GE Healthcare

Technical Publications

DOC2603552 Revision 2

DoseWatch 3.3
DICOM CONFORMANCE STATEMENT

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CONFORMANCE STATEMENT OVERVIEW

DoseWatch implements DICOM services to facilitate the acquisition, monitoring and reporting of Radiation Exposure in the enterprise. Radiation dose information is either acquired from DICOM Radiation Dose SR instances, DICOM Radiopharmaceutical Radiation Dose SR instances, DICOM MPPS messages or DICOM image headers. DoseWatch is also able to communicate radiation dose information with other peers using MPPS and SR objects.

Table 0.1 provides an overview of the network services supported by DoseWatch.

TABLE 0.1.
NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Computed Radiography Image Storage	No	Yes
Digital X-Ray Image Storage – For Presentation	No	Yes
Digital X-Ray Image Storage – For Processing	No	Yes
Digital Mammography X-Ray Image Storage – For Presentation	No	Yes
Digital Mammography X-Ray Image Storage – For Processing	No	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	No	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	No	Yes
CT Image Storage	No	Yes
Enhanced CT Image Storage	No	Yes
Secondary Capture Image Storage	Yes (*)	Yes
Ultrasound Multi-frame Image Storage	No	Yes
MR Image Storage	No	Yes
Enhanced MR Image Storage	No	Yes
MR Spectroscopy Storage	No	Yes
Ultrasound Image Storage	No	Yes
X-Ray Angiographic Image Storage	No	Yes
Enhanced XA Image Storage	No	Yes
X-Ray Radiofluoroscopic Image Storage	No	Yes
Enhanced XRF Image Storage	No	Yes
Breast Tomosynthesis Image Storage	No	Yes
Nuclear Medicine Image Storage	No	Yes
Comprehensive SR Storage	Yes(*)	Yes
X-Ray Radiation Dose SR Storage	Yes	Yes
Enhanced SR Storage	Yes(*)	Yes
Radiopharmaceutical Radiation Dose SR Storage	Yes	Yes
Positron Emission Tomography Image Storage	No	Yes
Query/Retrieve		
Patient Root Query/Retrieve Information Model – FIND	Yes	No
Patient Root Query/Retrieve Information Model – MOVE	Yes	No
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No

Workflow Management		
Modality Performed Procedure Step SOP Class	Yes	Yes
Modality Worklist Information Model – FIND SOP Class	Yes	No

(*) Supports only the forwarding of object produced by a modality. DoseWatch does not produce these objects.
DoseWatch does not support any Media Storage Application Profile.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 (Introduction), which describes the overall structure, intent, and references for this Conformance Statement.

Section 2 (Network Conformance Statement), which specifies the GEHC equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (CT Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a CT Image Information Object.

Section 4 (Digital Mammography X-Ray Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a MG Image Information Object.

Section 5 (MR Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a MR Image Information Object.

Section 6 (Secondary Capture Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a Secondary Capture Object.

Section 7 (US Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of an US Image Information Object.

Section 8 (US Multi-frame Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a US Multi-frame Image Information Object.

Section 9 (X-Ray Angiographic Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a XA Image Object.

Section 10 (X-Ray RF Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a RF Image Object.

Section 11 (Computed Radiography Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a CR Image Object.

Section 12 (Positron Emission Tomography Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of a PET Image Object.

Section 13 (Nuclear Medicine Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the reading and storage of an NM Image Object.

Section 14 (CT/X-Ray Radiation Dose Structured Report Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the storage and implementation of a CT/X-Ray Radiation Dose Structured Report.

Section 15 (Radiopharmaceutical Radiation Dose Structured Report Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the storage and implementation of a Radiopharmaceutical Radiation Dose Structured Report.

