

Philips Medical Systems

DICOM

Conformance Statement



Pinnacle³ 9.0/DICOM

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1. INTRODUCTION

This chapter provides general information about the purpose, scope and contents of this Conformance Statement.

1.1. Scope and Field of Application

The scope of this DICOM Conformance Statement is to facilitate data exchange with equipment of Philips Medical Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X standards). It contains a short description of the applications involved and provides technical information about the data exchange capabilities of the equipment. The main elements describing these capabilities are: the supported DICOM Service Object Pair (SOP) Classes, Roles, Information Object Definitions (IOD) and Transfer Syntaxes.

The field of application is the integration of the Philips Medical Systems equipment into an environment of medical devices. This Conformance Statement should be read in conjunction with the DICOM standard and its addenda.

This conformance statement describes the DICOM conformance of the Pinnacle³ Radiation Treatment Planning System. Pinnacle³ sets the standard for 3D treatment planning and visualization systems. As an imaging workstation, Pinnacle³'s sophisticated 2D and 3D imaging options, multi-modality image fusion, and treatment simulation tools allow users to accurately localize and delineate target and critical structures. Fully integrated photon, electron, stereotactic radiosurgery, and brachytherapy treatment planning allow users to perform all of their treatment planning from a single platform. Finally, accurate 3D dose calculation algorithms and plan evaluation tools facilitate the applications of new treatment techniques.

This application was developed using the MergeCOM-3 Advanced Software Tool Kit for DICOM Services supplied by Merge Healthcare, Milwaukee, Wisconsin USA.

1.2. Intended Audience

This Conformance Statement is intended for:

- customers
- system integrators of medical equipment
- marketing staff interested in system functionality
- software designers implementing DICOM interfaces

It is assumed that the reader is familiar with the DICOM standard.

1.3. Contents and Structure

The DICOM Conformance Statement is contained in chapters 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2.

1.4. Used Definitions, Terms and Abbreviations

DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see NEMA DICOM Standard, PS 3.3 and PS 3.4.

The word Philips in this document refers to Philips Medical Systems.

1.5. References

1.5.1. [DICOM] The Digital Imaging and Communications in Medicine

(DICOM) standard (NEMA DICOM Standard, PS 3.X):
National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1847
Rosslyn, Va. 22209, United States of America

1.6. Important Note to the Reader

This Conformance Statement by itself does not guarantee successful interoperability of Philips equipment with non-Philips equipment. The user (or user's agent) should be aware of the following issues:

➤ Interoperability

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment.

It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

➤ Validation

Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement.

Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and the exchanged data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

➤ New versions of the DICOM Standard

The DICOM Standard will evolve in the future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue their delivery.

The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

1.7. General Acronyms and Abbreviations

The following acronyms and abbreviations are used in the document.

- ACC American College of Cardiology
- AE Application Entity
- ACR American College of Radiology
- ANSI American National Standards Institute
- DICOM Digital Imaging and Communications in Medicine
- DIMSE DICOM Message Service Element
- ELE Explicit VR Little Endian
- EBE Explicit VR Big Endian
- ILE Implicit VR Little Endian
- IOD Information Object Definition
- NEMA National Electrical Manufacturers Association
- PDU Protocol Data Unit
- RIS Radiology Information System
- RWA Real World Activity
- SCP Service Class Provider
- SCU Service Class User
- SOP Service Object Pair
- TCP/IP Transmission Control Protocol/Internet Protocol
- UID Unique Identifier

2. IMPLEMENTATION MODEL

This document is the DICOM Conformance statement for the Philips Medical Systems Pinnacle³ Radiation Treatment Planning Software, later referred to as Pinnacle³.

2.1. Application Data Flow Diagram

The ADACRTP_SCP server application stores received DICOM message information within a standard UNIX directory. This directory is specified on the command line of the application launched at system boot. The messages may then be imported into the Pinnacle³ database via the Launch Pad application's Import capability.

For DICOM RT messages, import is performed within the Pinnacle³ application. The Plan, Structure Set or Spatial Registration information is added to the plan being edited.

ADACRTP_SCP is a daemon, started at system boot, which runs continuously. Launch Pad is a Pinnacle³ application which utilizes an associated DICOM-to-Pinnacle³ file format converter to import DICOM image data to the Pinnacle³ database.

ADACRTP_SCU is the Pinnacle³ application. (Note that the actual AE Title will be the name of the workstation, capitalized; the default name ADACRTP_SCU will only be used if the workstation name cannot be determined.) ADACRTP_SCU will answer Verification requests only if the application is running. Print and RT transmission requests are submitted as requested by the user. It can also send the received CT, MR, NM, and PET images back to the remote server via the DICOM Image Export feature of Launch Pad or CT images used as the primary dataset of the Pinnacle³ plan via the DICOM Image Export feature of Pinnacle³.

The Pinnacle³-related Implementation Model is shown in figure.

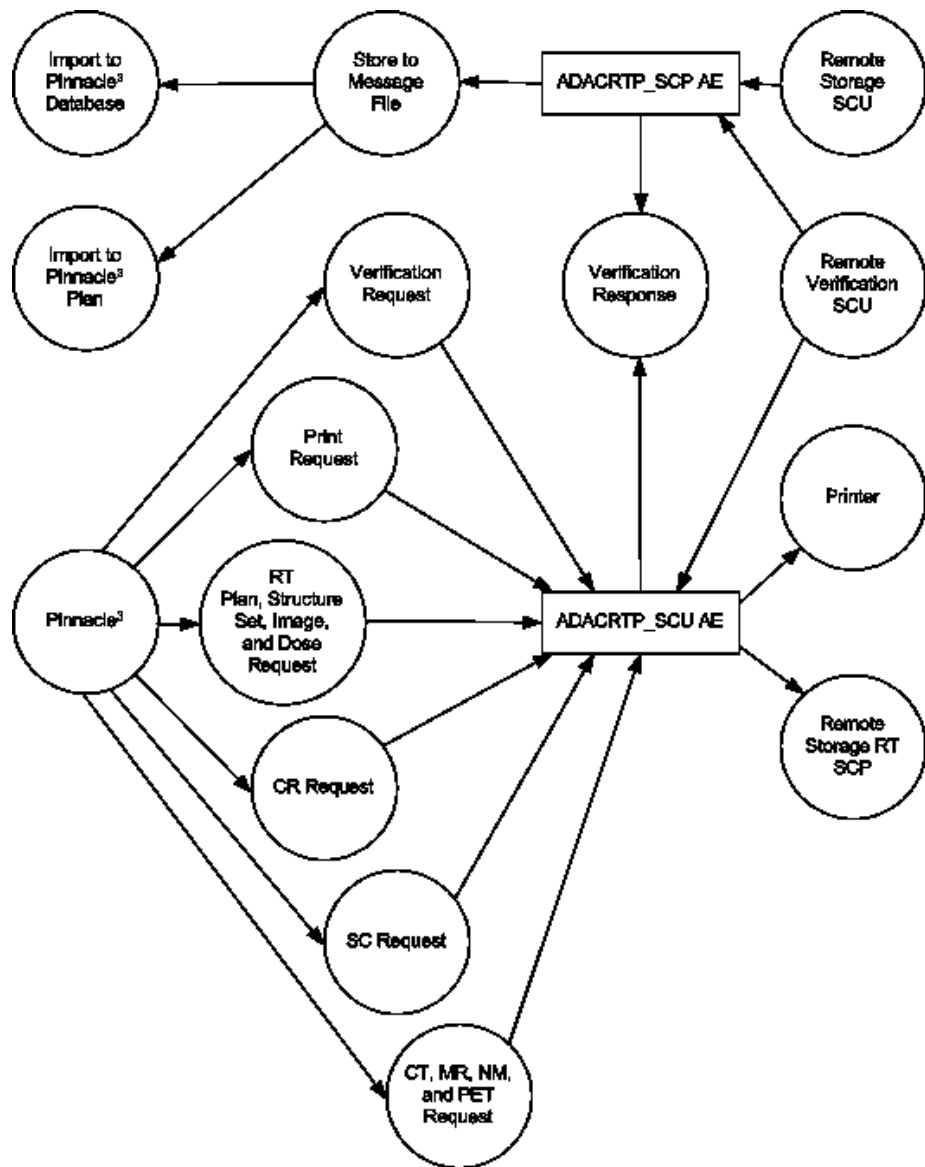


Figure 1: Pinnacle³ Implementation Model

As documented in PS 3.4, the arrows in the diagram have the following meanings:

- An arrow pointing to the right indicates the local application entity initiates an association.
- An arrow pointing to the left indicates the local application entity accepts an association.

2.2. Functional Definition of Application Entities

2.2.1. ADACRTP_SCP

The ADACRTP_SCP server application waits until it receives a C-STORE request from a remote SCU. Upon receipt it will save the received data to a directory with a unique file name. The server is capable of handling multiple associations.

ADACRTP_SCP is a daemon, started at system boot, which runs continuously.

When invoked, the DICOM-to-Pinnacle³ file format converter will scan the directory of files for image messages written by ADACRTP_SCP to determine if individual files may be associated. The association criterion is a matching Series Instance UID. If files belong to the same series, they will be imported to Pinnacle³ as a single data set.

Launch Pad is a Pinnacle³ application that utilizes the DICOM-to-Pinnacle³ file format converter to import DICOM image data to the Pinnacle³ database.

2.2.2. ADACRTP_SCU

Import of RT Plan and RT Structure Set IODs is accomplished within Pinnacle³. The user creates a plan, edits it, and invokes the import operation. The message files will be scanned for RT messages and the selections presented to the user. On import the plan will be populated with the information as described in the selected RT Plan and/or RT Structure Set messages.

The Pinnacle³ application, using the workstation's name as the AE Title or failing that, ADACRTP_SCU, communicates with the remote application using the DICOM protocol. At the user's request an association is established with the AE defined in the printer configuration just prior to sending a print request to that AE. After completion of the transmission the association is closed.

The Pinnacle³ application also communicates with a remote SCP to transfer RT Plan, RT Structure Set, RT Dose, and RT Image IODs. At the user's request an association is established with an AE defined during installation. After completion of the transmission the association is closed. It is also capable of sending the CT, MR, NM and PET images back to the remote server, via the DICOM Image Export feature of Launch Pad or CT images used as the primary dataset of the Pinnacle³ plan within the DICOM Image Export feature of Pinnacle³.

The Pinnacle³ application also communicates with a remote SCP to transfer computed radiography and secondary capture IODs. At the user's request an association is established with an AE defined during installation. After completion of the transmission the association is closed.

2.3. Sequencing of Real World Activities

Not applicable.

3. AE SPECIFICATIONS

The Network capabilities of the system consist of two DICOM Application Entities:

- An Imaging and RT Plan and Structure Set Import Storage AE (ADACRTP_SCP)
- A Send Print, RT Plan, Image, Dose, Structure Set, Computed Radiography, Secondary Capture, Spatial Registration, and Imaging AE (ADACRTP_SCU)

Throughout this document ADACRTP_SCU is used to specify the AE Title representing the Pinnacle³ application. In the field the presented AE Title will be the capitalized hostname of the machine sending the message.

3.1. ADACRTP_SCP

The ADACRTP_SCP Application Entity provides Standard Conformance to the DICOM SOP classes as an SCP specified in Table 1.

