

Elekta Oncology Systems Ltd.

DICOM Conformance Statement

for

PrecisePLAN 2.00 Export

(DICOM Release 2.00)

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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 Elekta Oncology Systems. This document specifies the compliance to the DICOM standard (formally called the NEMA PS 3.X-1998 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 Syntax's.

The field of application is the integration of the Elekta Oncology Systems equipment into an environment of medical devices.

This Conformance Statement should be read in conjunction with the DICOM standard and its addenda.

1.2 Intended audience

This Conformance Statement is intended for:

- (Potential) 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 chapter 2 through 7 and follows the contents and structuring requirements of DICOM PS 3.2-2001. Additionally, the Appendices following chapter 7 specify the details of the applied IODs, handling of SCP-specific status codes and extended configuration details.

1.4 Used definitions, terms and abbreviations

- DICOM definitions, terms and abbreviations are used throughout this Conformance Statement. For a description of these, see DICOM PS 3 2001.
- The word Elekta in this document refers to Elekta Oncology Systems Ltd.
- The word *PrecisePLAN* in this document refers to the Elekta Oncology Systems *PrecisePLAN* Treatment Planning System Product Release 2.00, or to *Render-Plan 3-D*® Release 4.10 with DICOM 2.00.

1.5 References

[DICOM PS 3 2001]

The Digital Imaging and Communications in Medicine (DICOM) standard:
DICOM PS 3.X (X refers to the part 1 - 13) and Supplements.
National Electrical Manufacturers Association (NEMA) Publication Sales
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209, United States of America

1.6 Important notes to the reader

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

- Scope

The goal of DICOM is to facilitate inter-connectivity rather than 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 a networked 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 Elekta equipment with non-Elekta equipment. It is the user's responsibility to analyse thoroughly the application requirements and to specify a solution that integrates Elekta equipment with non-Elekta equipment.

- Validation

Elekta equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where Elekta equipment is to be linked to non-Elekta 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 stability of prescription and prescription related data. Prospective users may contact Elekta for up-to-date information regarding available validation status and any known compatibility issues with specific 3rd party vendors. Ultimately, however, it is the responsibility of the user (or user's agent) to specify an appropriate test suite and to carry out additional validation tests on combinations of equipment used within the users environment. In particular integrators should not assume that the Elekta equipment would always be able to detect all forms of invalid data originating from 3rd party equipment.

- New versions of the DICOM Standard

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Elekta is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Elekta reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Elekta provider linking to Elekta equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Elekta equipment may lead to loss of connectivity and/or incompatibility.

2. Implementation Model

The DICOM Export within PrecisePLAN is a DICOM Client (SCU) for the purpose of exporting PrecisePLAN objects to external medical equipment. It provides the following features:

- ❑ Sending RT Plans to a remote database, often a Linear Accelerator or its patient management system.
- ❑ Sending CT images to a remote database.
- ❑ Sending DRR images (as RTIMAGE, CRIMAGE or SCIMAGE) to a viewing and portal imaging system.
- ❑ Sending RT Structure Set to a viewing, simulation, or similar system.
- ❑ Sending RT Dose to a Validation or similar system.

2.1 Application Data Flow Diagram

The PrecisePLAN DICOM Export behaves as a single Application Entity (AE). The related Implementation Model is shown in Figure 1 below.

2.2 Functional definition of Application Entity

The PrecisePLAN Application Entity acts as a Service Class User (SCU) of Verification and Storage Service Classes. The Application Entity is active only during an export from PrecisePLAN.

2.3 Sequencing of Real-World Activities

The user initiates the activity from the operator console by selecting one or more objects to be exported.

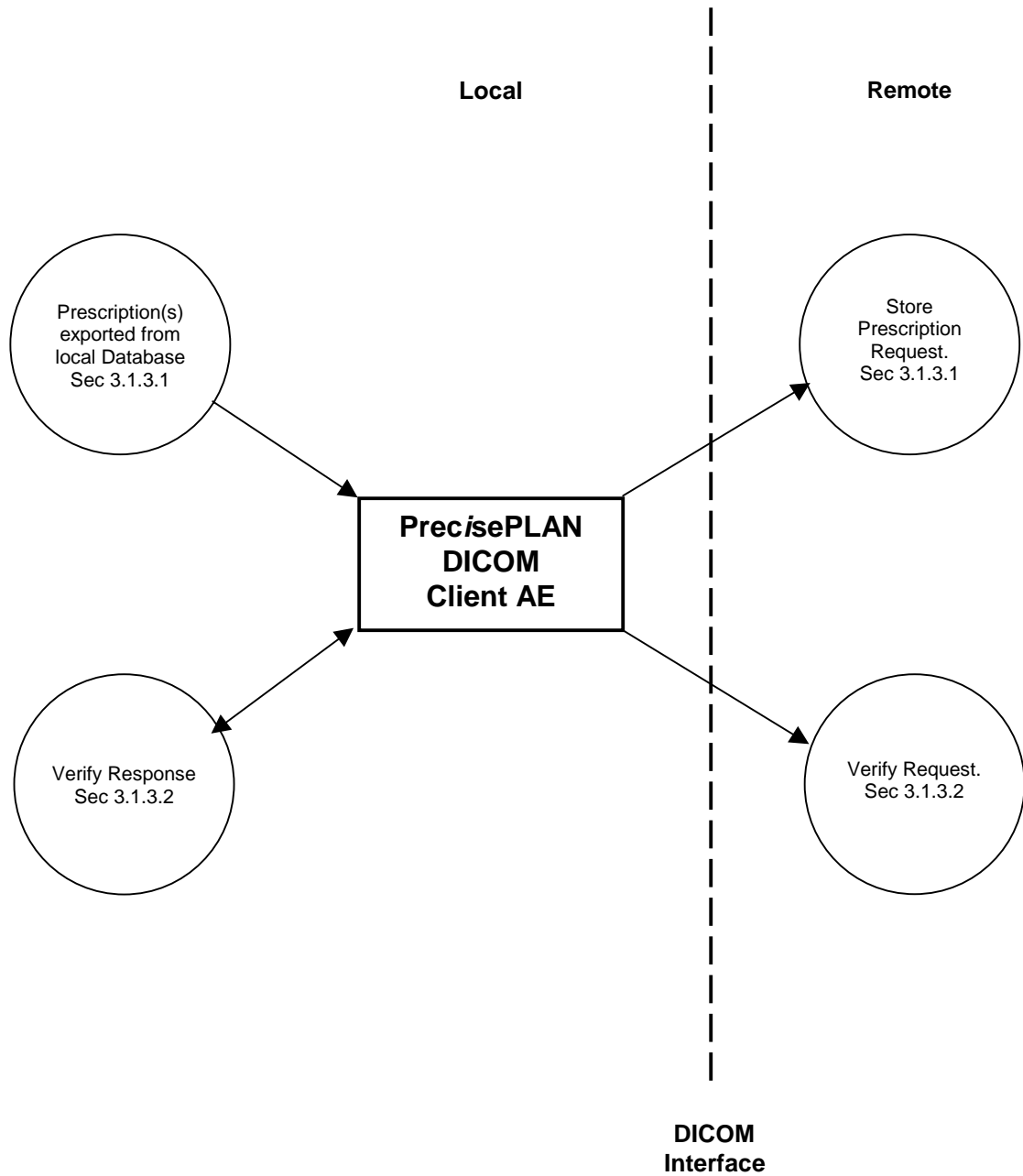


Figure 1 PrecisePLAN DICOM Export Implementation Model

3. AE Specifications

3.1 PrecisePLAN Export AE Specification

PrecisePLAN Client Application Entity provides Standard Conformance to the following DICOM V3.0 SOP classes as an SCU:

Table 1 SOP Classes supported by PrecisePLAN as SCU

SOP Class Name	UID
CR Image Storage	1.2.840.10008.5.1.4.1.1.1
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
SC Image Storage	1.2.840.10008.5.1.4.1.1.7
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
Verification	1.2.840.10008.1.1

3.1.1 Association Establishment Policies

3.1.1.1 General

The maximum PDU size for PrecisePLAN is configurable from a minimum of 4 Kbytes. There is no upper limit. It is limited by the available system resources. The default value is 64 Kbytes.

3.1.1.2 Number of Associations

PrecisePLAN supports one active association at a time as a Service Class User.

3.1.1.3 Asynchronous Nature

PrecisePLAN does not support asynchronous operations and will not perform asynchronous window negotiation.

3.1.1.4 Implementation Identifying Information

Implementation Class UID: 2.16.840.1.114090.1.0.2.0
 Implementation Version Name: rtClient 2.0

3.1.2 Association Initiation Policy

PrecisePLAN initiates associations under the control of the operator for the purpose of

- Exporting prescriptions or related objects from the PrecisePLAN system to a Linac or other similar system (Sec 3.1.3.1 below)
- Verify the application level communication from PrecisePLAN to another system (Sec 3.1.3.2 below)

3.1.3 Association Acceptance Policy

PrecisePLAN client does not accept associations.