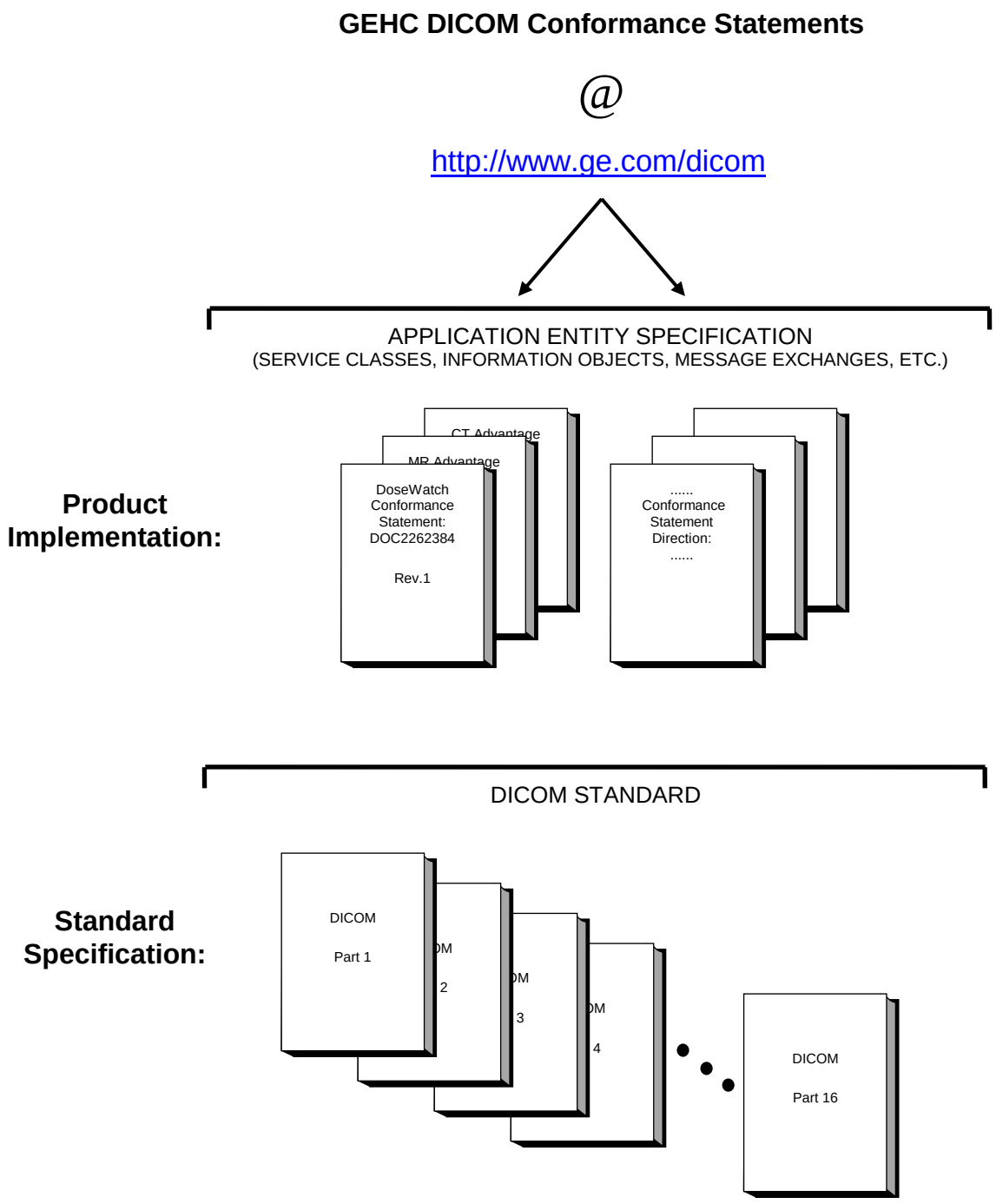
Section 16 (Modality Worklist Information Model), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Modality Worklist service.

Section 17 (Modality Performed Procedure Step Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the storage and implementation of a Modality Performed Procedure Step.

Section 18 (Query Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Query to a capable device.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEHC DICOM Conformance Statements is shown in the illustration below.



This document specifies the DICOM implementation. It is entitled:

DoseWatch 3.3
Conformance Statement for DICOM
DOC2603552

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GEHC network interface.

The GEHC Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM Part 8 standard.

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at https://www.dicomstandard.org/.

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM Standard and with the terminology and concepts which are used in that Standard.

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEHC devices are capable of using different Information Object Definitions. For example, a GEHC CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEHC implementation. If the user encounters unspecified private data elements while parsing a GEHC Data Set, the user is well advised to ignore those data elements (per the DICOM standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEHC devices.

1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM Standard, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be

underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

  Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEHC protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) described by these DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

- **Interaction** - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

NEMA PS3	Digital Imaging and COmmunications in Medicine (DICOM) Standard, available free at https://www.dicomstandard.org/

1.7 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an endpoint of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title (AET) – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – a network communication channel set up between *Application Entities*.

Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs).

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the

tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: JPEG-LS Lossless Image Compression, Explicit VR Little Endian.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.8 SYMBOLS AND ABBREVIATIONS

AE	Application Entity
AET	Application Entity Title
CAD	Computer Aided Detection
CR	Computed Radiography
CT	Computed Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and COmmunications in Medicine
DX	Digital X-ray
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
IO	Intra-Oral X-ray
JPEG	Joint Photographic Experts Group
LDAP	Lightweight Directory Access Protocol
LUT	Look-Up Table
MG	Mammography (X-ray)
MPPS	Modality Performed Procedure Step
MR	Magnetic Resonance Imagery (MRI)

MSPS	Modality Scheduled Procedure Step
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist
NM	Nuclear Medicine
O	Optional (Key Attribute)
OCR	Optical Character Recognition
OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PET	Positron Emission Tomography
PDU	Protocol Data Unit
Q/R	Query and Retrieve
R	Required (Key Attribute)
RDSR	Radiation Dose Structured Report
RF	Radiofluoroscopy
RIS	Radiology Information System
RT	Radiotherapy
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Report
SSDE	Size-Specific Dose Estimate
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
UL	Upper Layer
US	UltraSound
VL	Visible Light
VR	Value Representation
XA	X-ray Angiography

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the DoseWatch compliance to DICOM requirements for **Networking** features.

The DoseWatch product uses DICOM to receive images, Performed Procedure Steps and (Radiopharmaceutical) Radiation Dose Structured Reports through 3rd-party systems initiating network associations.