3.1.1. Association Establishment Policies

Table 1: Supported SOP Classes as SCP by ADACRTP_SCP AE

| SOP Class Name | UID |
|---------------------------------|-------------------------------|
| Verification | 1.2.840.10008.1.1 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 |
| PET Image Storage | 1.2.840.10008.5.1.4.1.1.128 |
| NM Image Storage | 1.2.840.10008.5.1.4.1.1.20 |
| US Image Storage | 1.2.840.10008.5.1.4.1.1.6.1 |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 |
| RT Dose Storage | 1.2.840.10008.5.1.4.1.1.481.6 |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 |
| Spatial Registration Storage | 1.2.840.10008.5.1.4.1.1.66.1 |

3.1.1.1. General

The ADACRTP_SCP AE and the ADACRTP_SCU AE always propose the following DICOM Application Context Name (ACN): 1.2.840.10008.3.1.1.1.

The maximum PDU length negotiation is included in all association establishment requests. For all services the maximum PDU size is 28672 bytes.

3.1.1.1.1. Number of Associations

The number of simultaneous associations that will be accepted by ADACRTP_SCP is limited only by system resources. ADACRTP_SCP will spawn a new process to handle each connection request it receives. Therefore, ADACRTP_SCP can support multiple simultaneous connections, and there are no inherent limitations on the total number of simultaneous associations. The ADACRTP_SCU application entity opens a single association for each request.

3.1.1.1.2. Asynchronous Nature

DICOM asynchronous mode is not supported, meaning that only one transaction may be outstanding over an association at any given point in time.

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3.1.1.1.3. Implementation Identifying Information

Implementation Class UID: 2.16.840.1.113669.2.931128

Implementation version name: ADAC_RTP_XX

The implementation version name for ADACRTP_SCU may vary per release. An example of its value is "ADAC_RTP_XX," where XX may vary per release.

3.1.2. Association Acceptance Policy

When ADACRTP_SCP accepts an association it will receive supported SOP Instances and store the messages to disk. There are neither limitations on who may connect to the SCP, nor on the number of simultaneous associations it will support.

When ADACRTP_SCP receives a verification request it responds with a success status.

Import of the data into Pinnacle³ is a separate operation requested by the user. Upon import the attribute values contained in the message will be verified. Import may be performed from the standard directory, written by the SCP, or from CD that conforms to the media interchange format as described in PS3.10.

3.1.2.1. Storage**3.1.2.1.1. Associated Real-World Activity**

The ADACRTP_SCP server application responds to remote C-ECHO requests with success status.

The ADACRTP_SCP server application will automatically handle requests for image storage and store them on receipt of C-STORE requests. The file will be stored in the directory specified at startup of the daemon.

The timers used for the management of associations and DICOM services (i.e., C-STORE) are specified in the configuration files for the server.

3.1.2.1.2. Presentation Context Table

Any of the presentation contexts in Table 2 are acceptable for ADACRTP_SCP to receive images. Transfer syntax will be selected based on the following ordering: Explicit Little Endian, then Implicit Little Endian.

Table 2: Supported Presentation Context for the Store Services by ADACRTP_SCP

| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
|---------------------------------|-------------------------------|-----------------|------------------------------------|------|-----------|
| Name | UID | Name | UID | | |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| PET Image Storage | 1.2.840.10008.5.1.4.1.1.128 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| NM Image Storage | 1.2.840.10008.5.1.4.1.1.20 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| US Image Storage | 1.2.840.10008.5.1.4.1.1.6.1 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |

Table 2: Supported Presentation Context for the Store Services by ADACRTP_SCP

| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
|------------------------------|-------------------------------|-----------------|------------------------------------|------|-----------|
| Name | UID | Name | UID | | |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| RT Dose Storage | 1.2.840.10008.5.1.4.1.1.481.2 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |
| Spatial Registration Storage | 1.2.840.10008.5.1.4.1.1.66.1 | ELE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2 | SCP | None |

3.1.2.1.3. Storage Conformance

ADACRTP_SCP conforms to the SOPs of the Image Storage Service Class at Level 0, meaning a subset of the attributes associated with the image will be stored. All others will be discarded. Stored attributes are described in the tables following.

Upon receipt of a C-STORE request by ADACRTP_SCP, the message is saved to a file in the directory specified to the process at startup. Upon saving the data to this file, a successful C-STORE-RSP is returned to the sender.

If insufficient resources exist to store the messages, a response indicating such will be transmitted and the association aborted. Images transferred prior to depleting the resources will be preserved. The image in the process of transfer upon depletion of resources will be removed.

Minimal interpretation of the transferred images is performed by the Image Storage SCP. Data consistency and orientation issues are addressed when the data is imported to Pinnacle³.

Voxel sizing information is required for image data to be used within Pinnacle³. If the X, Y, or Z voxel dimensions are missing from the DICOM message, the user will be prompted for proper dimensions on import to Pinnacle³.

Pinnacle³ will not accept non-axial data sets for use as a primary data set.

On receipt of Nuclear Medicine data in a multi-image format, each frame of the multi-image is treated as a slice within a volume. The volume is spaced isotropically in the Z dimension.

The following table lists the actions that are performed when an exception occurs. The Service Name Status Responses that are returned by ADACRTP_SCP are given.

Table 3: Exception handling by the C-STORE service

| Error Type | Error | Action | Status Response |
|------------|------------------------|---|-----------------|
| Error | Insufficient resources | Notification sent, logging and connection aborted | 0xA700 |
| Success | NA | NA | 0x0000 |

3.1.2.1.4. SOP Specific Conformance to Verification SOP Class

ADACRTP_SCP provides standard conformance to the DICOM Verification Service Class.

3.1.2.1.5. SOP Specific Conformance to Storage SOP Classes

ADACRTP_SCP conforms to the Image Storage Service Classes at Level 0, meaning a subset of the attributes associated with the image will be stored. All others will be discarded. Stored attributes are described below.

Table 4: Patient Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|---|
| Patient's Name | (0010,0010) | 2 | Displayed to user. |
| Patient ID | (0010,0020) | 2 | Patient ID. Used in the "Medical Record Number" part of the Patient Demographics feature of AcQSim ³ . |
| Patient's Birth Date | (0010,0030) | 2 | Birth date of the patient. Used in the Patient Demographics feature of AcQSim ³ . |
| Patient's Sex | (0010,0040) | 2 | Displayed to user. |

Table 5: General Study Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| Study Instance UID | (0020,000D) | 1 | Used to associate multiple images into a single Pinnacle ³ data file. |
| Study Date | (0008,0020) | 2 | Displayed to user. Need to contain same value throughout the study or null. |
| Study Time | (0008,0030) | 2 | Displayed to user. Need to contain same value throughout the study or null. |
| Referring Physician's Name | (0008,0090) | 2 | Patient's referring physician. Used in the Patient Demographics feature of AcQSim ³ . |
| Study Description | (0008,1030) | 3 | Study description. Used in the "Comments" field of the Patient Demographics feature of AcQSim ³ . |

Table 6: General Series Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|---|
| Modality | (0008,0060) | 1 | Determine special processing required for interpretation of the image data. |
| Series Instance UID | (0020,000E) | 1 | Used to associate multiple images into a single Pinnacle ³ data file. |
| Patient Position | (0018,5100) | 2C | Used to determine the patient's original position/orientation at the scanner. Should contain one of the following enumerated values: HFS, HFP, HFDL, HFDR, FFS, FFP, FFDL, FFDR. (Although this is a type 2 attribute in DICOM Standards, it is important that this info is provided to be used in Pinnacle ³ .) |

Table 7: Frame of Reference Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|--|
| Frame of Reference UID | (0020,0052) | 1 | Uniquely identify the Frame of Reference for the series. For CT and MR data, must be the same for every image in the series. |

Table 8: General Equipment Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Manufacturer | (0008,0070) | 2 | Required for licensing. |
| Manufacturer's Model Name | (0008,1090) | 3 | Manufacturer's model name. |
| Pixel Padding Value | (0028,0120) | 3 | Value of pixels added to non-rectangular image to pad to rectangular format. |

Table 9: General Image Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|--------------------------------|-------------|------|---|
| Image Number (Instance Number) | (0020,0013) | 2 | Used as slice number. If no value exists or values are the same throughout the dataset, Pinnacle ³ uses its own slice numbering mechanism. |

Table 10: Image Plane Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------------|-------------|------|--|
| Pixel Spacing | (0028,0030) | 1 | Physical distance in the patient between the center of each pixel. |
| Slice Thickness | (0018,0050) | 2 | Nominal slice thickness, in mm. |
| Image Position (Patient) | (0020,0032) | 1 | The x, y, and z coordinates of the upper left corner (center of first voxel transmitted) of the image in mm. Used to properly position each slice in the dataset. |
| Image Orientation (Patient) | (0020,0037) | 1 | Used to find out how the image is stored (how it is reconstructed as compared to the original patient scan orientation). In combination with information from "Patient Position" (0018, 5100) field, this is used to properly import the images in the original orientation of the patient scan. |
| Slice Location | (0020,1041) | 3 | Position of slice relative to an unspecified implementation-specific reference point. Used to represent horizontal couch position in Philips scanners only. |

Table 11: Image Pixel Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|---|
| Samples per Pixel | (0028,0002) | 1 | Must be 1. |
| Photometric Interpretation | (0028,0004) | 1 | Must be MONOCHROME2. |
| Rows | (0028,0010) | 1 | Number of rows in the image. |
| Columns | (0028,0011) | 1 | Number of columns in the image. |
| Bits Allocated | (0028,0100) | 1 | Number of bits allocated for each pixel sample. |
| Bits Stored | (0028,0101) | 1 | Number of bits stored for each pixel sample. |
| Pixel Representation | (0028,0103) | 1 | Data representation of the pixel samples. |
| Pixel Data | (7FE0,0010) | 1 | Pixel data. |
| Pixel Aspect Ratio | (0028,0034) | 1C | Must be 1/1. |

Table 12: Multi-Frame Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|------------------|-------------|------|--|
| Number of Frames | (0028,0008) | 1 | The number of frames in a multi-frame message. |

Table 13: CT Image Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|---|
| Image Type | (0008,0008) | 1 | Image identification characteristics. |
| Rescale Intercept | (0028,1052) | 1 | Used to scale data to Hounsfield Units. |
| Rescale Slope | (0028,1053) | 1 | Used to scale data to Hounsfield Units. |
| Gantry/Detector Tilt | (0018,1120) | 3 | If present, must be zero. |
| Table Height | (0018,1130) | 3 | Couch height. |
| High Bit | (0028,0102) | 1 | Most significant bit for pixel sample data. For CT, NM and PT, value is one less than the value in Bits Stored. |

Table 14: MR Image Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|---------------------------------------|
| Image Type | (0008,0008) | 1 | Image identification characteristics. |

Table 15: NM Image Pixel Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|---|
| Image Type | (0008,0008) | 1 | Image identification characteristics. |
| High Bit | (0028,0102) | 1 | Most significant bit for pixel sample data. For CT, NM and PT, value is one less than the value in Bits Stored. |

Table 16: NM Reconstruction Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|--|
| Spacing Between Slices | (0018,0088) | 2 | Used to determine the spacing of the slices for rendering. |

Table 17: PET Image Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|-------------------|-------------|------|---|
| Image Type | (0008,0008) | 1 | Image identification characteristics. |
| High Bit | (0028,0102) | 1 | Most significant bit for pixel sample data. For CT, NM and PT, value is one less than the value in Bits Stored. |
| Rescale Intercept | (0028,1052) | 1 | Used to scale data to appropriate units. Always zero for PET images. |
| Rescale Slope | (0028,1053) | 1 | Used to scale data to appropriate Units. |

Table 18: SOP Common Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|------------------|-------------|------|---------------------------------------|
| SOP Class UID | (0008,0016) | 1 | Used in identifying the SOP class. |
| SOP Instance UID | (0008,0018) | 1 | Used in identifying the SOP instance. |

3.1.2.1.6. SOP Specific Conformance to RT Structure Set Storage SOP Class

ADACRTP_SCP conforms to the RT Structure Set Storage Service Class at Level 0, meaning a subset of the attributes associated with the image will be stored. All others will be discarded. Stored attributes are described below.