3.1.3.1 Store Prescriptions into PrecisePLAN Database

3.1.3.1.1 Associated Real World Activity

PrecisePLAN requests associations with remote systems that it wishes to send prescriptions for storage into the remote database.

3.1.3.1.2 Presentation Context Table

PrecisePLAN proposes following presentation contexts, listed in the order of preference.

Table 2 Proposed Presentation Contexts for PrecisePLAN Image Storage

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
CR Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Image Storage	1.2.840.10008.5.1.4.1.1.481.1	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

Table 3 Proposed Presentation Contexts for PrecisePLAN Prescription Objects Storage

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Struct Storage	1.2.840.10008.5.1.4.1.1.481.3	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	Explicit VR Big Endian	1.2.840.10008.1.2.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Implicit VR Little Endian	1.2.840.10008.1.2		

3.1.3.1.3 C-STORE SCU Conformance

PrecisePLAN provides standard conformance for Storage as an SCU.

The PrecisePLAN system performs a Conformance Level 0 for Storage, i.e., not all DICOM Type 1 and 2 attributes received earlier by another module may have been stored for re-export. Also, a subset of the stored attributes may be exported. The attributes handled and their mapping is listed in the Appendices.

The PrecisePLAN operator determines the duration of storage of the originating prescription data in the local database.

3.1.3.1.4 Presentation Context Acceptance Criterion

Not applicable.

3.1.3.1.5 Transfer Syntax Selection Policies

Not applicable.

3.1.3.2 Verify Application Level Communication

3.1.3.2.1 Associated Real World Activity

PrecisePLAN requests associations from remote systems to verify the application level communication using the C-ECHO command.

3.1.3.2.2 Presentation Context Table

All of the presentation contexts shown in Table 4 below are offered:

Table 4 Acceptable Presentation Contexts for Verification

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1	SCP	None
		Explicit VR Big Endian	1.2.840.10008.1.2.2	SCP	None

3.1.3.2.3 C-ECHO SCP Conformance

PrecisePLAN provides standard conformance for Verification as an SCU.

3.1.3.2.4 Presentation Context Acceptance Criterion

Not applicable.

3.1.3.2.5 Transfer Syntax Selection Policies

Not applicable.

4. Communication Profiles

4.1 Supported Communication Stacks

PrecisePLAN application provides DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

4.2 TCP/IP Stack

PrecisePLAN inherits its TCP/IP stack from the SGI IRIX 6.5 operating system upon which it executes.

4.3 Physical Media Support

PrecisePLAN supports Ethernet ISO.8802-3.

On Elekta supplied hardware platforms the connection type provided is 100/10BASE-T (RJ45 twisted pair).

5. Extensions/Specialisations/Privatisations

Not applicable.

6. Configuration

PrecisePLAN DICOM configuration is maintained through a special utility. The configuration changes are intended to be performed by Elekta service engineers or by Customer engineers with reference to the User Documentation.

6.1 AE Title/Presentation Address mapping

These changes are effective immediately after being committed.

6.1.1 Local AE Titles and Presentation Addresses

The local Application Entity Title is derived from the workstation hostname, which is configurable.

6.1.2 Remote AE Titles and Presentation Addresses

The remote AE Title and IP address are configurable as per the requirement of the remote SCP.

6.2 Configurable Parameters

6.2.1 Communication Parameters

- Maximum PDU size is configurable.
- DICOM Upper Layer Timeouts are configurable.

6.2.2 PrecisePLAN Attribute Mapping

- The mapping of certain PrecisePLAN Prescription parameters to the RT Plan IOD can be disabled through configuration setting (see Appendix F).

7. Support of Extended Character Sets

None.

APPENDIX A Applied RT Plan IOD and Mapping to PrecisePLAN Database

A.1 Export of RT Plan Prescriptions

The modules selected from the RT Plan IOD of DICOM for prescription export are given in Table 5 below. If a module is not listed, none of the attributes in that module is sent by PrecisePLAN.

Table 5 Applied Modules in the RT Plan IOD for Export (SCU Role)

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	RT Series	M
Equipment	General Equipment	M
Plan	RT General Plan	M
	RT Prescription	U
	RT Fraction Scheme	U
	RT Beams	C
	SOP Common	M

Table 6 to Table 15 specify, for each of the applied modules above, the attributes sent by PrecisePLAN, further details of mapping onto the PrecisePLAN database, and any attribute specific constraints applicable to their use. Attributes that are never sent by PrecisePLAN are shown shaded.

Note that PrecisePLAN configuration settings may determine whether certain attributes are included in the sent message (see Appendix G).

Table 6 RT Plan Storage SOP Class (SCP) – Patient Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patients Name	(0010,0010)	PN 1	2	The patients name in PrecisePLAN.
Patient ID	(0010, 0020)	LO 1	2	The patients id number in PrecisePLAN
Patient's Birth Date	(0010, 0030)	DA 1	2	Birth date, time and Gender from original CT input or as modified in Workflow Manager.
Patient's Birth Time	(0010, 0032)	TM 1	3	
Patients Sex	(0010, 0040)	CS 1	2	Not sent to Elekta Precise Desktop.
Other Patient IDs	(0010, 1000)	LO 1-N	3	Patient file name
Referenced Patient Sequence	(0008, 1120)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Other Patient Names	(0010, 1001)	PN 1-N	3	
Ethnic Group	(0010, 2160)	SH 1	3	
Patient Comments	(0010, 4000)	LT 1	3	

Note I Handling of Empty Patient Identification Attributes

The Patient ID (0010, 0020) and Patient Name (0010, 0010) attributes of the Patient Module are specified by DICOM as Type 2 and so may legally have zero length. PrecisePLAN always sends a value in Patient Name, and apart from RTOG mode always sends a value in Patient ID. PrecisePLAN always has a patient name but can have no patient Id. In this situation the patient name will also be sent as the patient Id when an ID is required. In RTOG mode all patient module entries are sent empty except the patient name which is sent with the RTOG Protocol and Subject Id.

Table 7 RT Plan Storage SOP Class (SCP) – General Study Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Study Instance UID	(0020, 000D)	UI 1	1	
Study Date	(0008, 0020)	DA 1	2	Date plan was last saved.
Study Time	(0008, 0030)	TM 1	2	Time plan was last saved.
Referring Physicians Name	(0008, 0090)	PN 1	2	First Doctors name in Workflow Manager or sent blank.
Study ID	(0020, 0010)	SH 1	2	
Accession Number	(0008, 0050)	SH 1	2	Sent blank.
Study Description	(0008, 1030)	LO 1	3	Never sent
Physician(s) of Record	(0008, 1048)	PN 1-N	3	
Name of Physician(s) Reading Study	(0008, 1060)	PN 1-N	3	
Referenced Study Sequence	(0008, 1110)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 8 RT Plan Storage SOP Class (SCP) – RT Series Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Modality	(0008, 0060)	CS 1	1	"RTPLAN"
Series Instance UID	(0020, 000E)	UI 1	1	
Series Number	(0020, 0011)	IS 1	2	
Series Description	(0008, 103E)	LO 1	3	Plan description
Referenced Study Component Sequence	(0008, 1111)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 9 RT Plan Storage SOP Class (SCP) – General Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Manufacturer	(0008, 0070)	LO 1	2	Always "Elekta"
Institution Name	(0008, 0080)	LO 1	3	Never sent
Institution Address	(0008, 0081)	ST 1	3	
Station Name	(0008, 1010)	SH 1	3	The PrecisePLAN hostname.
Institutional Department Name	(0008, 1040)	LO 1	3	Never sent
Manufacturer's Model Name	(0008, 1090)	LO 1	3	The host product name is sent: either "PrecisePLAN", "Render-Plan 3-D"
Device Serial Number	(0018, 1000)	LO 1	3	CPU number of host SGI
Software Version	(0018, 1020)	LO 1-N	3	Build identification of DicomRT software
Spatial Resolution	(0018, 1050)	DS 1	3	Never sent
Date of Last Calibration	(0018, 1200)	DA 1-N	3	
Time of Last Calibration	(0018, 1201)	TM 1-N	3	
Pixel Padding Value	(0028, 0120)	US 1	3	

Table 10 RT Plan Storage SOP Class (SCP) – RT General Plan Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
RT Plan Label	(300A, 0002)	SH 1	1	Plan number
RT Plan Name	(300A, 0003)	LO 1	3	Plan description
RT Plan Description	(300A, 0004)	ST 1	3	Never sent
Operators Name	(0008, 1070)	PN 1-N	2	The logged in username running PrecisePLAN
RT Plan Date	(300A, 0006)	DA 1	2	Date plan was last saved.
RT Plan Time	(300A, 0007)	TM 1	2	Time plan was last saved.
Treatment Protocols	(300A, 0009)	LO 1-N	3	Never sent
Treatment Intent	(300A, 000A)	CS 1	3	
Treatment Sites	(300A, 000B)	LO 1-N	3	
RT Plan Geometry	(300A, 000C)	CS 1	1	"PATIENT"
Referenced Structure Set Sequence	(300C, 0060)	SQ 1	1C	Always sent even if a structure set is not included in the export. (The Structure Set may be exported separately later)
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Referenced Dose Sequence	(300C, 0080)	SQ 1	3	Sent if RTDOSE is exported.
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	One cross reference for each exported RTDOSE object.
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Referenced RT Plan Sequence	(300C, 0002)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>RT Plan Relationship	(300A, 0055)	CS 1	1C	