DoseWatch is also able to automatically initiate DICOM associations to send radiation dose information to 3rd-party systems using MPPS messages or SR objects.

DoseWatch is able to query a Modality Worklist SCP to retrieve modality worklist procedure step for a specific application entity and map those elements to its existing database of exams.

DoseWatch is able to query a PACS or a device to retrieve examinations.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

The network application model for DoseWatch is shown in the following illustrations:

ILLUSTRATION 2-1 : RETRIEVE A MODALITY WORKLIST FROM A REMOTE SYSTEM

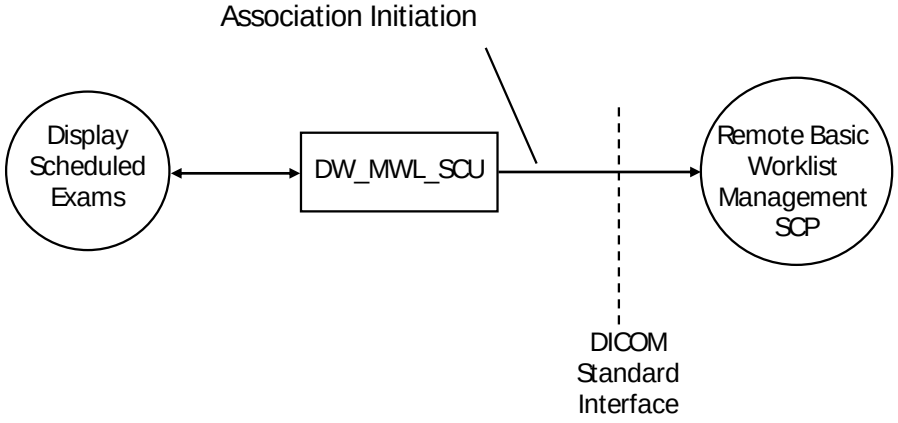


Illustration 2-2 : VERIFICATION REQUEST FROM A REMOTE AE

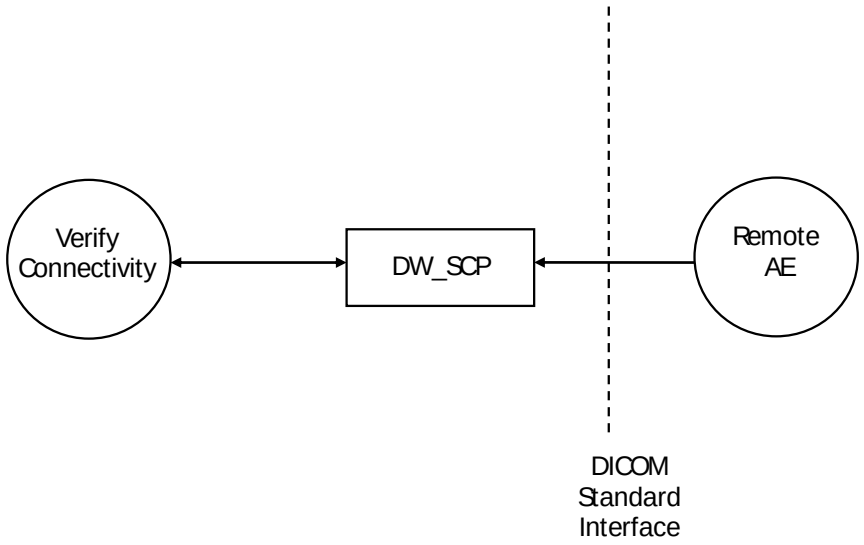


ILLUSTRATION 2-3 : RECEIVE INSTANCES FROM A REMOTE SYSTEM

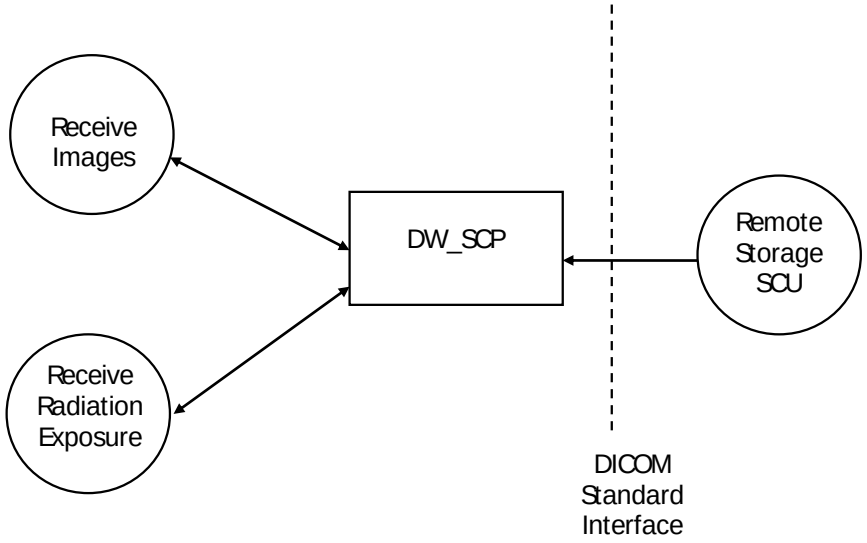


ILLUSTRATION 2-4 : RECEIVE MPPS MESSAGE FROM A REMOTE SYSTEM

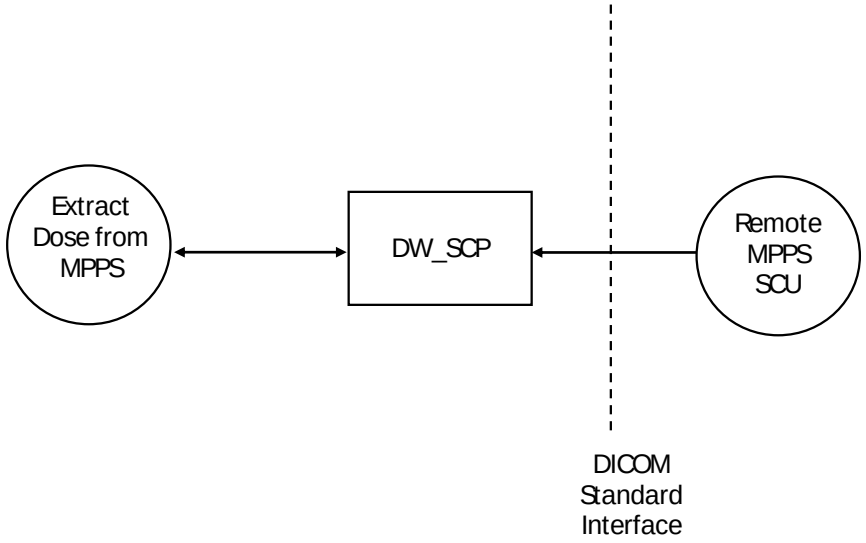


ILLUSTRATION 2-5 : FORWARD OR GENERATE MPPS MESSAGE TO A REMOTE SYSTEM

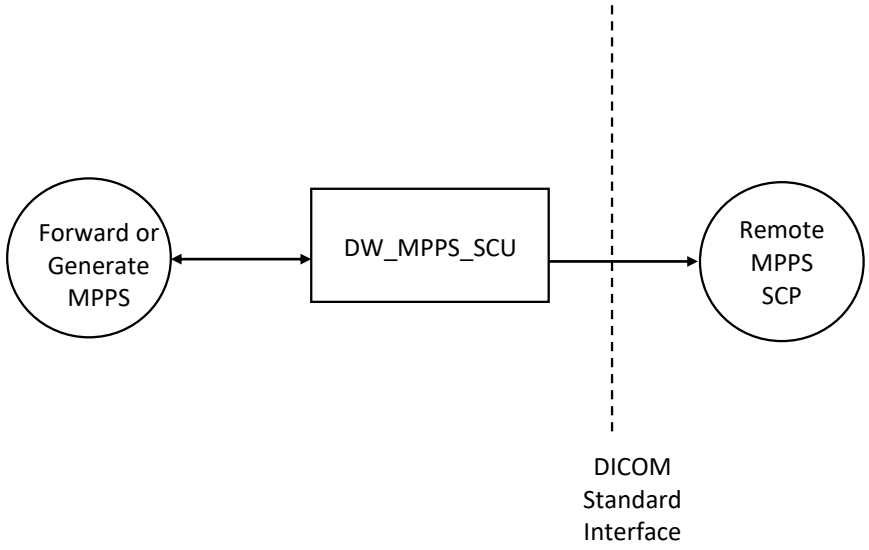


ILLUSTRATION 2-6 FORWARD OR GENERATE SR MESSAGE TO A REMOTE SYSTEM

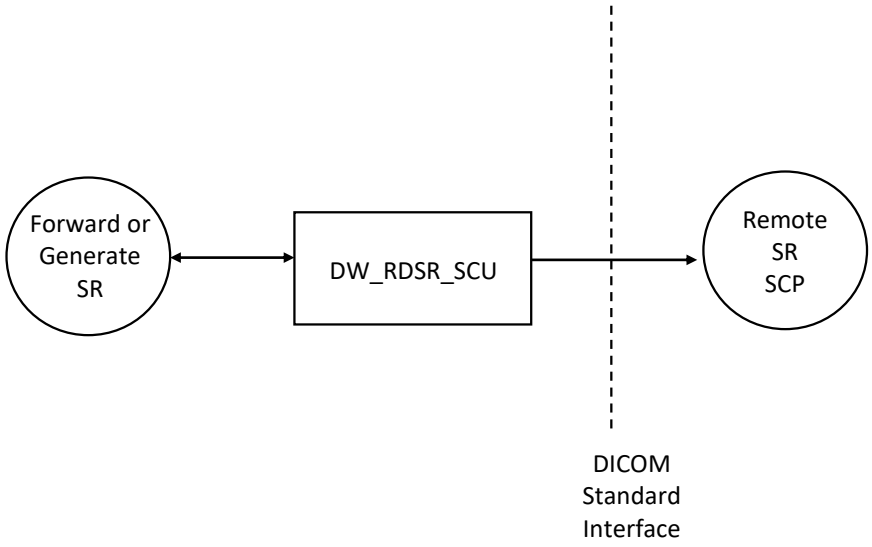
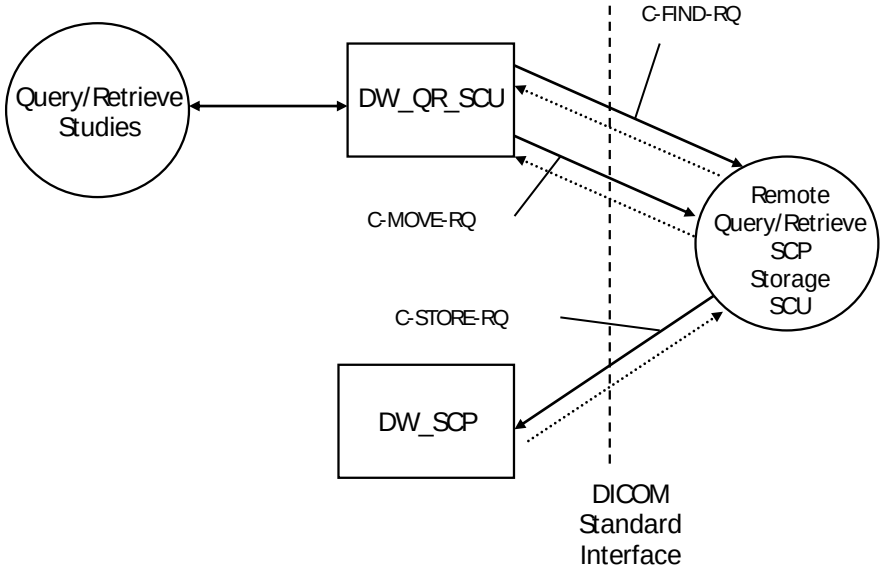


ILLUSTRATION 2-7 QUERY/RETRIEVE STUDIES FROM A PACS OR A DEVICE



2.2.2 Functional Definition of AE's

Query Modality Worklist: DoseWatch queries the Modality Worklist server to display the scheduled examinations for the devices connected to DoseWatch. A background task also queries the Modality Worklist server to store modality scheduled procedure steps items in its internal database and reuse this content in some processing tasks.