Table 19: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|---|
| Patient's Name | (0010,0010) | 2 | Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | Used to verify the patient plan matches with the data. Matched with the medical record number as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | Not used. |
| Patient's Sex | (0010,0040) | 2 | Used to verify the patient plan matches with the data. |

Table 20: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--------------------------|
| Modality | (0008,0060) | 1 | RTSTRUCT |
| Series Instance UID | (0020,000E) | 1 | Written to transfer log. |
| Series Number | (0020,0011) | 2 | Not used. |
| Series Description | (0008,103E) | 3 | Not used. |

Table 21: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--------------------------|
| Manufacturer | (0008,0070) | 2 | Written to transfer log. |
| Station Name | (0008,1010) | 3 | Written to transfer log. |
| Manufacturer's Model Name | (0008,1090) | 3 | Written to transfer log. |
| Software Version | (0018,1020) | 3 | Written to transfer log. |

Table 22: Structure Set Module

| Attribute Name | Tag | Type | Attribute Use |
|--|-------------|------|--|
| Structure Set Label | (3006,0002) | 1 | Not used. |
| Structure Set Name | (3006,0004) | 3 | Not used. |
| Structure Set Date | (3006,0008) | 2 | Not used. |
| Structure Set Time | (3006,0009) | 2 | Not used. |
| Referenced Frame of Reference Sequence | (3006,0010) | 3 | Introduces the sequence describing the frame of reference for the data set. Data must have been transferred to Pinnacle ³ via DICOM. |
| >Frame of Reference UID | (0020,0052) | 1C | Must equal the Frame of Reference UID of the plan data set. |
| >RT Referenced Study Sequence | (3006,0012) | 3 | Introduces the sequence describing studies referenced by this structure set. In Pinnacle ³ this identifies the data set used by the plan. |
| >>Referenced SOP Class UID | (0008,1150) | 1C | Not used. |
| >>Referenced SOP Instance UID | (0008,1155) | 1C | Used to verify that the structure set corresponds to the current plan. If not the discrepancy is logged and the user warned. |

Table 22: Structure Set Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------------|-------------|------|---|
| >>RT Referenced Series Sequence | (3006,0014) | 1C | Introduces the sequence describing the series referenced by this structure set. In Pinnacle ³ this identifies the data set. |
| >>>Series Instance UID | (0020,000E) | 1C | Used to verify that the structure set corresponds to the current plan. If not the discrepancy is logged and the user warned. |
| >>>Contour Image Sequence | (3006,0016) | 1C | Introduces the list of Image Class and Instance UIDs within the data set series. May include images that have no contours assigned. |
| >>>>Referenced SOP Class UID | (0008,1150) | 1C | Used to verify that images used to define contours are of the correct class. If not the discrepancy is logged and the user warned. |
| >>>>Referenced SOP Instance UID | (0008,1155) | 1C | Used to verify that the image to which the contour is assigned has been transferred to Pinnacle ³ . If not the discrepancy is logged and the user warned. |
| Structure Set ROI Sequence | (3006,0020) | 3 | Introduces the sequence of structures. One entry per ROI. |
| >ROI Number | (3006,0022) | 1C | Uniquely identifies an ROI when referenced by an ROI Contour and RT ROI Observations modules. |
| >Referenced Frame of Reference UID | (3006,0024) | 1C | Must match the Frame of Reference UID for the data set. If not the discrepancy is logged and the user notified. |
| >ROI Name | (3006,0026) | 2C | Used as the ROI or POI name in Pinnacle ³ . If the name is not a valid Pinnacle ³ name or duplicates an existing name, a new unique name will be generated, the action logged, and the user warned. |
| >ROI Volume | (3006,002C) | 3 | Not used. |
| >ROI Generation Algorithm | (3006,0036) | 2C | Not used. |

Table 23: ROI Contour Module

| Attribute Name | Tag | Type | Attribute Use |
|--------------------------------|-------------|------|---|
| ROI Contour Sequence | (3006,0039) | 1 | Introduces the sequence of Contour Sequences defining ROIs. |
| >Referenced ROI Number | (3006,0084) | 1 | Used to match the contours with the ROI data in the Structure Set. |
| >ROI Display Color | (3006,002A) | 3 | Used to assign a color to the ROI. |
| >Contour Sequence | (3006,0040) | 3 | Introduces the sequence of Contours defining an ROI. |
| >>Contour Image Sequence | (3006,0016) | 3 | Introduces the sequence of image UIDs to which this contour corresponds. The sequence will contain 1 item. |
| >>>Referenced SOP Class UID | (0008,1150) | 1C | Required that all Class UIDs are the same. If not the discrepancy will be logged. |
| >>>Referenced SOP Instance UID | (0008,1155) | 1C | If present, and if the contour is transverse, the contour is assigned to the image identified by this UID, ignoring the z coordinate specified in the contour data. |

Table 23: ROI Contour Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| >>Contour Geometric Type | (3006,0042) | 1C | If POINT, the contour represents a POI. If CLOSED_PLANAR, the contour represents an ROI. |
| >>Number of Contour Points | (3006,0046) | 1C | The number of points describing the contour in the Contour Data attribute. |
| >>Contour Data | (3006,0050) | 1C | The (x, y, z) coordinates of the vertices of a single contour in the ROI. |

Table 24: RT ROI Observations Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------------|-------------|------|--|
| RT ROI Observation Sequence | (3006,0080) | 1 | Introduces a sequence of ROI observations. 1 per beam. |
| >Observation Number | (3006,0082) | 1 | Not used. |
| >Referenced ROI Number | (3006,0084) | 1 | Not used. |
| >RT ROI Interpreted Type | (3006,00A4) | 2 | Type of ROI or POI. Pinnacle supports the following interpreted types: EXTERNAL PTV CTV GTV TREATED_VOLUME IRRAD_VOLUME AVOIDANCE ORGAN CAVITY SUPPORT FIXATION DOSE_REGION CONTROL BOLUS |

Table 25: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|---|
| SOP Class UID | (0008,0016) | 1 | Must equal 1.2.840.10008.5.1.4.1.1.481.3. |
| SOP Instance UID | (0008,0018) | 1 | Not used. |
| Specific Character Set | (0008,0005) | 1C | Written to transfer log. |
| Instance Creation Date | (0008,0012) | 3 | Written to transfer log. |
| Instance Creation Time | (0008,0013) | 3 | Written to transfer log. |

3.1.2.1.7. SOP Specific Conformance to RT Plan Storage SOP Class

ADACRTP_SCP conforms to the RT Plan Storage Service Class at Level 0, meaning a subset of the attributes associated with the image will be stored. All others will be discarded. Stored attributes are described below.

Table 26: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|---|
| Patient's Name | (0010,0010) | 2 | Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | Used to verify the patient plan matches with the data. Matched with the medical record number as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | Not used. |
| Patient's Sex | (0010,0040) | 2 | Used to verify the patient plan matches with the data. |

Table 27: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|---|
| Modality | (0008,0060) | 1 | RTPLAN |
| Series Instance UID | (0020,000E) | 1 | Written to transfer log. |
| Series Number | (0020,0011) | 2 | A number that identifies this series |
| Series Description | (0008,103E) | 3 | User defined description for this series. |

Table 28: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--------------------------|
| Manufacturer | (0008,0070) | 2 | Written to transfer log. |
| Station Name | (0008,1010) | 3 | Written to transfer log. |
| Manufacturer's Model Name | (0008,1090) | 3 | Written to transfer log. |
| Software Version | (0018,1020) | 3 | Written to transfer log. |

Table 29: RT General Plan Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|---------------|
| RT Plan Label | (300A,0002) | 1 | Not used. |
| RT Plan Name | (300A,0003) | 3 | Not used. |
| RT Plan Description | (300A,0004) | 3 | Not used. |
| Operator's Name | (0008,1070) | 2 | Not used. |
| RT Plan Date | (300A,0006) | 2 | Not used. |
| RT Plan Time | (300A,0007) | 2 | Not used. |
| RT Plan Geometry | (300A,000C) | 1 | Not used. |

Table 30: RT Fraction Scheme Module*

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|-------------|------|---|
| Fraction Group Sequence | (300A,0070) | 1 | Introduces sequence of Fraction Groups in current Fraction Scheme. Each Fraction Group is translated to a Prescription in Pinnacle ³ . |
| >Fraction Group Number | (300A,0071) | 1 | Identifies the fraction scheme for a beam. |
| >Number of Fractions Planned | (300A,0078) | 2 | The number of fractions for a prescription. |

Table 30: RT Fraction Scheme Module*

| Attribute Name | Tag | Type | Attribute Use |
|--------------------------------------|-------------|------|---|
| >Number of Beams | (300A,0080) | 1 | Used to verify the consistency of the transmitted plan. If this does not match the actual number of beams using this plan, the discrepancy is logged and the user warned. |
| >Referenced Beam Sequence | (300C,0004) | 1C | Introduces the sequence of treatment beams in the current Fraction Group. |
| >>Referenced Beam Number | (300C,0006) | 1C | Associates a prescription with a beam. |
| >>Beam Dose | (300A,0084) | 3 | Not used. |
| >>Beam Meterset | (300A,0086) | 3 | Not used. |
| >Number of Brachy Application Setups | (300A,00A0) | 1 | Not used. |

*Attributes related to brachytherapy treatments are not supported.

3.1.2.1.8. SOP Specific Conformance to Spatial Registration Storage SOP Class

ADACRTP_SCP conforms to the Spatial Registration Storage Service Class at Level 0, meaning a subset of the attributes associated with the image will be stored. All others will be discarded. Stored attributes are described below.