Table 11 RT Plan Storage SOP Class (SCP) – RT Prescription Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Prescription Description	(300A, 000E)	ST 1	3	Never sent
Dose Reference Sequence	(300A, 0010)	SQ 1	3	Created for each PrecisePLAN Calculation point.
>Dose Reference Number	(300A, 0012)	IS 1	1C	Sequential number starting from 1
>Dose Reference Structure Type	(300A, 0014)	CS 1	1C	Always "COORDINATES"
>Dose Reference Description	(300A, 0016)	LO 1	3	The label of the PrecisePLAN calculation point.
>Referenced ROI Number	(3006, 0084)	IS 1	1C	Never sent
>Dose Reference Point Coordinates	(300A, 0018)	DS 3	1C	Patient coordinates of the calculation point.
>Nominal Prior Dose	(300A, 001A)	DS 1	3	Never sent
>Dose Reference Type	(300A, 0020)	CS 1	1C	Either 'TARGET' or 'ORGAN_AT_RISK' depending on whether the PrecisePLAN calculation point label ends with /t or /T to define the point as a target.
>Constraint Weight	(300A, 0021)	DS 1	3	Never sent
>Delivery Warning Dose	(300A, 0022)	DS 1	3	Calculation point Max Dose.
>Delivery Maximum Dose	(300A, 0023)	DS 1	3	Never sent
>Target Minimum Dose	(300A, 0025)	DS 1	3	
>Target Prescription Dose	(300A, 0026)	DS 1	3	Calculation point Max Dose (if Dose Reference Type is 'TARGET')
>Target Maximum Dose	(300A, 0027)	DS 1	3	
>Target Underdose Volume Fraction	(300A, 0028)	DS 1	3	
>Organ at Risk Full-volume Dose	(300A, 002A)	DS 1	3	Never sent
>Organ at Risk Limit Dose	(300A, 002B)	DS 1	3	
>Organ at Risk Maximum Dose	(300A, 002C)	DS 1	3	Calculation point Max Dose (if Dose Reference Type is 'ORGAN_AT_RISK')
>Organ at Risk Overdose Volume Fraction	(300A, 002D)	DS 1	3	Never sent

Table 12 RT Plan Storage SOP Class (SCP) – RT Patient Setup Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patient Setup Sequence	(300A, 0180)	SQ 1	1	One Patient Setup is sent for each beam.
>Patient Setup Number	(300A, 0182)	IS 1	1	Referenced beam number
>Patient Position	(0018, 5100)	CS 1	1C	
>Fixation Device Sequence	(300A, 0190)	SQ 1	3	Sent if SBF used and not Precise Desktop Validation. (If Precise Desktop validation is selected the SBF coordinates are included in the Beam Description).
>>Fixation Device Type	(300A, 0192)	CS 1	1C	"BODYFRAME" if used.
>>Fixation Device Label	(300A, 0194)	SH 1	2C	"SBF" if used.
>>Fixation Device Description	(300A, 0196)	ST 1	3	The coordinates in SBF space of the beam isocenter if SBF used.

Table 13 RT Plan Storage SOP Class (SCP) – RT Fraction Scheme Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Fraction Group Sequence	(300A, 0070)	SQ 1	1	Used to create Fractions for new Phase
>Fraction Group Number	(300A, 0071)	IS 1	1	Sequentially allocated beginning at 1.
>Referenced Patient Setup Number	(300C, 006A)	IS 1	3	Never sent
>Referenced Dose Sequence	(300C, 0080)	SQ 1	3	
>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>Referenced Dose Reference Sequence	(300C, 0050)	SQ 1	3	
>>Referenced Dose Reference Number	(300C, 0051)	IS 1	1C	
>>Constraint Weight	(300A, 0021)	DS 1	3	
>>Delivery Warning Dose	(300A, 0022)	DS 1	3	
>>Delivery Maximum Dose	(300A, 0023)	DS 1	3	
>>Target Minimum Dose	(300A, 0025)	DS 1	3	
>>Target Prescription Dose	(300A, 0026)	DS 1	3	
>>Target Maximum Dose	(300A, 0027)	DS 1	3	
>>Target Underdose Volume Fraction	(300A, 0028)	DS 1	3	
>>Organ at Risk Full-volume Dose	(300A, 002A)	DS 1	3	
>>Organ at Risk Limit Dose	(300A, 002B)	DS 1	3	
>>Organ at Risk Maximum Dose	(300A, 002C)	DS 1	3	
>>Organ at Risk Overdose Volume Fraction	(300A, 002D)	DS 1	3	
>Number of Fractions Planned	(300A, 0078)	IS 1	2	Number of Treatments prescribed for this Fraction
>Number of Fractions Per Day	(300A, 0079)	IS 1	3	Never sent
>Repeat Fraction Cycle Length	(300A, 007A)	IS 1	3	
>Fraction Pattern	(300A, 007B)	LT 1	3	
>Number of Beams	(300A, 0080)	IS 1	1	Number of Beams in Fraction
>Referenced Beam Sequence	(300C, 0004)	SQ 1	1C	
>>Referenced Beam Number	(300C, 0006)	IS 1	1C	
>>Beam Dose Specification Point	(300A, 0082)	DS 3	3	Never sent
>>Beam Dose	(300A, 0084)	DS 1	3	Prescribed beam dose
>>Beam Meterset	(300A, 0086)	DS 1	3	Total MU for this beam (open + wedged)
>Number of Brachy Application Setups	(300A, 00A0)	IS 1	1	Always zero.
>Referenced Brachy Application Setup Sequence	(300C, 000A)	SQ 1	1C	Never sent
>>Referenced Brachy Application Setup Number	(300C, 000C)	IS 1	1C	
>>Brachy Application Setup Dose Specification Point	(300A, 00A2)	DS 3	3	
>>Brachy Application Setup Dose	(300A, 00A4)	DS 1	3	

Table 14 RT Plan Storage SOP Class (SCP) – RT Beams Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Beam Sequence	(300A, 00B0)	SQ 1	1	
>Beam Number	(300A, 00C0)	IS 1	1	
>Beam Name	(300A, 00C2)	LO 1	3	
>Beam Description	(300A, 00C3)	ST 1	3	Same as beam name unless Precise Desktop Validation is configured AND the SBF is used in which case the coordinates in SBF space of the beam isocenter are sent.
>Beam Type	(300A, 00C4)	CS 1	1	
>Radiation Type	(300A, 00C6)	CS 1	2	"PHOTON" or "ELECTRON" only
>Treatment Machine Name	(300A, 00B2)	SH 1	2	As configured by the user in MACHINE configuration.
>Manufacturer	(0008, 0070)	LO 1	3	Always "Elekta"
>Institution Name	(0008, 0080)	LO 1	3	Never sent
>Institution Address	(0008, 0081)	ST 1	3	
>Institutional Department Name	(0008, 1040)	LO 1	3	
>Manufacturers Model Name	(0008, 1090)	LO 1	3	
>Device Serial Number	(0018, 1000)	LO 1	3	The host product name: "PrecisePLAN", "Render-Plan 3-D" or "FiducialPLAN"
>Primary Dosimeter Unit	(300A, 00B3)	CS 1	3	As configured by the user in MACHINE configuration. Not sent if configured as blank.
>Referenced Tolerance Table Number	(300C, 00A0)	IS 1	3	Always "MU".
>Source-Axis Distance	(300A, 00B4)	DS 1	3	Never sent
>Beam Limiting Device Sequence	(300A, 00B6)	SQ 1	1	
>>RT Beam Limiting Device Type	(300A, 00B8)	CS 1	1	
>>Source to Beam Limiting Device Distance	(300A, 00BA)	DS 1	3	Never sent
>>Number of Leaf/Jaw Pairs	(300A, 00BC)	IS 1	1	
>>Leaf Position Boundaries	(300A, 00BE)	DS 3-N	2C	Sent if BLD is MLC
>Referenced Patient Setup Number	(300C, 006A)	IS 1	3	Sent for each selected active beam.