Verification Request from a remote AE: If DoseWatch receives a C-ECHO-RQ message, it will responds a C-ECHO-RSP message with a status “success”.

Receive Instances: DoseWatch receives from a remote system a C-STORE-RQ messages. DoseWatch stores images from devices, stores images header in its database to process them and extracts dose or data usage related information. In addition, DoseWatch stores localizers images for SSDE calculation. DoseWatch responds with a C-STORE-RSP message. DoseWatch receives (Radiopharmaceutical) Radiation Dose Structured Reports from modalities (with a C-STORE operation), stores them in its database and extracts dose related information. In some specific cases, DoseWatch extracts only the first frame of an instance for OCR analysis.

Receive MPPS: DoseWatch receives Modality Performed Procedure Step messages from devices, stores them in its database to extract dose related information. MPPS sent with the N-CREATE operation and the N-SET operation are considered. When the N-CREATE MPPS message is received, the DoseWatch wait for a N-SET message before integrating data.

Forward MPPS messages: If configured to do so, DoseWatch forwards MPPS messages to other DICOM systems.

Generate MPPS messages: If configured to do so, DoseWatch generates MPPS N-CREATE and N-SET messages to other DICOM system if the original device is not able to produce such a file.

Forward SR messages: If configured to do so, DoseWatch forwards Radiation Dose Structured Reports, Secondary Captures or Enhanced SR received from devices to other DICOM systems.

Generate RDSR messages: If configured to do so, DoseWatch generates a RDSR message to other DICOM systems if the original device is not able to produce such a file.