Table 31: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|---|
| Patient's Name | (0010,0010) | 2 | Used to verify the patient plan matches with the data. Matched with the patient name as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | Used to verify the patient plan matches with the data. Matched with the medical record number as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | Not used. |
| Patient's Sex | (0010,0040) | 2 | Used to verify the patient plan matches with the data. |

Table 32: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|---|
| Modality | (0008,0060) | 1 | REG |
| Series Instance UID | (0020,000E) | 1 | Written to transfer log. |
| Series Number | (0020,0011) | 2 | A number that identifies this series |
| Series Description | (0008,103E) | 3 | User defined description for this series. |

Table 33: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--------------------------|
| Manufacturer | (0008,0070) | 2 | Written to transfer log. |
| Station Name | (0008,1010) | 3 | Written to transfer log. |
| Manufacturer's Model Name | (0008,1090) | 3 | Written to transfer log. |
| Software Version | (0018,1020) | 3 | Written to transfer log. |

Table 34: Spatial Registration Module

| Attribute Name | Tag | Type | Attribute Use |
|---|-------------|------|--|
| Content Date | (0008,0023) | 1 | Not used. |
| Content Time | (0008,0033) | 1 | Not used. |
| Instance Number | (0020,0013) | 1 | Not used. |
| Content Label | (0070,0080) | 1 | Not used. |
| Registration Sequence | (0070,0308) | 1 | Introduces two registration sequences. |
| >Frame of Reference UID | (0020,0052) | 1C | Identifies the dataset's Frame of Reference. |
| >>Referenced SOP Class UID | (0008,1150) | 1 | Not used. |
| >>Referenced SOP Instance UID | (0008,1155) | 1 | Not used. |
| >Matrix Registration Sequence | (0070,0309) | 1 | Introduces a single matrix registration sequence. |
| >>Frame of Reference Transformation Comment | (3006,00C8) | 3 | Not used.. |
| >>Registration Type Code Sequence | (0070,030D) | 2 | Not used. |
| >>Matrix Sequence | (0070,030D) | 1 | Introduces a single matrix registration. |
| >>>Frame of Reference Transformation Matrix | (0070,030C) | 1 | A 4x4 homogeneous transformation matrix that registers the dataset to the primary dataset. Matrix elements shall be listed in row-major order. For the primary dataset, this must be an identity matrix. |

Table 35: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|--|
| SOP Class UID | (0008,0016) | 1 | Must equal 1.2.840.10008.5.1.4.1.1.66.1. |
| SOP Instance UID | (0008,0018) | 1 | Not used. |
| Specific Character Set | (0008,0005) | 1C | Written to transfer log. |
| Instance Creation Date | (0008,0012) | 3 | Written to transfer log. |

Table 36: Frame Of Reference Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|-------------|------|---------------|
| Frame of Reference UID | (0020,0052) | 1 | Not used. |
| Position Reference Indicator | (0020,1040) | 2 | Not used. |

3.2. ADACRTP_SCU Specification

The ADACRTP_SCU provides standard conformance to the DICOM Basic Color Print Management Meta and Basic Grayscale Print Management Meta SOP classes, as well as the Print Job SOP class as a DICOM Basic Print User (SCU). ADACRTP_SCU also provides standard conformance to the DICOM RT Plan, RT Structure Set, RT Image, RT Dose, Computed Radiography, Secondary Capture, CT, MR, NM, and PET Storage SOP classes.

3.2.1. Association Establishment Policies

Table 37: Supported SOP Classes as SCU by ADACRTP_SCU

| SOP Class Name | UID |
|---|-------------------------------|
| Verification | 1.2.840.10008.1.1 |
| Basic Grayscale Print Management (META) | 1.2.840.10008.5.1.1.9 |
| Basic Film Session | 1.2.840.10008.5.1.1.1 |
| Basic Film Box | 1.2.840.10008.5.1.1.2 |
| Basic Grayscale Image Box | 1.2.840.10008.5.1.1.4 |
| Printer | 1.2.840.10008.5.1.1.16 |
| Basic Color Print Management (META) | 1.2.840.10008.5.1.1.18 |
| Basic Film Session | 1.2.840.10008.5.1.1.1 |
| Basic Film Box | 1.2.840.10008.5.1.1.2 |
| Basic Color Image Box | 1.2.840.10008.5.1.1.4.1 |
| Printer | 1.2.840.10008.5.1.1.16 |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 |
| RT Dose Storage | 1.2.840.10008.5.1.4.1.1.481.2 |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 |
| PET Image Storage | 1.2.840.10008.5.1.4.1.1.128 |
| NM Image Storage | 1.2.840.10008.5.1.4.1.1.20 |
| Spatial Registration Storage | 1.2.840.10008.5.1.4.1.1.66.1 |

3.2.1.1. General

The ADACRTP_SCU Network AE always proposes the following DICOM Application Context Name (ACN): 1.2.840.10008.3.1.1.1.

The maximum PDU length negotiation is included in all association establishment requests. The maximum PDU size is: 28 KB.

Note that the actual local AE Title will be the name of the workstation, capitalized: the default name 'ADACRTP_SCU' will only be used if the workstation name cannot be determined.

3.2.1.1.1. Number of Associations

The ADACRTP_SCU application entity opens a single association for each user requested transfer.

3.2.1.1.2. Asynchronous Nature

DICOM asynchronous mode is not supported meaning that only one transaction may be outstanding over an association at any given point in time.

3.2.1.1.3. Implementation Identifying Information

Implementation Class UID: 2.16.840.1.113669.2.931128

Implementation version name: ADAC_RTP_XX

The implementation version name for ADACRTP_SCU may vary per release. An example of its value is "ADAC_RTP_XX," where XX may vary per release.

3.2.2. Association Initiation Policy**3.2.2.1. Storage****3.2.2.1.1. Associated Real-World Activity**

When transmitting RT IODs, ADACRTP_SCU initiates an association for RT Plan, RT Image, RT Dose, RT Structure Set and Spatial Registration based on the information selected by the user. The association is closed after completion of the transfer.

The configuration of the printer in Pinnacle³ also includes the time-out value to wait for a reply message from the SCP. The default value is 30 seconds. If the time-out is exceeded, ADACRTP_SCU will abort the association.

3.2.2.1.2. Associated Real-World Activity for Storage Operations

ADACRTP_SCU initiates associations on request from the user. An association is established with the specified application entity. ADACRTP_SCU sends a C_STORE request for each message to be sent. When the user requests transfer of ROIs and POIs, they will be transferred over the same association but as separate C_STORE requests.

3.2.2.1.3. Presentation Context Table

ADACRTP_SCU will initiate the presentation contexts as given in the following table.

Table 38: Supported Presentation Context for the Store Services by ADACRTP_SCU

| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
|---|-----------------------------|-----------------|---|------|-----------|
| Name | UID | Name | UID | | |
| CT Image Storage | 1.2.840.10008.5.1.4.1.1.2 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| MR Image Storage | 1.2.840.10008.5.1.4.1.1.4 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| PET Image Storage | 1.2.840.10008.5.1.4.1.1.128 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| NM Image Storage | 1.2.840.10008.5.1.4.1.1.20 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| Basic Grayscale Print Management (META) | 1.2.840.10008.5.1.1.9 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |

Table 38: Supported Presentation Context for the Store Services by ADACRTP_SCU

| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
|-------------------------------------|-------------------------------|-----------------|---|------|-----------|
| Name | UID | Name | UID | | |
| Basic Color Print Management (META) | 1.2.840.10008.5.1.1.18 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| RT Image Storage | 1.2.840.10008.5.1.4.1.1.481.1 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| RT Dose Storage | 1.2.840.10008.5.1.4.1.1.481.2 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| RT Structure Set Storage | 1.2.840.10008.5.1.4.1.1.481.3 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| RT Plan Storage | 1.2.840.10008.5.1.4.1.1.481.5 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| Computed Radiography Image Storage | 1.2.840.10008.5.1.4.1.1.1 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |
| Spatial Registration Storage | 1.2.840.10008.5.1.4.1.1.66.1 | ELE, EBE, ILE | 1.2.840.10008.2.1, 1.2.840.10008.2.2, 1.2.840.10008.2 | SCU | None |

3.2.2.1.4. Storage Conformance

ADACRTP_SCU provides standard conformance to the DICOM Storage Service Class.

3.2.2.1.5. SOP Specific Conformance to Verification SOP Class

ADACRTP_SCU provides standard conformance to the DICOM Verification Service Class.

3.2.2.1.6. SOP Specific Conformance to RT Image Storage SOP Class

Attribute values for the RT Image SOP class proposed by ADACRTP_SCU are described below.

Table 39: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

Table 40: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|--------------|------|--|
| Study Instance UID | (0020,000D) | 1 | Copied from the Primary Image set, if transferred via DICOM else it is generated. |
| Study Date | (0008,0020) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the Primary Image set, if transferred via DICOM else it is generated. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |
| Referenced Study Sequence | (0008,1110) | 3 | Introduces the sequence describing the study containing the data set for which this set of ROIs was defined. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.3.1.2.3.2'. |
| >Referenced SOP Instance UID | (0008, 1155) | 1C | Study UID of the data set from which this image was defined. |

Table 41: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Modality | (0008,0060) | 1 | 'RTIMAGE'. |
| Series Instance UID | (0020,000E) | 1 | Generated. |
| Series Number | (0020,0011) | 2 | Series Number from DICOM Export Window. |
| Series Description | (0008,103E) | 3 | Series Description from DICOM Export Window. |

Table 42: Frame of Reference Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|-------------|------|---|
| Frame of Reference UID | (0020,0052) | 1 | Matches the Frame of Reference UID for the primary image set if the patient position has not been altered on import. If the patient position was altered on import, a new Frame of Reference UID will be generated. |
| Position Reference Indicator | (0020,1040) | 2 | Empty. |

Table 43: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 44: General Image Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Instance Number | (0020,0013) | 2 | A unique number for each IOD instance sent in a single transfer operation. |
| Patient Orientation | (0020,0020) | 2C | Empty. |
| Content Date | (0008,0023) | 2C | Date the transfer was performed. |
| Content Time | (0008,0033) | 2C | Time the transfer was performed.. |

Table 45: Image Pixel Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| Samples per Pixel | (0028,0002) | 1 | '1'. |
| Photometric Interpretation | (0028,0004) | 1 | 'MONOCHROME2'. |
| Rows | (0028,0010) | 1 | Number of rows in the image. |
| Columns | (0028,0011) | 1 | Number of columns in the image. |
| Bits Allocated | (0028,0100) | 1 | Number of bits allocated for each pixel sample. (16) |
| Bits Stored | (0028,0101) | 1 | Number of bits stored for each pixel sample. ('16') |
| High Bit | (0028,0102) | 1 | Most significant bit for pixel sample data. ('15') |
| Pixel Representation | (0028,0103) | 1 | Data representation of the pixel samples. ('0') |
| Pixel Data | (7FE0,0010) | 1 | Pixel data. |

Table 46: RT Image Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| RT Image Label | (3002,0002) | 1 | Beam Name appended with BEV |
| Operator's Name | (0008,1070) | 2 | Dosimetrist Name as entered in Launch Pad. |
| Image Type | (0008,0008) | 1 | 'DERIVED\SECONDARY\DRR'. |
| Conversion Type | (0008,0064) | 2 | 'WSD'. |
| Samples per Pixel | (0028,0002) | 1 | '1'. |
| Photometric Interpretation | (0028,0004) | 1 | 'MONOCHROME2'. |