>Referenced Reference Image Sequence	(300C, 0042)	SQ 1	3	Never sent
>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>>Reference Image Number	(300A, 00C8)	IS 1	1C	
>>Start Cumulative Meterset Weight	(300C, 0008)	DS 1	3	
>>End Cumulative Meterset Weight	(300C, 0009)	DS 1	3	
>Planned Verification Image Sequence	(300A, 00CA)	SQ 1	3	
>>Start Cumulative Meterset Weight	(300C, 0008)	DS 1	3	
>>Meterset Exposure	(3002, 0032)	DS 1	3	
>>End Cumulative Meterset Weight	(300C, 0009)	DS 1	3	
>>RT Image Plane	(3002, 000C)	CS 1	3	
>>X-Ray Image receptor Angle	(3002, 000E)	DS 1	3	
>>RT Image Orientation	(3002, 0010)	DS 6	3	
>>RT Image Position	(3002, 0012)	DS 2	3	
>>RT Image SID	(3002, 0026)	DS 1	3	
>>Imaging Device-Specific Acquisition Parameters	(300A, 00CC)	LO 1-N	3	
>>Referenced Reference Image Number	(300C, 0007)	IS 1	3	
>Treatment Delivery Type	(300A, 00CE)	CS 1	3	Always "TREATMENT"
>Referenced Dose Sequence	(300C, 0080)	SQ 1	3	Never sent
>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>Number of Wedges	(300A, 00D0)	IS 1	1	Zero or one
>Wedge Sequence	(300A, 00D1)	SQ 1	1C	Sent if wedge is used
>>Wedge Number	(300A, 00D2)	IS 1	1C	If wedge used set to 1
>>Wedge Type	(300A, 00D3)	CS 1	2C	Configured per MACHINE and wedge.
>>Wedge ID	(300A, 00D4)	SH 1	3	The PrecisePLAN wedge label.
>>Wedge Angle	(300A, 00D5)	IS 1	2C	Nominal angle sent.
>>Wedge Factor	(300A, 00D6)	DS 1	2C	
>>Wedge Orientation	(300A, 00D8)	DS 1	2C	
>>Source to Wedge Tray Distance	(300A, 00DA)	DS 1	3	Never sent

>Number of Compensators	(300A, 00E0)	IS 1	1	Zero or one.
>Total Compensator Tray Factor	(300A, 00E2)	DS 1	3	Never sent
>Compensator Sequence	(300A, 00E3)	SQ 1	1C	Sent if there is a compensator for this beam
>>Compensator Number	(300A, 00E4)	IS 1	1C	Always 1
>>Material ID	(300A, 00E1)	SH 1	2C	Sent if Compensator and RTD Validation is configured. Always blank. See Note below.
>>Compensator ID	(300A, 00E5)	SH 1	3	Sent if compensator.
>>Source to Compensator Tray Distance	(300A, 00E6)	DS 1	2C	Sent if compensator.
>>Compensator Rows	(300A, 00E7)	IS 1	1C	Sent if compensator.
>>Compensator Columns	(300A, 00E8)	IS 1	1C	Sent if compensator.
>>Compensator Pixel Spacing	(300A, 00E9)	DS 2	1C	Sent if compensator.
>>Compensator Position	(300A, 00EA)	DS 2	1C	Sent if compensator.
>>Compensator Transmission Data	(300A, 00EB)	DS 1-N	1C	Sent if compensator.
>>Compensator Thickness Data	(300A, 00EC)	DS 1-N	1C	Sent if Compensator and RTD Validation is configured, values are height toward the radiation source. See Note below.
>Number of Boli	(300A, 00ED)	IS 1	1	Always zero.
>Referenced Bolus Sequence	(300C, 00B0)	SQ 1	1C	Never sent
>>Referenced ROI Number	(3006, 0084)	IS 1	1C	
>Number of Blocks	(300A, 00F0)	IS 1	1	Total number of Blocks plus Apertures
>Total Block Tray Factor	(300A, 00F2)	DS 1	3	
>Block Sequence	(300A, 00F4)	SQ 1	1C	
>>Block Tray ID	(300A, 00F5)	SH 1	3	If configured, the prefix number or string from the Block or Irregular field label. This is configured per MACHINE. For PreciseDesktop this is the Photon ShadowTrayId or Electron Cone EndFrameld.
>>Source to Block Tray Distance	(300A, 00F6)	DS 1	2C	
>>Block Type	(300A, 00F8)	CS 1	1C	"APERTURE" or "SHIELDING"
>>Block Divergence	(300A, 00FA)	CS 1	2C	Always "PRESENT"
>>Block Number	(300A, 00FC)	IS 1	1C	Sequential number starting with 1
>>Block Name	(300A, 00FE)	LO 1	3	Full user entered block label.
>>Material ID	(300A, 00E1)	SH 1	2C	Sent blank.
>>Block Thickness	(300A, 0100)	DS 1	2C	Sent blank.
>>Block Transmission	(300A, 0102)	DS 1	2C	
>>Block Number of Points	(300A, 0104)	IS 1	2C	
>>Block Data	(300A, 0106)	DS 2-2N	2C	Set of 2-D coordinates defining the block or aperture shape.

Note: Compensator Material and Thickness Data are sent to overcome an error in the DICOM library used by one of the tested destinations which required Thickness AND Transmission.

>Applicator Sequence	(300A, 0107)	SQ 1	3	Only be present if Radiation Type (300A, 00C6) is "ELECTRON".
>>Applicator ID	(300A, 0108)	SH 1	1C	If configured, the prefix number or string from the Block or Irregular field label. This is configured per MACHINE. For PreciseDesktop this is the Electron Cone EndFrameId.
>>Applicator Type	(300A, 0109)	CS 1	1C	"ELECTRON_SQUARE", "ELECTRON_RECT", "ELECTRON_CIRC", or "ELECTRON_SHORT" "ELECTRON_OPEN" is not supported.
>>Applicator Description	(300A, 010A)	LO 1	3	PrecisePLAN's textual description of the applicator.
>Final Cumulative Meterset Weight	(300A, 010E)	DS 1	1C	Used in conjunction with Beam Meterset (300A, 0086) for this Beam (from RT Fraction Scheme Module) to specify Prescribed Field MU.
>Number of Control Points	(300A, 0110)	IS 1	1	
>Control Point Sequence	(300A, 0111)	SQ 1	1	
>>Control Point Index	(300A, 0112)	IS 1	1C	Values start from 0 and increase in steps of 1 for each control point.
>>Cumulative Meterset Weight	(300A, 0134)	DS 1	2C	Used in conjunction with Beam Meterset (300A, 0086) for this Beam (from RT Fraction Scheme Module) to derive Control Point MU.
>>Referenced Dose Reference Sequence	(300C, 0050)	SQ 1	3	
>>>Referenced Dose Reference Number	(300C, 0051)	IS 1	1C	Will match a Dose Reference Number (300A, 0012) included in the RT Prescription Module.
>>>Cumulative Dose Reference Coefficient	(300A, 010C)	DS 1	2C	Used in conjunction with Beam Dose (300A, 0084) for this Beam (from RT Fraction Scheme Module) to derive the Field Dose Contribution from this Beam to the respective Dose Monitoring Point.
>>Nominal Beam Energy	(300A, 0114)	DS 1	3	
>>Dose Rate Set	(300A, 0115)	DS 1	3	Never sent.
>>Wedge Position Sequence	(300A, 0116)	SQ 1	3	
>>>Referenced Wedge Number	(300C, 00C0)	IS 1	1C	
>>>Wedge Position	(300A, 0118)	CS 1	1C	Wedge position (IN, OUT only) will apply to whole of forthcoming segment.
>>Beam Limiting Device Position Sequence	(300A, 011A)	SQ 1	1C	
>>>RT Beam Limiting Device Type	(300A, 00B8)	CS 1	1C	
>>>Leaf/Jaw Positions	(300A, 011C)	DS 2-2N	1C	Only PHOTON Beams will specify MLC leaf positions. For ELECTRONS the MACHINE configuration within PrecisePLAN defines whether the nominal cone size is used to set these values or whether the projected field size at the isocenter should be used. For RTD the nominal cone size setting should be selected. Resolution is configurable between 1mm and 0.1mm.

>>Gantry Angle	(300A, 011E)	DS 1	1C	A configurable offset can be added to align non IEC scale systems.
>>Gantry Rotation Direction	(300A, 011F)	CS 1	1C	
>>Beam Limiting Device Angle	(300A, 0120)	DS 1	1C	A configurable offset can be added to align non IEC scale systems.
>>Beam Limiting Device Rotation Direction	(300A, 0121)	CS 1	1C	
>>Patient Support Angle	(300A, 0122)	DS 1	1C	A configurable offset can be added to align non IEC scale systems.
>>Patient Support Rotation Direction	(300A, 0123)	CS 1	1C	
>>Table Top Eccentric Axis Distance	(300A, 0124)	DS 1	3	Never sent
>>Table Top Eccentric Angle	(300A, 0125)	DS 1	1C	
>>Table Top Eccentric Rotation Direction	(300A, 0126)	CS 1	1C	
>>Table Top Vertical Position	(300A, 0128)	DS 1	2C	Each of Vertical, Lateral and Longitudinal can be configured to be sent or not per destination machine.
>>Table Top Longitudinal Position	(300A, 0129)	DS 1	2C	
>>Table Top Lateral Position	(300A, 012A)	DS 1	2C	A configurable offset can be added to align non IEC scale systems.
>>Isocenter Position	(300A, 012C)	DS 3	2C	Never sent
>>Surface Entry Point	(300A, 012E)	DS 3	3	
>>Source to Surface Distance	(300A, 0130)	DS 1	3	Not sent for ARC or multi-port beams.