Query/Retrieve Studies: DoseWatch queries a remote server listening at a TCP/IP port for incoming DICOM query messages. The query request (find matching patients or studies or series or images) is made by DoseWatch as Service Class User with a C-FIND-RQ operation. The remote server which acting as Service Class Provider responds (C-FIND-RSP) a list of DICOM objects corresponding to the request. DoseWatch performs a C-MOVE-RQ on the remote server and receives DICOM objects on the DoseWatch storage SCP listener.

2.2.3 Sequencing of Real-World Activities

The forwarding or generation of MPPS messages to another system is triggered by an incoming DICOM communication (images, MPPS message or SR instance).

The forwarding or generation of SR messages to another system is triggered by an incoming DICOM communication (images, MPPS message or SR instance).

The Query/Retrieve to another system can be triggered by an incoming DICOM communication (images, MPPS message or SR instance). In this case it is used to complete the information already received in the system. It can also be triggered periodically (every day or every x minutes) to get information from the day before.

2.3 AE SPECIFICATIONS

DoseWatch configuration allows the definition of up to three Application Entities as SCP to structure DICOM incoming dataflows:

- Each listener handles MPPS, images, SR and Secondary Captures.
- Each listener can be configured for specific scenarios and some SOP Classes or Transfer Syntaxes can be added/deactivated if necessary.
- The workflows can be dispatched on the three listeners if the user want to separated MPPS / image / SR workflows.