Table 46: RT Image Module Attributes

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------------|-------------|------|--|
| Rows | (0028,0010) | 1 | Number of rows in the image. |
| Columns | (0028,0011) | 1 | Number of columns in the image. |
| Bits Allocated | (0028,0100) | 1 | Number of bits allocated for each pixel sample. ('16') |
| Bits Stored | (0028,0101) | 1 | Number of bits stored for each pixel sample. ('16') |
| High Bit | (0028,0102) | 1 | Most significant bit for pixel sample data. ('15') |
| Pixel Representation | (0028,0103) | 1 | Data representation of the pixel samples. ('0') |
| RT Image Label | (3002,0002) | 1 | Name of the beam from which the DRR is generated. |
| RT Image Plane | (3002,000C) | 1 | 'NORMAL'. |
| X-Ray Image Receptor Translation | (3002,000D) | 3 | '0.0\0.0\0.0'. |
| X-Ray Image Receptor Angle | (3002,000E) | 2 | If Image Type (0008,0008) is DRR set to 0, otherwise it is equivalent to the collimator angle of the beam. |
| Image Plane Pixel Spacing | (3002,0011) | 2 | Pixel size in the format X\Y in mm. |
| RT Image Position | (3002,0012) | 2 | Coordinate of the center of the first pixel transmitted. |
| Radiation Machine Name | (3002,0020) | 2 | The name of the machine assigned to the beam cooresponding to this image. |
| Primary Dosimeter Unit | (300A,00B3) | 2 | 'MU'. |
| Radiation Machine SAD | (3002,0022) | 2 | Distance from source to gantry rotation axis for the beam in mm. |
| Radiation Machine SSD | (3002,0024) | 3 | Distance from source to patient surface for the beam in mm. |
| RT Image SID | (3002,0026) | 2 | SAD for the beam in mm. |
| Gantry Angle | (300A,011E) | 3 | The gantry angle of the beam for this control point. Control point zero will always represent the starting angle for the beam. |
| Beam Limiting Device Angle | (300A,0120) | 3 | The collimator angle for the beam. |
| Patient Support Angle | (300A,0122) | 3 | The couch angle for the beam. |
| Table Top Eccentric Angle | (300a,0125) | 3 | '0.0'. |
| Referenced RT Plan Sequence | (300C,0002) | 3 | The sequence is included only if the export of an RT Plan is performed within the same association as RT Image instance. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.5.1.4.1.1.481.5'. |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Instance UID of RT plan object exported in the same association as this RT Image instance. |
| Referenced Beam Number | (300C,0006) | 3 | Identifies the beam number of this beam within that RT Plan instance exported simultaneously with the RT Image instance. |

Table 47: Modality LUT Module

| Attribute Name | Tag | Type | Attribute Use |
|-------------------|-------------|------|---------------|
| Rescale Intercept | (0028,1052) | 1C | '0.0'. |
| Rescale Slope | (0028,1053) | 1C | '1.0'. |

Table 47: Modality LUT Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|---------------|
| Rescale Type | (0028,1054) | 1C | 'US'. |

Table 48: VOI LUT Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|--|
| Window Center | (0028,1050) | 1C | The default window center value for the image, for display purposes. |
| Window Width | (0028,1051) | 1C | The default window width value for the image, for display purposes. |

Table 49: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.481.1 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

3.2.2.1.7. SOP Specific Conformance to RT Dose Storage SOP Class

Attribute values for the RT Dose SOP class proposed by ADACRTP_SCU are described below.

Table 50: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

Table 51: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|---|
| Study Instance UID | (0020,000D) | 1 | Copied from the Primary Image set, if transferred via DICOM else it is generated. |
| Study Date | (0008,0020) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |

Table 51: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|--------------|------|--|
| Referenced Study Sequence | (0008,1110) | 3 | Introduces the sequence describing the study containing the data set for which this set of ROIs was defined. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.3.1.2.3.2'. |
| >Referenced SOP Instance UID | (0008, 1155) | 1C | Study UID of the data set from which this image was defined. |

Table 52: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Modality | (0008,0060) | 1 | 'RTDOSE'. |
| Series Instance UID | (0020,000E) | 1 | Generated. |
| Series Number | (0020,0011) | 2 | Series Number from DICOM Export Window |
| Series Description | (0008,103E) | 3 | Series Description from DICOM Export Window. |

Table 53: Frame Of Reference

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|-------------|------|---|
| Frame of Reference UID | (0020,0052) | 1 | Matches the Frame of Reference UID for the primary image set if the patient position has not been altered on import. If the patient position was altered on import, a new Frame of Reference UID will be generated. |
| Position Reference Indicator | (0020,1040) | 2 | Empty. |

Table 54: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 55: General Image Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Instance Number | (0020,0013) | 2 | A unique number for each IOD instance sent in a single transfer operation. |
| Patient Orientation | (0020,0020) | 2C | Empty. |
| Content Date | (0008,0023) | 2C | Date the transfer was performed. |
| Content Time | (0008,0033) | 2C | Time the transfer was performed.. |

Table 56: Image Plane Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|--|
| Pixel Spacing | (0028,0030) | 1 | Physical distance in the patient between the center of each voxel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. |

Table 56: Image Plane Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------------|-------------|------|--|
| Image Orientation (Patient) | (0020,0037) | 1 | The direction cosines of the first row and the first column with respect to the patient. Matches the orientation of the Primary Image Set. |
| Image Position (Patient) | (0020,0032) | 1 | The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm. |
| Slice Thickness | (0018,0050) | 2 | The spacing, in mm, between slices of the dose grid planes. |

Table 57: RT Dose Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|-------------|------|---|
| Samples per Pixel | (0028,0002) | 1 | '1'. |
| Photometric Interpretation | (0028,0004) | 1 | 'MONOCHROME2'. |
| Rows | (0028,0010) | 1 | Number of rows in the dose grid. |
| Columns | (0028,0011) | 1 | Number of columns in the dose grid. |
| Bits Allocated | (0028,0100) | 1 | '16'. |
| Bits Stored | (0028,0101) | 1 | '16'. |
| High Bit | (0028,0102) | 1 | '15'. |
| Pixel Representation | (0028,0103) | 1 | '0'. (unsigned integer) |
| Dose Units | (3004,0002) | 1 | Units used to describe dose: 'GY' (Gray) |
| Dose Type | (3004,0004) | 1 | 'PHYSICAL' (physical dose) |
| Dose Summation Type | (3004,000A) | 1 | PLAN = dose calculated for entire Trial FRACTION = dose calculated for a selected prescription BEAM = dose calculated for one or more Beams in each selected prescription CONTROL_POINT = dose calculated for one or more Control Points for each beam in the selected prescription BRACHY = unsupported |
| Normalization Point | (3004,0008) | 3 | If specified for the plan, the position of the dose normalization point in the patient coordinate system. |
| Grid Frame Offset Vector | (3004,000C) | 1C | An array which contains the z coordinates (in mm) of the image frames in a multiframe dose. All coordinates are relative to Image Position (Patient) (0020,0032). |
| Dose Grid Scaling | (3004,000E) | 1 | Scaling factor that when multiplied by the dose grid data found in the Pixel Data (7FE0,0010) attribute of the Image Pixel Module, yields grid doses in the dose units as specified by Dose Units (3004,0002). |
| Referenced RT Plan Sequence | (300C,0002) | 1C | Introduces sequence of one Class/Instance pair describing the RT Plan associated with the dose. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.5.1.4.1.1.481.5' (RT Plan Storage) |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Unique identifier of the referenced RT Plan SOP Instance. |
| Pixel Data | (7FE0,0010) | 1 | A data stream of the pixel samples that comprise the values of the dose grid. |

Table 58: Multi-Frame Module

| Attribute Name | Tag | Type | Attribute Use |
|-------------------------|-------------|------|--|
| Number of Frames | (0028,0008) | 1 | Number of frames in a Multi-frame Image. See C.7.6.6.1.1 for further explanation. |
| Frame Increment Pointer | (0028,0009) | 1 | Contains the Data Element Tag of the attribute that is used as the frame increment in Multi-frame pixel data. Points to Grid Frame Offset Vector (300C,0004). See C.7.6.6.1.1 for further explanation. |

Table 59: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.481.2 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

3.2.2.1.8. SOP Specific Conformance to RT Structure Set Storage SOP Class

Attribute values for the RT Structure Set SOP class proposed by ADACRTP_SCU are described below.

Table 60: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

Table 61: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|--------------|------|--|
| Study Instance UID | (0020,000D) | 1 | Copied from the dataset the structures are assigned to, if transferred via DICOM, else it is generated. |
| Study Date | (0008,0020) | 2 | Copied from the dataset the structures are assigned to, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the dataset the structures are assigned to, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the dataset the structures are assigned to, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the dataset the structures are assigned to, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the dataset the structures are assigned to, if transferred via DICOM. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |
| Referenced Study Sequence | (0008,1110) | 3 | Introduces the sequence describing the study containing the data set for which this set of ROIs was defined. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.3.1.2.3.2'. |
| >Referenced SOP Instance UID | (0008, 1155) | 1C | Study UID of the data set from which this image was defined. |

Table 62: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Modality | (0008,0060) | 1 | 'RTSTRUCT'. |
| Series Instance UID | (0020,000E) | 1 | Generated. |
| Series Number | (0020,0011) | 2 | Series Number from the DICOM Export Window. |
| Series Description | (0008,103E) | 3 | Series Description from the DICOM Export Window. |

Table 63: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|---------------|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |

Table 63: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 64: Structure Set Module

| Attribute Name | Tag | Type | Attribute Use |
|--|-------------|------|---|
| Structure Set Label | (3006,0002) | 1 | The name of the plan. |
| Structure Set Name | (3006,0004) | 3 | 'POLandROlandBolus' |
| Structure Set Date | (3006,0008) | 2 | Date of transfer. |
| Structure Set Time | (3006,0009) | 2 | Time of transfer. |
| Referenced Frame of Reference Sequence | (3006,0010) | 3 | Introduces the sequence describing the frame of reference for the data set. |
| >Frame of Reference UID | (0020,0052) | 1C | Duplicated from the image data set the structure is assigned to, as transferred via DICOM. |
| >RT Referenced Study Sequence | (3006,0012) | 3 | Introduces the sequence describing studies referenced by this structure set. |
| >>Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.3.1.2.3.2'. |
| >>Referenced SOP Instance UID | (0008,1155) | 1C | The Study UID duplicated from the image data set as transferred via DICOM. |
| >>RT Referenced Series Sequence | (3006,0014) | 1C | Introduces the sequence describing the series referenced by this structure set. |
| >>>Series Instance UID | (0020,000E) | 1C | The Series UID duplicated from the image data set as transferred via DICOM. |
| >>>Contour Image Sequence | (3006,0016) | 1C | Introduces the list of Image Class and Instance UIDs within the data set series. There will be 1 entry per slice. |
| >>>>Referenced SOP Class UID | (0008,1150) | 1C | The Image Class UID duplicated from the image data set as transferred via DICOM. |
| >>>>Referenced SOP Instance UID | (0008,1155) | 1C | The instance UID duplicated from the image instance for the contour as transferred via DICOM. |
| Structure Set ROI Sequence | (3006,0020) | 3 | Introduces the sequence of structures. One entry per ROI or POI. |
| >ROI Number | (3006,0022) | 1C | A unique number for POIs and ROIs within the message. |
| >Referenced Frame of Reference UID | (3006,0024) | 1C | The Frame of Reference UID for each instance UID, duplicated from the image. |
| >ROI Name | (3006,0026) | 2C | The name of the ROI or POI as entered in Pinnacle ³ . |
| >ROI Volume | (3006,002C) | 3 | The volume of the ROI in cubic cm. |
| >ROI Generation Algorithm | (3006,0036) | 2C | SEMIAUTOMATIC. |

Table 65: ROI Contour

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|---|
| ROI Contour Sequence | (3006,0039) | 1 | Introduces the sequence of Contour Sequences defining ROIs or POIs. |