Table 15 RT Plan Storage SOP Class (SCP) – SOP Common Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
SOP Class UID	(0008, 0016)	UI 1	1	1.840.10008.5.1.4.1.1.481.5 only
SOP Instance UID	(0008, 0018)	UI 1	1	PrecisePLAN will create a plan instance UID for each plan export.
Instance Creation Date	(0008, 0012)	DA 1	3	Last date plan was saved
Instance Creation Time	(0008, 0013)	TM 1	3	Last time plan was saved
Instance Creator UID	(0008, 0014)	UI 1	3	The UID stem defining the workstation.

APPENDIX B Applied SC Image IOD and Mapping to PrecisePLAN Database

B.1 Export of SC Images

Digitally Reconstructed Radiographs (DRRs) are exported from PrecisePLAN by one of RT Image, CR Image or SC Image formats according to the configuration. For brevity, only the SC format is described in this document. The RT and CR Image formats have a similar mapping with attributes added or removed to achieve conformance.

The modules selected from the Secondary Capture Image IOD table of DICOM for image export are given in the table below. If a module is not listed, none of the attributes in that module is sent by PrecisePLAN.

Table 16 Applied Modules in the SC Image IOD for Export (SCU Role)

IE	Module
Patient	Patient
Study	General Study
Series	General Series
Equipment	General Equipment
	SC Equipment
Image	General Image
	Image Pixel
	SC Image
	SOP Common

The tables below specify the applied attributes for each module, and note their mappings from the PrecisePLAN database. If an attribute is not listed, or is grayed out, it is not sent by PrecisePLAN. If an attribute is listed without Notes, there is a mapping from a directly equivalent PrecisePLAN database entry.

Note that PrecisePLAN configuration settings may determine whether certain attributes are included in the sent message (see Appendix G).

Table 17 SC Image Storage SOP Class (SCU) – Patient Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patients Name	(0010,0010)	PN 1	2	The patients name in PrecisePLAN.
Patient ID	(0010, 0020)	LO 1	2	The patients id number in PrecisePLAN
Patient's Birth Date	(0010, 0030)	DA 1	2	Sent blank
Patients Sex	(0010, 0040)	CS 1	2	
Referenced Patient Sequence	(0008, 1120)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Patient's Birth Time	(0010, 0032)	TM 1	3	
Other Patient IDs	(0010, 1000)	LO 1-N	3	
Other Patient Names	(0010, 1001)	PN 1-N	3	
Ethnic Group	(0010, 2160)	SH 1	3	
Patient Comments	(0010, 4000)	LT 1	3	

Table 18 SC Image Storage SOP Class (SCU) – General Study Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Study Instance UID	(0020, 000D)	UI 1	1	
Study Date	(0008, 0020)	DA 1	2	Date plan was last saved.
Study Time	(0008, 0030)	TM 1	2	Time plan was last saved.
Referring Physicians Name	(0008, 0090)	PN 1	2	Sent blank.
Study ID	(0020, 0010)	SH 1	2	
Accession Number	(0008, 0050)	SH 1	2	Sent blank.
Study Description	(0008, 1030)	LO 1	3	Never sent
Physician(s) of Record	(0008, 1048)	PN 1-N	3	
Name of Physician(s) Reading Study	(0008, 1060)	PN 1-N	3	
Referenced Study Sequence	(0008, 1110)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 19 SC Image Storage SOP Class (SCU) – General Series Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Modality	(0008, 0060)	CS 1	1	"CR"
Series Instance UID	(0020, 000E)	UI 1	1	
Series Number	(0020, 0011)	IS 1	2	
Protocol Name	(0018, 1030)	LO 1	3	Never sent
Series Description	(0008, 103E)	LO 1	3	Sent blank.
Patient Position	(0018, 5100)	LO 1	2C	
Referenced Study Component Sequence	(0008, 1111)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 20 SC Image Storage SOP Class (SCU) – General Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Manufacturer	(0008, 0070)	LO 1	2	Always "Elekta"
Institution Name	(0008, 0080)	LO 1	3	Never sent
Institution Address	(0008, 0081)	ST 1	3	
Station Name	(0008, 1010)	SH 1	3	The PrecisePLAN hostname.
Institutional Department Name	(0008, 1040)	LO 1	3	Never sent
Manufacturer's Model Name	(0008, 1090)	LO 1	3	The host product name is sent: either "PrecisePLAN" or "Render-Plan 3-D"
Device Serial Number	(0018, 1000)	LO 1	3	CPU number of host SGI
Software Version	(0018, 1020)	LO 1-N	3	Build identification of DicomRT software
Spatial Resolution	(0018, 1050)	DS 1	3	Never sent
Date of Last Calibration	(0018, 1200)	DA 1-N	3	
Time of Last Calibration	(0018, 1201)	TM 1-N	3	
Pixel Padding Value	(0028, 0120)	US 1	3	

Table 21 SC Image Storage SOP Class (SCU) – SC Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Conversion Type	(0008, 0064)	CS 1	1	"DV"
Modality	(0008, 0060)	CS 1	3	"CR"
Secondary Capture Device ID	(0018, 1010)	LO 1	3	
Secondary Capture Device Manufacturer	(0018, 1016)	LO 1	3	
Secondary Capture Device Manufacturer's Model Name	(0018, 1018)	LO 1	3	"PrecisePLAN"
Secondary Capture Device Software Version	(0018, 1019)	LO 1-n	3	

Table 22 SC Image Storage SOP Class (SCU) – General Image Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Image Number	(0020, 0013)	IS 1	2	
Patient Orientation	(0020, 0020)	CS 2	2C	
Image Date	(0008, 0023)	DA 1	2C	Image acquisition date
Image Time	(0008, 0033)	TM 1	2C	Image acquisition time
Image Type	(0008, 0008)	CS 1-n	3	"DERIVED\SECONDARY\DRR"
Acquisition Date	(0008, 0022)	DA 1	3	Image acquisition date
Acquisition Time	(0008, 0032)	TM 1	3	Image acquisition time
Images in Acquisition	(0020, 1002)	IS 1	3	1
Image Comments	(0020, 4000)	LT 1	3	

Table 23 SC Image Storage SOP Class (SCU) –Image Pixel Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Samples per Pixel	(0028, 0002)	US 1	1	1
Photometric Interpretation	(0028, 0004)	CS 1	1	"MONOCHROME2" or "RGB" according to Configuration setting
Rows	(0028, 0010)	US 1	1	
Columns	(0028, 0011)	US 1	1	
Bits Allocated	(0028, 0100)	US 1	1	8 or 16
Bits Stored	(0028, 0101)	US 1	1	8 or 12
High Bit	(0028, 0102)	US 1	1	7 or 11
Pixel Representation	(0028, 0103)	US 1	1	0
Pixel Data	(7FE0, 0010)	OW/OB	1	
Planar Configuration	(0028, 0006)	US 1	1C	Only sent for RGB, always 0
Pixel Aspect Ratio	(0028, 0034)	IS 2	1C	1/1 always
Smallest Image Pixel Value	(0028, 0106)	US 1	3	Never sent
Largest Image Pixel Value	(0028, 0107)	US 1	3	

Table 24 SC Image Storage SOP Class (SCU) – SC Image Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Date of Secondary Capture	(0018, 1012)	DA 1	3	Image acquisition date
Time of Secondary Capture	(0018, 1014)	TM 1	3	Image acquisition time

Table 25 SC Image Storage SOP Class (SCU) – SOP Common Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
SOP Class UID	(0008, 0016)	UI 1	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008, 0018)	UI 1	1	Generated by PrecisePLAN
Instance Creation Date	(0008, 0012)	DA 1	3	Last date plan was saved
Instance Creation Time	(0008, 0013)	TM 1	3	Last time plan was saved
Instance Creator UID	(0008, 0014)	UI 1	3	The UID stem for the export

APPENDIX C Applied RTDOSE Image IOD and Mapping to PrecisePLAN Database

C.1 Export of RTDOSE

The modules selected from the RTDOSE IOD table of DICOM for export are given in the table below. If a module is not listed, none of the attributes in that module is sent by PrecisePLAN.

Table 26 Applied Modules in the RTDOSE IOD for Export (SCU Role)

IE	Module
Patient	Patient
Study	General Study
Series	RT Series
Frame of Reference	Frame of Reference
Equipment	General Equipment
Dose	General Image
	Image Plane
	Image Pixel
	Multi-Frame
	RT Dose
	RT DVH
	SOP Common

The tables below specify the applied attributes for each module, and note their mappings from the PrecisePLAN database. If an attribute is not listed, or is grayed out, it is not sent by PrecisePLAN. If an attribute is listed without Notes, there is a mapping from a directly equivalent PrecisePLAN database entry.

Note that PrecisePLAN configuration settings may determine whether certain attributes are included in the sent message (see Appendix G).