The DoseWatch system can also communicate dose information within DICOM MPPS messages sent to a remote AE. When doing so, DoseWatch will re-use the AE Title of the modality which originally sent to DoseWatch the images, SR or MPPS message or use a custom AE title defined in the configuration. In the following section, "**DW_MPPS_SCU**" represents this DoseWatch Application Entity.

Additionnally, the DoseWatch system can communicate dose information within DICOM SR messages sent to a remote AE. DoseWatch will re-use the AE Title of the modality which originally sent to DoseWatch information or use a custom AE title defined in the configuration. In the following section, "**DW_RDSR_SCU**" represents this DoseWatch Application Entity.

Through its **DW_MWL_SCU** Application Entity, the DoseWatch system can query a RIS for scheduled exams to be displayed to end-users.

DoseWatch uses an additional Application Entity when it performs query/retrieve to a remote system. The default AET used is "**DW_QR_SCU**" and can be changed if needed.

2.3.1 DW_SCP AE Specification

The DW_SCP Application Entities provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP**:

SOP Class Name	SOP Class UID	SCU	SCP
Verification SOP Class	1.2.840.10008.1.1	No	Yes
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	No	Yes
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	No	Yes
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	No	Yes
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	No	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	No	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes

MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	No	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	No	Yes
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	No	Yes
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	No	Yes
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	No	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	No	Yes
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	No	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	No	Yes
Radiopharmaceutical Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.68	No	Yes
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	No	Yes
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	No	Yes
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	No	Yes
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	No	Yes

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the DoseWatch Application Entity is: 16KB

Maximum Length PDU	16KB (Configurable)

2.3.1.1.2 Number of Associations

The DW_SCP will support a default of 50 simultaneous associations initiated by remote nodes. However having more than 8 simultaneous connection per node is not recommended. There is also the possibility to configure the number of supported associations per AET.

2.3.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	DW-2020.2.0

2.3.1.2 Association Initiation Policy

The DW_SCP Application Entity does not initiate any Association.

2.3.1.3 Association Acceptance Policy

2.3.1.3.1 Real World Activity : Verification request from Remote AE

2.3.1.3.1.1 Associated Real-World Activity

This AE is indefinitely listening for associations. No operator action is required to respond to a verification message. The Real-World Activity associated with the verification request is to send a C-ECHO response message with a status of "success" to the requesting AE.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by AE DoseWatch_Receiver for Activity Verification request from Remote AE					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

2.3.1.3.1.2.1 SOP Specific Conformance to C_ECHO SCP

The DW_SCP provides standard conformance to the DICOM Verification Service Class.

Each C-ECHO operation supports an "Association Timer" with a timeout value of 60 seconds. This timeout is configurable if necessary.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

The DW_SCP evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DW_SCP will select the following Transfer Syntax:

- Implicit VR Little Endian

2.3.1.3.2 Real World Activity : "Receive Instances"

2.3.1.3.2.1 Associated Real-World Activity

A device sends DICOM images or (Radiopharmaceutical) Radiation Dose Structured Reports to DoseWatch. DoseWatch stores localizers images, other images' headers and (R)RDSR in its database for further processing. In some cases of multiframe images, only the first frame is kept for OCR analysis.

2.3.1.3.2.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by DW_SCP for Activity Receive Instances					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Digital X-Ray Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Digital X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Digital Mammography Image Storage - For Presentation	1.2.840.10008.5.1.4.1.1.1.2	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Digital Mammography Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.2.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Digital Intra-oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Digital Intra-oral X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Enhanced XA Image Storage	1.2.840.10008.5.1.4.1.1.12.1.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Enhanced XRF Image Storage	1.2.840.10008.5.1.4.1.1.12.2.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Nuclear Medicine Image Storage	1.2.840.10008.5.1.4.1.1.20	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None

MR Image Storage	1.2.840.10008.5.1.4.1.1.4	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None
Positron Emission Tomography Image Storage	1.2.840.10008.5.1.4.1.1.128	See Table **Transfer Syntax for Image Storage SOPClasses** below		SCP	None

Transfer Syntax for Image Storage SOPClasses	
Name List	**UID List**
Implicit VR Little Endian	1.2.840.10008.1.2
Explicit VR Little Endian	1.2.840.10008.1.2.1
Explicit VR Big Endian (Retired)	*1.2.840.10008.1.2.2*
JPEG Baseline (Process 1)	1.2.840.10008.1.2.4.50
JPEG Baseline (Processes 2 & 4)	1.2.840.10008.1.2.4.51
JPEG Extended (Processes 3 & 5)	1.2.840.10008.1.2.4.52