Table 65: ROI Contour

| Attribute Name | Tag | Type | Attribute Use |
|--------------------------------|-------------|------|---|
| >Referenced ROI Number | (3006,0084) | 1 | Unique identifier of POI or ROI within this message instance. |
| >ROI Display Color | (3006,002A) | 3 | The color of the ROI. |
| >Contour Sequence | (3006,0040) | 3 | Introduces the sequence of Contours defining an ROI. |
| >>Contour Image Sequence | (3006,0016) | 3 | Introduces the sequence of image UIDs to which this contour corresponds. The sequence will contain 1 item. |
| >>>Referenced SOP Class UID | (0008,1150) | 1C | Image class UID duplicated from the DICOM transfer of the assigned data set. Requires that the image data set has been transferred via DICOM. |
| >>>Referenced SOP Instance UID | (0008,1155) | 1C | Image instance UID duplicated from the DICOM transfer of the data set. Requires that the image data set has been transferred via DICOM. |
| >>Contour Geometric Type | (3006,0042) | 1C | For POIs: POINT. For ROIs: CLOSED_PLANAR. |
| >>Number of Contour Points | (3006,0046) | 1C | 1 for a POI; otherwise, the number of points describing the contour in the Contour Data attribute (3006,0050). |
| >>Contour Data | (3006,0050) | 1C | x y z triplets describing the vertices of the ROI or point of the POI. |

Table 66: RT ROI Observations Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------------|-------------|------|--|
| RT ROI Observation Sequence | (3006,0080) | 1 | Introduces a sequence of ROI observations. 1 per beam. |
| >Observation Number | (3006,0082) | 1 | Unique identifier of POI or ROI within this message instance. |
| >Referenced ROI Number | (3006,0084) | 1 | Unique identifier of POI or ROI within this message instance. |
| >RT ROI Interpreted Type | (3006,00A4) | 2 | Type of ROI or POI. Pinnacle supports the following interpreted types: EXTERNAL PTV CTV GTV TREATED_VOLUME IRRAD_VOLUME AVOIDANCE ORGAN CAVITY SUPPORT FIXATION DOSE_REGION CONTROL BOLUS |
| >ROI Interpreter | (3006,00A6) | 2 | Empty. |

Table 67: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.481.3 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

3.2.2.1.9. SOP Specific Conformance to RT Plan Storage SOP Class

Attribute values for the RT Plan SOP class proposed by ADACRTP_SCU are described below.

Table 68: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date* | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

*This date will be in yyyymmdd format. If entered or imported in yyyy-mm-dd format, the date will be converted automatically upon export. Other date formats will not be exported.

Table 69: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|--------------|------|---|
| Study Instance UID | (0020,000D) | 1 | Generated. |
| Study Date | (0008,0020) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |
| Referenced Study Sequence | (0008,1110) | 3 | Introduces the sequence describing the study containing the data set for which this plan was defined. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.3.1.2.3.2'. |
| >Referenced SOP Instance UID | (0008, 1155) | 1C | Study UID of the data set from which this image was defined. |

Table 70: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Modality | (0008,0060) | 1 | 'RTPLAN'. |
| Series Instance UID | (0020,000E) | 1 | Generated. |
| Series Number | (0020,0011) | 2 | Series Number from DICOM Export Window. |
| Series Description | (0008,103E) | 3 | Series Description from DICOM Export Window. |

Table 71: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|---------------|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |

Table 71: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 72: RT General Plan Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------------------|-------------|------|---|
| RT Plan Label | (300A,0002) | 1 | The plan name as entered in Launch Pad concatenated with the Trial Number (i.e., <planName>-<Trial#>). |
| RT Plan Name | (300A,0003) | 3 | The plan name as entered in Launch Pad. |
| RT Plan Description | (300A,0004) | 3 | The comment as entered in Launch Pad. |
| Operator's Name | (0008,1070) | 2 | The Dosimetrist name as entered in Launch Pad. |
| RT Plan Date | (300A,0006) | 2 | The date that the message was created. |
| RT Plan Time | (300A,0007) | 2 | The time that the message was created. |
| RT Plan Geometry | (300A,000C) | 1 | Set to PATIENT if the primary data set was transferred via DICOM. If the primary data set was not transferred via DICOM, the value is TREATMENT_DEVICE. |
| Referenced Structure Set Sequence | (300C,0060) | 1C | Sent if RT Plan Geometry is PATIENT. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.5.1.4.1.1.481.3'. |
| >Referenced SOP Instance UID | (0008,1155) | 1C | Indicates the structure set that references the patient's coordinate system frame of reference. |

Table 73: RT Patient Setup Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|--|
| Patient Setup Sequence | (300A,0180) | 1 | Introduces the sequence of patient setup data. |
| >Patient Setup Number | (300A,0182) | 1 | '1'. |
| >Patient Position | (0018,5100) | 1C | The treatment position defined by the CT scan. Duplicated from the Primary data set on which the plan was created. |

Table 74: RT Fraction Scheme Module*

| Attribute Name | Tag | Type | Attribute Use |
|--------------------------------------|-------------|------|---|
| Fraction Group Sequence | (300A,0070) | 1 | Introduces sequence of Fraction Groups in current Fraction Scheme. Each Fraction Group is translated to a Prescription in Pinnacle ³ . |
| >Fraction Group Number | (300A,0071) | 1 | Prescription number in Pinnacle. |
| >Number of Fractions Planned | (300A,0078) | 2 | The number of fractions for the selected prescription. |
| >Number of Beams | (300A,0080) | 1 | The number of beams using this prescription. The number will include 2 additional beams if setup beams are being exported. |
| >Referenced Beam Sequence | (300C,0004) | 1C | Introduces the sequence of treatment beams in the current Fraction Group. |
| >>Referenced Beam Number | (300C,0006) | 1C | Specifies the Beam Number (300A,00C0) of the beam using this prescription. |
| >>Beam Dose Specification Point | (300A,0082) | 3 | The location of the Dose Reference Point for the beam, as specified in the Monitor Units window. |
| >>Beam Dose | (300A,0084) | 3 | The dose in Gy, to the reference point, calculated for this beam. This will be a value of '0' for setup beams. |
| >>Beam Meterset | (300A,0086) | 3 | The monitor units calculated for this beam. This will be a value of '0' for setup beams. |
| >Number of Brachy Application Setups | (300A,00A0) | 1 | '0'. |

*Attributes related to brachytherapy treatments are not supported

Table 75: RT Beams Module

| Attribute Name | Tag | Type | Attribute Use |
|-------------------|-------------|------|---|
| Beam Sequence | (300A,00B0) | 1 | Introduces the sequence of treatment beams for this RT Plan. There will be 1 entry per beam. |
| >Beam Number | (300A,00C0) | 1 | The ordinal representing the position of the beam in the beam list as displayed in Pinnacle ³ . |
| >Beam Name | (300A,00C2) | 3 | If the Field ID is specified for the beam, its value is exported in this attribute and the Pinnacle ³ Beam Name is exported in the Beam Description attribute (300A,00C3). If the Field ID is not specified this attribute contains the name of the beam as specified in Pinnacle ³ . |
| >Beam Description | (300A,00C3) | 3 | If Field ID is specified for the beam, this attribute contains the Pinnacle ³ Beam Name. |
| >Beam Type | (300A,00C4) | 1 | 'DYNAMIC' for a beam in which treatment geometry or characteristics are modified during delivery. 'STATIC' for a fixed field, fixed beam. (Note that there is a method to override this field. See our latest DICOM RT Release Note for more detail.) |
| >Radiation Type | (300A,00C6) | 2 | 'PHOTON' or 'ELECTRON'. |

Table 75: RT Beams Module

| Attribute Name | Tag | Type | Attribute Use |
|---|-------------|------|--|
| >Treatment Machine Name | (300A,00B2) | 2 | The name of the machine assigned to this beam. |
| >Manufacturer | (0008,0070) | 3 | The manufacturer of the machine assigned to this beam. |
| >Institution Name | (0008,0080) | 3 | The name of the institution in Pinnacle ³ . |
| >Primary Dosimeter Unit | (300A,00B3) | 3 | 'MU'. |
| >Source to Axis Distance | (300A,00B4) | 3 | The SAD of the machine assigned to this beam in mm. |
| >Beam Limiting Device Sequence | (300A,00B6) | 1 | Introduces the sequence of beam limiting devices (collimator) jaw or leaf (element) sets. |
| >>Beam Limiting Device Type | (300A,00B8) | 1 | As appropriate: X = symmetric jaw pair in X direction Y = symmetric jaw pair in Y direction ASYMX = asymmetric jaw pair in X direction ASYMY = asymmetric jaw pair in Y direction MLCX = multileaf jaw pair in X direction MLCY = multileaf jaw pair in Y direction. |
| >>Source to Beam Limiting Device Distance | (300A,00BA) | 3 | The Source to Beam Limiting Device distance in mm. As entered for the device in the machine definition. (Note that this is suppressible via script. See our latest DICOM RT Release Note for more detail.) |
| >>Number of Leaf/Jaw Pairs | (300A,00BC) | 1 | 1 for jaws or the number of leaf pairs for an MLC. |
| >>Leaf Position Boundaries | (300A,00BE) | 2C | The position of the edges of the leaf boundaries with respect to the central axis. There will be the number of leaf pairs + 1 entries. |
| >Referenced Patient Setup Number | (300C,006A) | 3 | References the Patient Setup number (300A,0182) as defined in the Patient Setup Module. |
| >Treatment Delivery Type | (300A,00CE) | 3 | 'TREATMENT\SETUP'. |
| >Number of Wedges | (300A,00D0) | 1 | '0' or '1'. |
| >Wedge Sequence | (300A,00D1) | 1C | Introduces sequence of treatment wedges. Required if Number of Wedges is non-zero. |
| >>Wedge Number | (300A,00D2) | 1C | '0'. |
| >>Wedge Type | (300A,00D3) | 2C | As appropriate: STANDARD = standard (static) wedge DYNAMIC = moving beam limiting device jaw simulating wedge MOTORIZED = single wedge that can be removed from beam remotely. |
| >>Wedge ID | (300A,00D4) | 3 | The Manufacturer code of the wedge assigned to the beam. |
| >>Wedge Angle | (300A,00D5) | 2C | The angle of the wedge for the beam. |
| >>Wedge Factor | (300A,00D6) | 2C | Empty. |
| >>Wedge Orientation | (300A,00D8) | 2C | The orientation of the wedge. |
| >Number of Compensators | (300A,00E0) | 1 | '0' or '1'. |
| >Compensator Sequence | (300A,00E3) | 1C | Compensators are not currently exported by Pinnacle ³ . |