Table 27 RTDOSE Storage SOP Class (SCU) – Patient Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patients Name	(0010,0010)	PN 1	2	The patients name in PrecisePLAN.
Patient ID	(0010, 0020)	LO 1	2	The patients id number in PrecisePLAN
Patient's Birth Date	(0010, 0030)	DA 1	2	Sent blank
Patients Sex	(0010, 0040)	CS 1	2	
Referenced Patient Sequence	(0008, 1120)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Patient's Birth Time	(0010, 0032)	TM 1	3	
Other Patient IDs	(0010, 1000)	LO 1-N	3	
Other Patient Names	(0010, 1001)	PN 1-N	3	
Ethnic Group	(0010, 2160)	SH 1	3	
Patient Comments	(0010, 4000)	LT 1	3	

Table 28 RTDOSE Storage SOP Class (SCU) – General Study Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Study Instance UID	(0020, 000D)	UI 1	1	
Study Date	(0008, 0020)	DA 1	2	Date plan was last saved.
Study Time	(0008, 0030)	TM 1	2	Time plan was last saved.
Referring Physicians Name	(0008, 0090)	PN 1	2	Sent blank.
Study ID	(0020, 0010)	SH 1	2	
Accession Number	(0008, 0050)	SH 1	2	Sent blank.
Study Description	(0008, 1030)	LO 1	3	Never sent
Physician(s) of Record	(0008, 1048)	PN 1-N	3	
Name of Physician(s) Reading Study	(0008, 1060)	PN 1-N	3	
Referenced Study Sequence	(0008, 1110)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 29 RTDOSE Storage SOP Class (SCU) – RT Series Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Modality	(0008, 0060)	CS 1	1	"RTDOSE"
Series Instance UID	(0020, 000E)	UI 1	1	
Series Number	(0020, 0011)	IS 1	2	
Protocol Name	(0018, 1030)	LO 1	3	Never sent
Series Description	(0008, 103E)	LO 1	3	Plan description
Patient Position	(0018, 5100)	LO 1	2C	Never sent
Referenced Study Component Sequence	(0008, 1111)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 30 RTDOSE Storage SOP Class (SCU) – Frame of Reference Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Frame of Reference UID	(0020, 0052)	UI 1	1	
Position Reference Indicator	(0020, 1040)	LO 1	2	Sent blank

Table 31 RTDOSE Storage SOP Class (SCU) – General Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Manufacturer	(0008, 0070)	LO 1	2	Always "Elekta"
Institution Name	(0008, 0080)	LO 1	3	Never sent
Institution Address	(0008, 0081)	ST 1	3	
Station Name	(0008, 1010)	SH 1	3	The PrecisePLAN hostname.
Institutional Department Name	(0008, 1040)	LO 1	3	Never sent
Manufacturer's Model Name	(0008, 1090)	LO 1	3	The host product name is sent: either "PrecisePLAN", "Render-Plan 3-D" or "FiducialPLAN"
Device Serial Number	(0018, 1000)	LO 1	3	CPU number of host SGI
Software Version	(0018, 1020)	LO 1-N	3	Build identification of DicomRT software
Spatial Resolution	(0018, 1050)	DS 1	3	Never sent
Date of Last Calibration	(0018, 1200)	DA 1-N	3	
Time of Last Calibration	(0018, 1201)	TM 1-N	3	
Pixel Padding Value	(0028, 0120)	US 1	3	

Table 32 RTDOSE Storage SOP Class (SCU) – General Image Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Image Number	(0020, 0013)	IS 1	2	Sent blank
Patient Orientation	(0020, 0020)	CS 2	2C	
Image Date	(0008, 0023)	DA 1	2C	Image acquisition date
Image Time	(0008, 0033)	TM 1	2C	Image acquisition time
Image Type	(0008, 0008)	CS 1-n	3	DERIVED\SECONDARY
Acquisition Date	(0008, 0022)	DA 1	3	Image acquisition date
Acquisition Time	(0008, 0032)	TM 1	3	Image acquisition time
Images in Acquisition	(0020, 1002)	IS 1	3	1
Image Comments	(0020, 4000)	LT 1	3	

Table 33 RTDOSE Storage SOP Class (SCU) – Image Plane Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Pixel Spacing	(0028, 0030)	DS 2	1	
Image Orientation Patient	(0020, 0037)	DS 6	1	
Image Position Patient	(0020, 0032)	DS 3	1	
Slice Thickness	(0018, 0050)	DS 1	2	Sent blank
Slice Location	(0020, 1041)	DS 1	3	Never sent

Table 34 RTDOSE Storage SOP Class (SCU) –Image Pixel Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Rows	(0028, 0010)	US 1	1	
Columns	(0028, 0011)	US 1	1	
Pixel Data	(7FE0, 0010)	OW	1	
Planar Configuration	(0028, 0006)	US 1	1C	Never sent
Pixel Aspect Ratio	(0028, 0034)	IS 2	1C	
Smallest Image Pixel Value	(0028, 0106)	US 1	3	
Largest Image Pixel Value	(0028, 0107)	US 1	3	

Table 35 RTDOSE Storage SOP Class (SCU) – Multi-frame Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Number of Frames	(0028, 0008)	IS 1	1	
Frame Increment Pointer	(0028, 0009)	AT 1-n	1	Sent for 3-D volume dose as (3004, 000C)

Table 36 RTDOSE Storage SOP Class (SCU) – RT Dose Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Samples per Pixel	(0028, 0002)	US 1	1	Always 1
Photometric Interpretation	(0028, 0004)	CS 1	1	Always "MONOCHROME2"
Bits Allocated	(0028, 0100)	US 1	1	Always 16
Bits Stored	(0028, 0101)	US 1	1	Always 16
High Bit	(0028, 0102)	US 1	1	Always 15
Pixel Representation	(0028, 0103)	US 1	1	Always 0
Dose Units	(3004, 0002)	CS 1	1	Always "GY"
Dose Type	(3004, 0004)	CS 1	1	Always "PHYSICAL"
Dose Comment	(3004, 0006)	LO 1	3	Describes the type of dose data: "Plan Dose Volume", "Beam Dose Volume" or "Beam Dose Plane at Depth xmm."
Normalization Point	(3004, 0008)	DS 3	3	Never sent
Dose Summation Type	(3004, 000A)	CS 1	1	"BEAM" or "PLAN"
Referenced RT Plan Sequence	(300C, 0002)	SQ 1	1C	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>Referenced Fraction Group Sequence	(300C, 0020)	SQ 1	1C	
>>Referenced Fraction Group Number	(300C, 0022)	IS 1	1C	
>>Referenced Beam Sequence	(300C, 0004)	SQ 1	1C	Sent if Dose Summation Type is "BEAM"
>>>Referenced Beam Number	(300C, 0006)	IS	1C	
>>Referenced Brachy Application Setup Sequence	(300C, 000A)	SQ	1C	Never sent
>>Referenced Brachy Application Setup Number	(300C, 000C)	IS 1	1C	
Grid Frame Offset Vector	(3004, 000C)	DS 2-n	1C	List of 'z' coordinates if dose data is 3-D volume.
Dose Grid Scaling	(3004, 000E)	DS 1	1	Conversion factor to convert each dose data value to Grays

Table 37 RTDOSE Storage SOP Class (SCU) – RT DVH Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Referenced Structure Set Sequence	(300C, 0002)	SQ 1	1	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1	
DVH Normalization Point	(3004,0040)		3	Never sent
DVH Normalization Dose Value	(3004,0042)		3	
DVH Sequence	(3004,0050)		1	
>DVH Referenced ROI Sequence	(3004,0060)		1	
>>Referenced ROI Number	(3006,0084)		1	
>>DVH ROI Contribution Type	(3004,0062)		1	
>DVH Type	(3004,0001)		1	Always "DIFFERENTIAL"
>Dose Units	(3004,0002)		1	Always "GY"
>Dose Type	(3004,0004)		1	Always "PHYSICAL", except for RTOG where sent as "PHYSICAL_HETRO" or "PHYSICAL_HOMO" according to where heterogeneity correction was applied.
>DVH Dose Scaling	(3004,0052)		1	
>DVH Volume Units	(3004,0054)		1	Always "CM3"
>DVH Number of Bins	(3004,0056)		1	
>DVH Data	(3004,0058)		1	
>DVH Minimum Dose	(3004,0070)		3	Never sent
>DVH Maximum Dose	(3004,0072)		3	
>DVH Mean Dose	(3004,0074)		3	

Table 38 RTDOSE Storage SOP Class (SCU) – SOP Common Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
SOP Class UID	(0008, 0016)	UI 1	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008, 0018)	UI 1	1	UID generated by PrecisePLAN
Instance Creation Date	(0008, 0012)	DA 1	3	Last date plan was saved
Instance Creation Time	(0008, 0013)	TM 1	3	Last time plan was saved
Instance Creator UID	(0008, 0014)	UI 1	3	The UID stem defining the workstation.

APPENDIX D Applied RTSTRUCT IOD and Mapping to PrecisePLAN Database

D.1 Export of RTSTRUCT

The modules selected from the RT Structure Set IOD table of DICOM for export are given in the table below. If a module is not listed, none of the attributes in that module is sent by PrecisePLAN.