JPEG Spectral Selection, Nonhierarchical (Processes 6 & 8)	1.2.840.10008.1.2.4.53
JPEG Spectral Selection, Nonhierarchical (Processes 7 & 9)	1.2.840.10008.1.2.4.54
JPEG Full Progression, Nonhierarchical (Processes 10 & 12)	1.2.840.10008.1.2.4.55
JPEG Full Progression, Nonhierarchical (Processes 11 & 13)	1.2.840.10008.1.2.4.56
JPEG Lossless, Nonhierarchical (Processes 14)	1.2.840.10008.1.2.4.57
JPEG Lossless, Nonhierarchical (Processes 15)	1.2.840.10008.1.2.4.58
JPEG Extended, Hierarchical (Processes 16 & 18)	1.2.840.10008.1.2.4.59
JPEG Extended, Hierarchical (Processes 17 & 19)	1.2.840.10008.1.2.4.60
JPEG Spectral Selection, Hierarchical (Processes 20 & 22)	1.2.840.10008.1.2.4.61
JPEG Spectral Selection, Hierarchical (Processes 21 & 23)	1.2.840.10008.1.2.4.62
JPEG Full Progression, Hierarchical (Processes 24 & 26)	1.2.840.10008.1.2.4.63
JPEG Full Progression, Hierarchical (Processes 25 & 27)	1.2.840.10008.1.2.4.64
JPEG Lossless, Nonhierarchical (Process 28)	1.2.840.10008.1.2.4.65
JPEG Lossless, Nonhierarchical (Process 29)	1.2.840.10008.1.2.4.66
JPEG Lossless, Nonhierarchical, First- Order Prediction (Processes 14 [Selection Value 1])	1.2.840.10008.1.2.4.70
JPEG-LS Lossless Image Compression	1.2.840.10008.1.2.4.80
JPEG-LS Lossy (Near- Lossless) Image Compression	1.2.840.10008.1.2.4.81
JPEG 2000 Image Compression (Lossless Only)	1.2.840.10008.1.2.4.90
JPEG 2000 Image Compression	1.2.840.10008.1.2.4.91
JPEG 2000 Part 2 Multicomponent Image Compression (Lossless Only)	1.2.840.10008.1.2.4.92
JPEG 2000 Part 2 Multicomponent Image Compression	1.2.840.10008.1.2.4.93

2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The DW_SCP AE does not provide any DICOM retrieve service to remote AE. DICOM Instances are received for the purpose of radiation dose calculation, equipment monitoring and practices improvement. They are not intended to be displayed, nor retrieved or sent to other remote AE.

Following are the status codes the Application may send back to the SCU Equipment after performing the requested storage:

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Success	0000		The Composite SOP Instance was successfully received, verified, and stored in the system repository.	
Error	0110	Processing Failure	This status is returned due to internal errors such as a processing failure response from the internal system. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	

Error	B000	One or more failures	This status is returned due to internal errors such as a error when reading the DICOM stream received. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	
Error	A700	Out of resources	This status is returned when there is no more space on the disk to store the DICOM object received. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	
Error	A702	Unable to perform sub-operations	This status is returned due to impossibility to write on the disk, create the URI on the disk or if the DICOM attributes are null. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	
Error	FE00	Cancel	This status is returned if a specific option is activated to accept only declared of Station Name and AET. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	

The DW_SCP AE supports Storage Level 0: for most images, only the DICOM header is stored in DoseWatch database; whole DICOM dataset is only stored for localizer images or some specific slices for further processing.

2.3.1.3.2.3 Presentation Context Acceptance Criterion

The DW_SCP evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.2.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DoseWatch AE will accept the first proposed transfer syntax that it also supports for that Abstract Syntax.

2.3.1.3.3 Real World Activity : “Receive MPPS”

2.3.1.3.3.1 Associated Real-World Activity

A modality sends DICOM MPPS to DoseWatch. DoseWatch stores them in its database for further processing.

2.3.1.3.3.2 Accepted Presentation Context Table

Presentation Context Table - Accepted by DW_SCP for Activity Receive MPPS					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

2.3.1.3.3.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The DW_MPPS_SCP AE does not provide any DICOM retrieve service to remote AE. DICOM Instances are received for the sole purpose of radiation dose calculation and monitoring and are not intended to be displayed, nor retrieved or sent to other remote AE.

Following are the status codes the Application may send back to the SCU Equipment after performing the requested storage:

Service Status	Status Code	Further Meaning	Status Code Explanation	Related Fields Sent Back to the SCU
Success	0000		The Composite SOP Instance was successfully received, verified, and stored in the system repository.	
Error	0110	Processing Failure	This status is returned due to internal errors such as a processing failure response from the internal database or a filesystem operation. The appropriate Status will be sent in the N-CREATE/N-SET Response. Error indication message is output to the Service Log.	
Error	0121	Missing Attribute Value	This status is returned when the N-CREATE received from the SCU does not contains the Study Instance UID.	Attribute Identifier List (0000,1005) returns the field Study Instance UID
Error	0121	Missing Attribute Value	This status is returned when the N-SET received from the SCU does not contains the field Requested Sop Instance UID (0000,1001)	Attribute Identifer List (0000,1005) returns the field Requested Sop Instance UID
Error	A700	Out of resources	This status is returned when there is no more space on the disk to store the DICOM object received. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	
Error	A702	Unable to perform sub-operations	This status is returned due to impossibility to write on the disk, create the URI on the disk or if the DICOM attributes are null. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	
Error	FE00	Cancel	This status is returned if a specific option is activated to accept only declared of Station Name and AET. The appropriate Status will be sent in the C-STORE Response. Error indication message is output to the Service Log.	