Table 75: RT Beams Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------------------------|-------------|------|---|
| >Number of Boluses | (300A,00ED) | 1 | Number of Boli assigned to beam. |
| >Referenced Bolus Sequence | (300C,00B0) | 1C | Introduces the sequence of boluses associated with the beam. |
| >>Referenced ROI Number | (3006,0084) | 1C | Indicates that bolus is specified for the beam. |
| >Number of Blocks | (300A,00F0) | 1 | The number of contours required to describe the block. |
| >Total Block Tray Factor | (300A,00F2) | 3 | The tray factor of the beam. |
| >Block Sequence | (300A,00F4) | 1C | Introduces sequence of blocks associated with Beam. Required if Number of Blocks is non-zero. |
| >>Block Tray ID | (300A,00F5) | 3 | The tray number, if any, otherwise UNKNOWN TRAY ID. |
| >>Source to Block Tray Distance | (300A,00F6) | 2C | The Source to Tray Distance as defined for the machine. |
| >>Block Type | (300A,00F8) | 1C | 'SHIELDING' or 'APERTURE'. |
| >>Block Divergence | (300A,00FA) | 2C | 'PRESENT'. |
| >>Block Number | (300A,00FC) | 1C | The identifying number for this contour. |
| >>Material ID | (300A,00E1) | 2C | Empty. |
| >>Block Thickness | (300A,0100) | 2C | Empty. |
| >>Block Transmission | (300A,0102) | 2C | The block and tray factor of the beam. |
| >>Block Number of Points | (300A,0104) | 2C | The number of points used to describe the contour. |
| >>Block Data | (300A,0106) | 2C | Data containing the (x, y) pairs describing the edge of the contour. |
| >Applicator Sequence | (300A,0107) | 3 | Introduces the sequence of Applicators. Only a single item shall be permitted in this sequence. |
| >>Applicator ID | (300A,0108) | 1C | The user name assigned to the applicator or circular collimator. For a stereo beam, send the name of the circular collimator. For electron beams, send the electron applicator name. |
| >>Applicator Type | (300A,0109) | 1C | For a stereo beam, set to 'STEREOTACTIC'. For an electron beam the dimensions of the applicator will be checked, if length = height 'ELECTRON_SQUARE' will be sent. Otherwise 'ELECTRON_RECT'. |
| >Final Cumulative Meterset Weight | (300A,010E) | 1C | '1'. |
| >Number of Control Points | (300A,0110) | 1 | The number of control points used to describe the beam behavior during treatment. (Setup beams will each use 2 control points.) |
| >Control Point Sequence | (300A,0111) | 1 | Introduces the sequence of machine configurations describing this treatment beam. |
| >>Control Point Index | (300A,0112) | 1C | Sequentially numbered starting at 0. |
| >>Cumulative Meterset Weight | (300A,0134) | 2C | For control point 0, this is 0.0. For each subsequent control point this represents the weight of the MU delivered during this control point, expressed as a percentage. The final value will be 1. |

Table 75: RT Beams Module

| Attribute Name | Tag | Type | Attribute Use |
|---|-------------|------|---|
| >>Nominal Beam Energy | (300A,0114) | 3 | The selected machine energy for this beam. |
| >>Dose Rate Set | (300A,0115) | 3 | Dose rate of the control point. |
| >>Wedge Position Sequence | (300A,0116) | 3 | Introduces sequence of Wedge positions and identities for this control point. |
| >>>Referenced Wedge Number | (300C,00C0) | 1C | The Wedge Number (300A,00D2) assigned to the selected wedge for this control point. |
| >>>Wedge Position | (300A,0118) | 1C | 'IN' or 'OUT'. |
| >>Beam Limiting Device Position Sequence | (300A,011A) | 1C | Introduces the sequence of beam limiting device (collimator) jaw or leaf (element) positions. |
| >>>RT Beam Limiting Device Type | (300A,00B8) | 1C | Assigned as appropriate: X = symmetric jaw pair in X direction Y = symmetric jaw pair in Y direction ASYMX = asymmetric jaw pair in X direction ASYMY = asymmetric jaw pair in Y direction MLCX = multileaf jaw pair in X direction MLCY = multileaf jaw pair in Y direction. |
| >>>Leaf/Jaw Positions | (300A,011C) | 1C | The jaw or MLC leaf positions for this control point in mm. |
| >>Gantry Angle | (300A,011E) | 1C | The gantry angle of the beam for this control point. Control point zero will always represent the starting angle for the beam. |
| >>Gantry Rotation Direction | (300A,011F) | 1C | If an arc is being described, this will represent the direction of the gantry rotation ('CW' or 'CC'). If this is a fixed treatment the value will be 'NONE'. |
| >>Beam Limiting Device Angle | (300A,0120) | 1C | The collimator angle for the beam. |
| >>Beam Limiting Device Rotation Direction | (300A,0121) | 1C | 'NONE'. |
| >>Patient Support Angle | (300A,0122) | 1C | The couch angle for the beam. |
| >>Patient Support Rotation Direction | (300A,0123) | 1C | 'NONE'. |
| >>Table Top Eccentric Angle | (300A,0125) | 1C | '0'. |
| >>Table Top Eccentric Rotation Direction | (300A,0126) | 1C | 'NONE'. |
| >>Table Top Vertical Position | (300A,0128) | 2C | Empty. |
| >>Table Top Longitudinal Position | (300A,0129) | 2C | Empty. |
| >>Table Top Lateral Position | (300A,012A) | 2C | Empty. |
| >>Isocenter Position | (300A,012C) | 2C | Sent in mm in the DICOM Patient coordinate system, if RT Plan Geometry (300A,000C) is PATIENT. Empty, if RT Plan Geometry is TREATMENT_DEVICE. |
| >>Source to Surface Distance | (300A,0130) | 3 | SSD of the beam in mm. |
| >Referenced Tolerance Table Number | (300C,00A0) | 3 | The number associated with the Tolerance Table in the DICOM Export Window as defined in your physics machine. |

Table 76: RT Tolerance Tables Module

| Attribute Name | Tag | Type | Attribute Use |
|--------------------------|-------------|------|--|
| Tolerance Table Sequence | (300A,0040) | 3 | Introduces sequence of tolerance tables to be used for delivery of treatment plan. One or more items may be included in sequence. |
| >Tolerance Table Number | (300A,0042) | 1C | Identification number of the Tolerance Table as defined in the physics machine. The value of Tolerance Table Number (300A,0042) shall be unique within the RT Plan in which it is created. Required if Tolerance Table Sequence (300A,0040) is sent. |
| >Tolerance Table Label | (300A,0043) | 3 | User-defined label for Tolerance Table. Defined as part of the tolerance table in the physics machine. |

Table 77: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.481.5 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

Table 78: Varian Private Attributes*

| Attribute Name | Tag | Type | Attribute Use |
|-------------------------------|--------------|------|--|
| Private Creator Code | (3253,0010) | 1 | Introduces the Varian extended interface for Setup beam support with the OBI. Contains 'Varian'. |
| >OBI Field Type Specification | (3253,1000) | 1C | An XML string describing each field's purpose, SETUP or TREATMENT. |
| >OBI Information Length | (3253,1001) | 1C | Number of characters in the OBI Field Type Specification (3253,1000) attribute. |
| Extended Interface Format | (3253, 1002) | 1C | 'Extended IF' |

* The Varian Private attributes are only included if Varian OBI support has been enabled and Setup beams are being exported.

3.2.2.1.10. SOP Specific Conformance to Spatial Registration Storage SOP Class

Table 79: Attribute values for the Spatial Registration SOP class proposed by ADACRTP_SCU are described below.

Table 80: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

Table 81: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|--------------|------|--|
| Study Instance UID | (0020,000D) | 1 | Copied from the Primary Image Set, if transferred via DICOM, else it is generated. |
| Study Date | (0008,0020) | 2 | Copied from the dataset the registration is being applied to, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the dataset the registration is being applied to, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the dataset the registration is being applied to, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the dataset the registration is being applied to, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the dataset the registration is being applied to, if transferred via DICOM. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |
| Referenced Study Sequence | (0008,1110) | 3 | Introduces the sequence describing the study containing the data set for which this set of ROIs was defined. |
| >Referenced SOP Class UID | (0008,1150) | 1C | '1.2.840.10008.3.1.2.3.2'. |
| >Referenced SOP Instance UID | (0008, 1155) | 1C | Study UID of the data set from which this image was defined. |

Table 82: RT Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|--|
| Modality | (0008,0060) | 1 | 'REG'. |
| Series Instance UID | (0020,000E) | 1 | Generated. |
| Series Number | (0020,0011) | 2 | Series Number from the DICOM Export Window. |
| Series Description | (0008,103E) | 3 | Series Description from the DICOM Export Window. |

Table 83: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|---------------|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |

Table 83: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 84: Spatial Registration Module

| Attribute Name | Tag | Type | Attribute Use |
|---|-------------|------|--|
| Content Date | (0008,0023) | 1 | Copied from Plan. |
| Content Time | (0008,0033) | 1 | Copied from Plan |
| Instance Number | (0020,0013) | 1 | '1' |
| Content Label | (0070,0080) | 1 | Current time/date stamp. |
| Registration Sequence | (0070,0308) | 1 | Introduces two registration sequences. |
| >Frame of Reference UID | (0020,0052) | 1C | Identifies the dataset's Frame of Reference. |
| >>Referenced SOP Class UID | (0008,1150) | 1 | The SOP Class UID of each image in the dataset. |
| >>Referenced SOP Instance UID | (0008,1155) | 1 | The SOP Instance UID of each image in the dataset. |
| >Matrix Registration Sequence | (0070,0309) | 1 | Introduces a single matrix registration sequence. |
| >>Frame of Reference Transformation Comment | (3006,00C8) | 3 | Empty. |
| >>Registration Type Code Sequence | (0070,030D) | 2 | Empty |
| >>Matrix Sequence | (0070,030D) | 1 | Introduces a single matrix registration. |
| >>>Frame of Reference Transformation Matrix | (0070,030C) | 1 | A 4x4 homogeneous transformation matrix that registers the dataset to the primary dataset. Matrix elements shall be listed in row-major order. For the primary dataset, this must be an identity matrix. |

Table 85: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.66.1 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

Table 86: Frame Of Reference Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------------|-------------|------|---|
| Frame of Reference UID | (0020,0052) | 1 | Matches the Frame of Reference UID for the primary image set. |
| Position Reference Indicator | (0020,1040) | 2 | Empty. |

3.2.2.1.11. SOP Specific Conformance to Computed Radiography Image Storage SOP Class

Attribute values for the Computed Radiography SOP class proposed by ADACRTP_SCU are described below.

Table 87: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

Table 88: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| Study Instance UID | (0020,000D) | 1 | Copied from the Primary Image set, if transferred via DICOM, else it is generated. |
| Study Date | (0008,0020) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |

Table 89: General Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|----------------------|
| Modality | (0008,0060) | 1 | 'CR'. |
| Series Instance UID | (0020,000E) | 1 | Generated on Export. |
| Series Number | (0020,0011) | 2 | Empty. |
| Laterality | (0020,0060) | 2C | Empty. |

Table 90: CR Series Module

| Attribute Name | Tag | Type | Attribute Use |
|--------------------|-------------|------|---------------|
| Body Part Examined | (0018,0015) | 2 | Empty. |
| View Position | (0018,5101) | 2 | Empty. |

Table 91: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|--|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |

Table 91: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 92: General Image Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|-----------------------------------|
| Instance Number | (0020,0013) | 2 | '1'. |
| Patient Orientation | (0020,0020) | 2C | Empty. |
| Content Date | (0008,0023) | 2C | Date the transfer was performed. |
| Content Time | (0008,0033) | 2C | Time the transfer was performed.. |

Table 93: CR Image Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| Photometric Interpretation | (0028,0004) | 1 | 'MONOCHROME2'. |
| Imager Pixel Spacing | (0018,1164) | 3 | Multivalued XY resolution of the image pixels. |

Table 94: VOI LUT Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|--|
| Window Center | (0028,1050) | 1C | The default window center value for the image, for display purposes. |
| Window Width | (0028,1051) | 1C | The default window width value for the image, for display purposes. |

Table 95: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.1 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

3.2.2.1.12. SOP Specific Conformance to Secondary Capture Image Storage SOP Class

Attribute values for the Secondary Capture SOP class proposed by ADACRTP_SCU are described below.