Table 39 Applied Modules in the RTSTRUCT IOD for Export (SCU Role)

IE	Module
Patient	Patient
Study	General Study
Series	RT Series
Equipment	General Equipment
Structure Set	Structure Set
	ROI Contour
	RT ROI Observations
	SOP Common

The tables below specify the applied attributes for each module, and note their mappings from the PrecisePLAN database. If an attribute is not listed, or is grayed out, it is not sent by PrecisePLAN. If an attribute is listed without Notes, there is a mapping from a directly equivalent PrecisePLAN database entry.

Table 40 RTSTRUCT Storage SOP Class (SCU) – Patient Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patients Name	(0010,0010)	PN 1	2	The patients name in PrecisePLAN.
Patient ID	(0010, 0020)	LO 1	2	The patients id number in PrecisePLAN
Patient's Birth Date	(0010, 0030)	DA 1	2	Sent blank
Patients Sex	(0010, 0040)	CS 1	2	
Referenced Patient Sequence	(0008, 1120)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Patient's Birth Time	(0010, 0032)	TM 1	3	
Other Patient IDs	(0010, 1000)	LO 1-N	3	
Other Patient Names	(0010, 1001)	PN 1-N	3	
Ethnic Group	(0010, 2160)	SH 1	3	
Patient Comments	(0010, 4000)	LT 1	3	

Table 41 RTSTRUCT Storage SOP Class (SCU) – General Study Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Study Instance UID	(0020, 000D)	UI 1	1	
Study Date	(0008, 0020)	DA 1	2	Date plan was last saved.
Study Time	(0008, 0030)	TM 1	2	Time plan was last saved.
Referring Physicians Name	(0008, 0090)	PN 1	2	Sent blank.
Study ID	(0020, 0010)	SH 1	2	Always "1"
Accession Number	(0008, 0050)	SH 1	2	Sent blank.
Study Description	(0008, 1030)	LO 1	3	Never sent
Physician(s) of Record	(0008, 1048)	PN 1-N	3	
Name of Physician(s) Reading Study	(0008, 1060)	PN 1-N	3	
Referenced Study Sequence	(0008, 1110)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 42 RTSTRUCT Storage SOP Class (SCU) – RT Series Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Modality	(0008, 0060)	CS 1	1	"RTSTRUCT"
Series Instance UID	(0020, 000E)	UI 1	1	
Series Number	(0020, 0011)	IS 1	2	Always "1"
Protocol Name	(0018, 1030)	LO 1	3	Never sent
Series Description	(0008, 103E)	LO 1	3	Sent blank.
Patient Position	(0018, 5100)	LO 1	2C	
Referenced Study Component Sequence	(0008, 1111)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 43 RTSTRUCT Storage SOP Class (SCU) – General Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Manufacturer	(0008, 0070)	LO 1	2	Always "Elekta"
Institution Name	(0008, 0080)	LO 1	3	Never sent
Institution Address	(0008, 0081)	ST 1	3	
Station Name	(0008, 1010)	SH 1	3	The PrecisePLAN hostname.
Institutional Department Name	(0008, 1040)	LO 1	3	Never sent
Manufacturer's Model Name	(0008, 1090)	LO 1	3	The host product name is sent: either "PrecisePLAN" or "Render-Plan 3-D"
Device Serial Number	(0018, 1000)	LO 1	3	CPU number of host SGI
Software Version	(0018, 1020)	LO 1-N	3	Build identification of DicomRT software
Spatial Resolution	(0018, 1050)	DS 1	3	Never sent
Date of Last Calibration	(0018, 1200)	DA 1-N	3	
Time of Last Calibration	(0018, 1201)	TM 1-N	3	
Pixel Padding Value	(0028, 0120)	US 1	3	

Table 44 RTSTRUCT Storage SOP Class (SCU) – Structure Set Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Structure Set Label	(3006, 0002)	SH 1	1	Plan number
Structure Set Name	(3006, 0004)	LO 1	3	Plan description
Structure Set Description	(3006, 0006)	ST 1	3	Never sent
Structure Set Date	(3006, 0008)	DA 1	2	Date plan was last saved.
Structure Set Time	(3006, 0009)	TM 1	2	Time plan was last saved.
Referenced Frame of Reference Sequence	(3006, 0010)	SQ 1	3	
>Frame of Reference UID	(0020, 0052)	UI 1	1C	
>Frame of Reference Relationship Sequence	(3006, 00C0)	SQ 1	3	Never sent
>>Related Frame of Reference UID	(3006, 00C2)	UI 1	1C	
>>Frame of Reference Transformation Type	(3006, 00C4)	CS 1	1C	
>>Frame of Reference Transformation Matrix	(3006, 00C6)	DS 16	1C	
>>Frame of Reference Transformation Comment	(3006, 00C8)	LO 1	3	
>RT Referenced Study Sequence	(3006, 0012)	SQ 1	3	Sent only if CT images are also sent in the same association.
>>Referenced SOP Class UID	(0008, 1155)	UI 1	1C	
>>Referenced SOP Instance UID	(0008, 1160)	UI 1	1C	
>>RT Referenced Series Sequence	(3006, 0014)	IS 1	1C	
>>>Series Instance UID	(0020, 000E)	UI	1C	
>>>Contour Image Sequence	(3006, 0016)	SQ 1	1C	
>>>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>>>>Referenced Frame Number	(0008, 1160)	IS 1	3	Never sent
Structure Set ROI Sequence	(3006, 0020)	SQ 1	3	
>ROI Number	(3006, 0022)	IS 1	1C	Sequential structure number starting at "1"
>Referenced Frame of Reference UID	(3006, 0024)	UI 1	1C	
>ROI Name	(3006, 0026)	LO 1	2C	The PrecisePLAN structure name truncated to 16 characters.
>ROI Description	(3006, 0028)	ST 1	3	Never sent
>ROI Volume	(3006, 002C)	DS 1	3	
>ROI Generation Algorithm	(3006, 0036)	CS 1	2C	Always "MANUAL"
>ROI Generation Description	(3006, 0038)	LO 1	3	Never sent

Table 45 RTSTRUCT Storage SOP Class (SCU) – ROI Contour Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
ROI Contour Sequence	(3006, 0039)	SQ 1	1	
>Referenced ROI Number	(3006, 0084)	IS 1	1	
>ROI Display Color	(3006, 002A)	IS 3	3	RGB value of colour used by PrecisePLAN
>Contour Sequence	(3006, 0040)	SQ 1	3	
>>Contour Image Sequence	(3006, 0016)	SQ 1	3	
>>>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>>>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
>>>Referenced Frame Number	(0008, 1160)	IS 1	1C	Never sent
>>Contour Geometric Type	(3006, 0042)	CS 1	1C	Either "OPEN_PLANAR", "CLOSED_PLANAR" or "POINT"
>>Contour Slab Thickness	(3006, 0044)	DS 1	3	Never sent
>>Contour Offset Vector	(3006, 0045)	DS 3	3	
>>Number of Contour Points	(3006, 0046)	IS 1	1C	
>>Contour Data	(3006, 0050)	DS 3-3n	1C	

Table 46 RTSTRUCT Storage SOP Class (SCU) –RT ROI Observations Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
RT ROI Observation Sequence	(3006, 0080)	SQ 1	1	
>Observation Number	(3006, 0082)	IS 1	1	Same as Referenced ROI Number
>Referenced ROI Number	(3006, 0084)	IS 1	1	
>ROI Observation Label	(3006, 0085)	SH 1	3	Same as Structure name
>ROI Observation Description	(3006, 0088)	ST 1	3	
>RT Related ROI Sequence	(3006, 0030)	SQ 1	3	Never sent
>>Referenced ROI Number	(3006, 0084)	IS 1	1C	
>>RT ROI Relationship	(3006, 0033)	CS 1	3	
>RT ROI Identification Code	(3006, 0086)	SQ 1	3	
>>Code Value	(0008, 0100)	SH 1	1C	
>>Coding Scheme Designator	(0008, 0102)	SH 1	1C	
>>Code Meaning	(0008, 0104)	LO 1	3	
>Related RT ROI Observations Sequence	(3006, 00A0)	SQ 1	3	
>>Observation Number	(3006, 0082)	IS 1	1C	
>RT ROI Interpreted Type	(3006, 00A4)	CS 1	2	
>ROI Interpreter	(3006, 00A6)	PN 1	2	Always blank
>Material ID	(300A, 00E1)	SH 1	3	Never sent
>ROI Physical Properties Sequence	(3006, 00B0)	SQ 1	3	
>>ROI Physical Property	(3006, 00B2)	CS 1	1C	
>>ROI Physical Property Value	(3006, 00B4)	DS 1	1C	

Table 47 RTSTRUCT Storage SOP Class (SCU) – SOP Common Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
SOP Class UID	(0008, 0016)	UI 1	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008, 0018)	UI 1	1	As initially imported or if changed a UID generated by PrecisePLAN
Instance Creation Date	(0008, 0012)	DA 1	3	Last date plan was saved
Instance Creation Time	(0008, 0013)	TM 1	3	Last time plan was saved
Instance Creator UID	(0008, 0014)	UI 1	3	The UID stem for the export.

