherapy treatments.	