Table 96: Patient Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------|-------------|------|--|
| Patient's Name | (0010,0010) | 2 | Patient's full legal name, as entered in Launch Pad. |
| Patient ID | (0010,0020) | 2 | The patient's Medical Record Number, as entered in Launch Pad. |
| Patient's Birth Date | (0010,0030) | 2 | The patient's Birthdate, as entered in Launch Pad. |
| Patient's Sex | (0010,0040) | 2 | M, F, or O as appropriate based on Launch Pad entry. |

Table 97: General Study Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------------------|-------------|------|--|
| Study Instance UID | (0020,000D) | 1 | Copied from the Primary Image set, if transferred via DICOM, else it is generated. |
| Study Date | (0008,0020) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Time | (0008,0030) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Referring Physician's name | (0008,0090) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study ID | (0020,0010) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Accession Number | (0008,0050) | 2 | Copied from the Primary Image set, if transferred via DICOM. |
| Study Description | (0008,1030) | 3 | Comment as entered in Launch Pad. |
| Physician of Record | (0008,1048) | 3 | Physician as entered in Launch Pad. |

Table 98: General Series Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|----------------------|
| Modality | (0008,0060) | 1 | 'OT'. |
| Series Instance UID | (0020,000E) | 1 | Generated on Export. |
| Series Number | (0020,0011) | 2 | Empty. |
| Laterality | (0020,0060) | 2C | Empty. |

Table 99: General Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------------|-------------|------|--|
| Manufacturer | (0008,0070) | 2 | 'ADAC'. |
| Station Name | (0008,1010) | 3 | The host name of the workstation which transmits the data. |
| Manufacturer's Model Name | (0008,1090) | 3 | 'Pinnacle3'. |
| Software Version | (0018,1020) | 3 | Current version of Pinnacle ³ which transmits the data. |

Table 100: General Image Module

| Attribute Name | Tag | Type | Attribute Use |
|---------------------|-------------|------|-----------------------------------|
| Instance Number | (0020,0013) | 2 | '1'. |
| Patient Orientation | (0020,0020) | 2C | Empty. |
| Content Date | (0008,0023) | 2C | Date the transfer was performed. |
| Content Time | (0008,0033) | 2C | Time the transfer was performed.. |

Table 101: SC Equipment Module

| Attribute Name | Tag | Type | Attribute Use |
|-----------------|-------------|------|---------------|
| Conversion Type | (0008,0064) | 1 | 'WSD'. |

Table 102: VOI LUT Module

| Attribute Name | Tag | Type | Attribute Use |
|----------------|-------------|------|--|
| Window Center | (0028,1050) | 1C | The default window center value for the image, for display purposes. |
| Window Width | (0028,1051) | 1C | The default window width value for the image, for display purposes. |

Table 103: SOP Common Module

| Attribute Name | Tag | Type | Attribute Use |
|------------------------|-------------|------|-----------------------------------|
| SOP Class UID | (0008,0016) | 1 | 1.2.840.10008.5.1.4.1.1.7 |
| SOP Instance UID | (0008,0018) | 1 | Generated. |
| Specific Character Set | (0008,0005) | 1C | 'ISO_IR 100' |
| Instance Creation Date | (0008,0012) | 3 | The date the message was created. |
| Instance Creation Time | (0008,0013) | 3 | The time the message was created. |

The System conforms to the SOP's of the Storage Service Class at level 2 (full). No data elements are discarded or coerced by the System.

3.2.2.1.13. SOP Specific Conformance to CT, MR, NM, and PET Image Storage SOP Class

The CT, MR, NM and PET Image IOD are forwarded verbatim. If the SCP has been configured to remove private tags prior to import, only the non-private attributes will be forwarded. The SOP Instance UID will be preserved regardless.

3.2.2.2. Print

3.2.2.2.1. Associated Real-World Activity

The ADACRTP_SCU application entity initiates an association for the Color or Grayscale print services class based on the configuration of the printer in Pinnacle³. The association is closed when the response to the N-ACTION on the Basic Film Session or Basic Film Box SOP classes is received.

The configuration of the printer in Pinnacle³ also includes the time-out value to wait for a reply message from the SCP. The default value is 30 seconds. If the time-out is exceeded, ADACRTP_SCU will abort the association.

3.2.2.2.2. Associated Real-World Activity for Print Image Operations

The ADACRTP_SCU application entity initiates associations for the printing of images to a Basic Print SCP. The image to be printed is specified by the user.

3.2.2.2.3. Associated Real-World Activity for Print Image Operations

When the user requests a print, an association is established with the configured application entity. ADACRTP_SCU sends a Printer, N-GET message to the Basic Print SCP to determine the status of the printer. This is followed by a Basic Film Session N-CREATE message, which in turn is followed by a Basic Film Box N-Create. Depending on the configuration of the printer, ADACRTP_SCU will then transmit a N-SET message on a Basic Grayscale or Color Image Box. Finally, an N-ACTION message is sent to instruct the Basic Print SCP to print either at the Basic Film Session or at the Basic Film Box level, depending on printer configuration.

3.2.2.2.4. Presentation Context Table

ADACRTP_SCU will initiate the presentation contexts as given in the following table.

Table 104: Supported Presentation Context for Print by ADACRTP_SCU

| Abstract Syntax | | Transfer Syntax | | Role | Ext. Neg. |
|---|------------------------|-----------------|-----------------|------|-----------|
| Name | UID | Name | UID | | |
| Basic Grayscale Print Management (META) | 1.2.840.10008.5.1.1.9 | ILE | 1.2.840.10008.2 | SCU | None |
| Basic Color Print Management (META) | 1.2.840.10008.5.1.1.18 | ILE | 1.2.840.10008.2 | SCU | None |

3.2.2.2.5. Print Conformance

ADACRTP_SCU provides standard conformance to the DICOM Print Service Classes.

3.2.2.2.6. SOP Specific Conformance to Verification SOP Class

ADACRTP_SCU provides standard conformance to the DICOM Verification Service Class.

3.2.2.2.7. SOP Specific Conformance to Print SOP Classes

Attribute values for SOP classes proposed by ADACRTP_SCU are specified in the following table.

Table 105: Print Actions and Attributes

| SOP Class Name | Command | Attribute Name | Valid Values | Default Value |
|--------------------|----------|-------------------------------|---|---------------|
| Basic Film Session | N-CREATE | Number of Copies | 1 | 1 |
| | | Print Priority | MEDIUM | MEDIUM |
| | | Medium Type | PAPER, CLEAR FILM, BLUE FILM | PAPER |
| | | Film Destination | MAGAZINE, PROCESSOR, BIN_1, BIN_2, BIN_3, BIN_4, BIN_5, BIN_6, BIN_7, BIN_8 | MAGAZINE |
| | N-ACTION | Referenced Print Job Sequence | (none, indicates start of sequence) | None |
| Basic Film Box | N-CREATE | Image Display Format | STANDARD\1,1 | STANDARD\1,1 |
| | | Film Orientation | PORTRAIT | PORTRAIT |
| | | Film Size ID | 14INX17IN, 14INX14IN, 11INX14IN, 10INX14IN, 10INX12IN, 8INX10IN, 24CMX30CM, 24CMX24CM | 14INX17IN |
| | | Magnification Type | CUBIC, BILINEAR, REPLICATE | CUBIC |
| | | Max Density | Printer Specific | None |
| | | Smoothing Type | Printer Specific | None |
| | | Empty Image Density | BLACK, WHITE | BLACK |
| | | Trim | YES, NO | NO |
| | | Border Density | BLACK, WHITE | WHITE |
| | | Configuration Information | Printer specific | None |
| | N-ACTION | Referenced Print Job Sequence | (none, indicates start of sequence) | None |

Table 105: Print Actions and Attributes

| SOP Class Name | Command | Attribute Name | Valid Values | Default Value |
|---------------------------|-----------------|----------------------------|-----------------|---------------|
| Basic Grayscale Image Box | N-SET | Samples Per Pixel | 1 | 1 |
| | | Photometric Interpretation | MONOCHROME2 | MONOCHROME2 |
| | | Pixel Representation | 0000 | 0000 |
| | | Rows | Image specific | None |
| | | Columns | Image specific | None |
| | | Pixel Data | Image specific | None |
| | | Pixel Aspect Ratio | 1\1 | 1\1 |
| | | Bits Allocated | 8 | 8 |
| | | Bits Stored | 8 | 8 |
| | | High Bit | 7 | 7 |
| | | Image Position | 1 | 1 |
| | | Requested Image Size | Image specific | None |
| | | Polarity | NORMAL, REVERSE | NORMAL |
| Basic Color Image Box | N-SET | Samples Per Pixel | 3 | 3 |
| | | Planar Configuration | 0 | 0 |
| | | Photometric Interpretation | RGB | RGB |
| | | Pixel Representation | 0000 | 0000 |
| | | Rows | Image specific | None |
| | | Columns | Image specific | None |
| | | Pixel Data | Image specific | None |
| | | Pixel Aspect Ratio | 1\1 | 1\1 |
| | | Bits Allocated | 8 | 8 |
| | | Bits Stored | 8 | 8 |
| | | High Bit | 7 | 7 |
| | | Image Position | 1 | 1 |
| | | Requested Image Size | Image specific | None |
| Polarity | NORMAL, REVERSE | NORMAL | | |
| Printer | N-GET | Printer Status | * | None |
| | | Printer Status Info | * | None |
| | | Manufacturer | * | None |
| | | Manufacturer's Model Name | * | None |
| | | Device Serial Number | * | None |
| | | Software Versions | * | None |

*The actual values depend on the type of printer.

The System conforms to the SOPs of the Print Service Class at level 2 (full). No data elements are discarded or coerced by the System.

4. COMMUNICATION PROFILES

4.1. Supported Communication Stacks

The TCP/IP protocol stack is used.

4.2. Physical Media Support

Any physical interconnection media supporting the TCP/IP protocol stack are supported, including:

- IEEE 802.3-1995 (Fast Ethernet) 100BASE-TX
- IEEE 802.3-1995 10BASE-TX

5. EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

Table 106: Mapping between UI elements and DICOM

| DICOM Attribute name | Tag | UI element |
|----------------------|-------------|-----------------------------------|
| Physician of Record | (0008,1048) | Radiation Oncologist |
| Operator's Name | (0008,1070) | Dosimetrist |
| Study Description | (0008,1110) | Comment |
| Patient's Name | (0010,0010) | Patient Last, First, Middle Names |
| Patient ID | (0010,0020) | Medical Record Number |
| Patient's Birth Date | (0010,0030) | Date of Birth |
| Patient's Sex | (0010,0040) | Gender |

6. CONFIGURATION

Configurable communication parameters include:

- **Maximum PDU Size.** The maximum size of a Protocol Data Unit (default: 28672 bytes).
- **Association Time-out.** The number of seconds to use as a time-out after waiting for an association request (default: 30 seconds).
- **Association Reply Time-out.** The number of seconds to wait for a reply to an association request (default: 15 seconds).
- **Association Release Time-out.** The number of seconds to wait for a reply to an association release (default: 15 seconds).
- **Connection Time-out.** The number of seconds to wait for a network connection to be accepted (default: 15 seconds).
- **Inactivity Time-out.** The number of seconds to wait for data between TCP/IP packets (default: 15 seconds).
- **TCP/IP Listen Port.** The TCP/IP port on which ADACRTP_SCP will listen for TCP/IP packets (default: 104).
- **DICOM Port.** The port number combined with the application entity title identifying ADACRTP_SCP to DICOM clients on the network (default: 104).
- **Application Entity Title.** The name of ADACRTP_SCP by which, combined with the DICOM Port number, DICOM clients may address the server (default: ADACRTP_SCP).

These configurations may be performed by Customer Support.

7. SUPPORT OF EXTENDED CHARACTER SETS

Extended Character Sets are not supported.