APPENDIX E Applied CT Image IOD and Mapping to PrecisePLAN Database

E.1 Export of CT Image

The modules selected from the CT Image IOD table of DICOM for export are given in **Error! Reference source not found.47** below. If a module is not listed, none of the attributes in that module is sent by PrecisePLAN.

Table 48 Applied Modules in the CT Image IOD for Export (SCU Role)

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	General Series	M
Frame of Reference	Frame of Reference	M
Equipment	General Equipment	M
Image	General Image	M
	Image Plane	M
	Image Pixel	M
	CT Image	M
	SOP Common	M

The tables below specify the applied attributes for each module, and note their mappings from the PrecisePLAN database. If an attribute is not listed, or is grayed out, it is not sent by PrecisePLAN. If an attribute is listed without Notes, there is a mapping from a directly equivalent PrecisePLAN database entry.

Table 49 CT Image Storage SOP Class (SCU) – Patient Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Patients Name	(0010,0010)	PN 1	2	The patients name in PrecisePLAN.
Patient ID	(0010, 0020)	LO 1	2	The patients id number in PrecisePLAN
Patient's Birth Date	(0010, 0030)	DA 1	2	
Patients Sex	(0010, 0040)	CS 1	2	
Referenced Patient Sequence	(0008, 1120)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	
Patient's Birth Time	(0010, 0032)	TM 1	3	
Other Patient IDs	(0010, 1000)	LO 1-N	3	
Other Patient Names	(0010, 1001)	PN 1-N	3	
Ethnic Group	(0010, 2160)	SH 1	3	
Patient Comments	(0010, 4000)	LT 1	3	

Table 50 CT Image Storage SOP Class (SCU) – General Study Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Study Instance UID	(0020, 000D)	UI 1	1	
Study Date	(0008, 0020)	DA 1	2	Date plan was last saved.
Study Time	(0008, 0030)	TM 1	2	Time plan was last saved.
Referring Physicians Name	(0008, 0090)	PN 1	2	From original imported CT slice, or as updated in PrecisePLAN.
Study ID	(0020, 0010)	SH 1	2	
Accession Number	(0008, 0050)	SH 1	2	Sent blank.
Study Description	(0008, 1030)	LO 1	3	Never sent
Physician(s) of Record	(0008, 1048)	PN 1-N	3	
Name of Physician(s) Reading Study	(0008, 1060)	PN 1-N	3	
Referenced Study Sequence	(0008, 1110)	SQ 1	3	
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 51 CT Image Storage SOP Class (SCU) – General Series Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Modality	(0008, 0060)	CS 1	1	"CT"
Series Instance UID	(0020, 000E)	UI 1	1	
Series Number	(0020, 0011)	IS 1	2	Always "1"
Protocol Name	(0018, 1030)	LO 1	3	Never sent
Series Description	(0008, 103E)	LO 1	3	
Patient Position	(0018, 5100)	LO 1	2C	Always head first.
Referenced Study Component Sequence	(0008, 1111)	SQ 1	3	Never sent
>Referenced SOP Class UID	(0008, 1150)	UI 1	1C	
>Referenced SOP Instance UID	(0008, 1155)	UI 1	1C	

Table 52 CT Image Storage SOP Class (SCU) – Frame of Reference Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Frame of Reference UID	(0020,0052)	UI 1	1	
Position Reference Indicator	(0020, 1040)	LO 1	2	Sent blank

Table 53 CT Image Storage SOP Class (SCU) – General Equipment Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
Manufacturer	(0008, 0070)	LO 1	2	From original imported CT slice, or if not available, 'Elekta'.
Institution Name	(0008, 0080)	LO 1	3	Never sent
Institution Address	(0008, 0081)	ST 1	3	
Station Name	(0008, 1010)	SH 1	3	PrecisePLAN Hostname
Institutional Department Name	(0008, 1040)	LO 1	3	Never sent
Manufacturer's Model Name	(0008, 1090)	LO 1	3	Always 'PrecisePLAN'
Device Serial Number	(0018, 1000)	LO 1	3	CPU number of PrecisePLAN host
Software Version	(0018, 1020)	LO 1-N	3	Software revision # of DICOM software
Spatial Resolution	(0018, 1050)	DS 1	3	Never sent
Date of Last Calibration	(0018, 1200)	DA 1-N	3	
Time of Last Calibration	(0018, 1201)	TM 1-N	3	
Pixel Padding Value	(0028, 0120)	US 1	3	

Table 54 CT Image Storage SOP Class (SCU) – General Image Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Image Number	(0020,0013)	IS 1	2	
Patient Orientation	(0020,0020)	CS 2	2C	
Image Date	(0008,0023)	DA 1	2C	Never sent
Image Time	(0008,0033)	TM 1	2C	

Note: Some of the General Image attributes are duplicated in the CT Image Module. They are included in that table and not included here.

Table 55 CT Image Storage SOP Class (SCU) – Image Plane Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Pixel Spacing	(0028,0030)	DS 2	1	
Image Orientation (Patient)	(0020,0037)	DS 6	1	
Image Position (Patient)	(0020,0032)	DS 3	1	
Slice Thickness	(0018,0050)	DS 1	2	Always blank
Slice Location	(0020,1041)	DS 1	3	

Table 56 CT Image Storage SOP Class (SCU) –Image Pixel Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Rows	(0028,0010)	US 1	1	
Columns	(0028,0011)	US 1	1	
Pixel Representation	(0028,0103)	US 1	1	Always 0, unsigned integer.
Pixel Data	(7FE0,0010)	OW	1	

Table 57 CT Image Storage SOP Class (SCU) –CT Image Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes
Image Type	(0008,0008)	CS 1-n	1	"DERIVED\SECONDARY\AXIAL"
Samples Per Pixel	(0028,0002)	US 1	1	Always 1
Photometric Interpretation	(0028,0004)	CS 1	1	Always "MONOCHROME2"
Bits Allocated	(0028,0100)	US 1	1	Always 16
Bits Stored	(0028,0101)	US 1	1	Always 12
High Bit	(0028,0102)		1	Always 11
Rescale intercept	(0028,1052)		1	Always -1024
Rescale slope	(0028,1053)		1	Always 1

KVP	(0018,0060)		2	From original imported CT slice
Acquisition Number	(0020,0012)		2	Always 1
Reconstruction Diameter	(0018,1100)		3	From original imported CT slice
Gantry/Detector Tilt	(0018,1120)		3	

Table 58 CT Image Storage SOP Class (SCU) – SOP Common Module

Attribute Name	Tag	VR, VM	DICOM Type	Notes/Constraints
SOP Class UID	(0008, 0016)	UI 1	1	1.2.840.10008.5.1.4.1.1.2
SOP Instance UID	(0008, 0018)	UI 1	1	UID generated by PrecisePLAN
Instance Creation Date	(0008, 0012)	DA 1	3	
Instance Creation Time	(0008, 0013)	TM 1	3	
Instance Creator UID	(0008, 0014)	UI 1	3	The UID stem for the export.

APPENDIX F Reported Status Codes

The possible status codes and their meanings are stored in a resource file delivered with the system.

The code and meaning text is displayed to the user whenever a warning or error occurs.

To facilitate multi-destination handling of reported status code meanings a separate resource file per destination can be defined.

The default resource file contains the Elekta *PreciseDesktop* codes.

APPENDIX G Configurable AE-Specific Attribute Mapping

PrecisePLAN offers the definition of multiple logical destinations. The same physical destination can be defined several times with a different set of configuration options.

Per logical destination the following options can be set:

Option class	Description of options
Capability	RTPLAN RTIMAGE RTSTRUCT RTDOSE CTIMAGE CRIMAGE SCIMAGE
Content settings	Include or not the object in the DICOM message: Shielding Blocks Aperture Blocks Compensator Applicator Dose Calculation Points Bolus Use: Destination Machine Id (otherwise use planning name for the machine) Strict Control Points List of dose depths for planar dose export
Interface settings	Ignore warnings Precise Desktop Validation RTOG Validation Jaw/MLC values rounded to 1mm. or to 0.1mm
DRR (image) settings	Colour (RGB) or MONOCHROME2 Burned in labelling Burned in overlays Orthogonal DRR types

For DRR image export the format will be RTIMAGE, CRIMAGE or SCIMAGE depending on the capability of the destination. If a destination supports more than one format then the preference order is as listed.

Per supported Linear Accelerator the following options can be set:

Option class	Description of options
Machine Id	Remote machine name and serial number
Block Id Settings	Controls the mapping of Block identifiers to DICOM block numbering and labelling
Wedge Settings	For each wedge known by PrecisePLAN define the DICOM wedge type ("STANDARD", "MOTORIZED" or "DYNAMIC")
Machine Settings	Handling of Nominal Cone size and coding, and Maximum permitted MU per control point.
Geometry Settings	Allows an offset to be applied to some geometric values to account for Varian offset scales. Allows PSS translational movements to be ignored. (not sent)