Note: if the SCU does not provide the Affected SOP Instance UID (0000,1000) in the N-CREATE operation, DoseWatch does not consider it as an error and generates one for the SCU. The SCU is in charge to use it and to reuse it for the N-SET operation. The Affected SOP Instance UID starts with the DoseWatch prefix "1.2.840.113619.2.326".

2.3.1.3.3.3 Presentation Context Acceptance Criterion

The DW_MPPS_SCP evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for any Real-World Activity.

2.3.1.3.3.4 Transfer Syntax Selection Policies

Within each Presentation Context, the DoseWatch AE will accept the first proposed transfer syntax that it also supports for that Abstract Syntax.

2.3.2 DW_MPPS_SCU AE Specification

The DW_MPPS_SCU Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID	SCU	SCP
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	No

2.3.2.1 Association Establishment Policies

2.3.2.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the DW_MPPS_SCU is:

Maximum Length PDU	16KB (Configurable)

2.3.2.1.2 Number of Associations

The DW_MPPS_SCU AE will initiate a maximum of 1 simultaneous associations to remote nodes (association will be established when a DICOM MPPS message is processed or when an exam is created in the database, depending on the configuration of the device in DoseWatch).

2.3.2.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.2.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	DW-2020.2.0

2.3.2.2 Association Initiation Policy

When the DW_MPPS_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_MPPS_SCU AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.2.2.1 Real-World Activity "Forward MPPS"

2.3.2.2.1.1 Associated Real-World Activity

2.3.2.2.1.1.1 Post Process Forwarding Rules

When configured to do so, DoseWatch will create MPPS Instances (N-CREATE and N-SET) upon receiving DICOM images, secondary captures, (R)RDSR and/or MPPS from a device. After the corresponding examination is created in the database, these MPPS instances shall be sent to the destination AE specified in DoseWatch configuration.

2.3.2.2.1.1.2 Direct Forwarding Rules

For devices sending MPPS to DoseWatch, DoseWatch can be configured to forward the received MPPS to a destination AE specified per MPPS source directly at the end of the DICOM association (in this case, it does not depend on the persistence of the study in the database).

2.3.2.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_MPPS_SCU for Activity "Forward MPPS"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Explicit VR Little Endian Explicit VR Big Endian (Retired) Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

2.3.2.2.1.2.1 SOP Specific DICOM Conformance Statement for Modality Performed Procedure Step SOP Class

2.3.2.2.1.2.1.1 MPPS N-CREATE

The DW_MPPS_SCU AE includes attributes in the Modality Performed Procedure Step N-CREATE sent by the device.

Following are the status codes that are more specifically processed when receiving an N-CREATE response from a MPPS SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	DICOM status is available in the DICOM logs of DoseWatch or in the gateway logs.
Success	0000		N-CREATE message is sent.

2.3.2.2.1.2.1.2 MPPS N-SET

The DW_MPPS_SCU AE includes attributes in the Modality Performed Procedure Step N-SET sent by the modality.

Following are the status codes that are more specifically processed when receiving an N-SET response from a MPPS SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	DICOM status is available in the DICOM logs of DoseWatch or in the gateway logs.
Success	0000		N-SET message is sent.

2.3.3 DW_RDSR_SCU AE Specification

The DW_RDSR_SCU Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID	SCU	SCP
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Yes	No
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	Yes	No
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Yes	No
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Yes	No
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Yes	No

2.3.3.1 Association Establishment Policies

2.3.3.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU size for the DW_RDSR_SCU is:

Maximum Length PDU	16KB (configurable)

2.3.3.1.2 Number of Associations

The DW_RDSR_SCU AE will initiate a maximum of 1 simultaneous associations to remote nodes (association will be established when a DICOM SR message is processed or when an examination is created in the database, depending on the configuration of the device in DoseWatch).

2.3.3.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.3.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	DW-2020.2.0

2.3.3.2 Association Initiation Policy

When the DW_RDSR_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_RDSR_SCU AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.3.2.1 Real-World Activity "Forward SR"

2.3.3.2.1.1 Associated Real-World Activity

2.3.3.2.1.1.1 Post Process Forwarding Rules

When configured to do so, DoseWatch will create a (R)RDSR Instance upon receiving DICOM images, secondary captures, (R)RDSR and/or MPPS from a device. After the corresponding exam is created in the database, this (R)RDSR instance shall be sent to the destination AE specified in DoseWatch configuration. In that case only a (R)RDSR file is generated, no Secondary capture nor enhanced SR are generated.

2.3.3.2.1.1.2 Direct Forwarding Rules

For modalities sending SR to DoseWatch, DoseWatch can be configured to forward the received RDSR, RRDSR, secondary capture, comprehensive SR or enhanced SR to a destination AE specified per RDSR source directly at the end of the DICOM association (in this case, it does not depend on the persistence of the study in the database).

2.3.3.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_RDSR_SCU for Activity "Forward SR"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Explicit VR Little Endian Explicit VR Big Endian (Retired) Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian Explicit VR Big Endian (Retired) Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Radiopharmaceutical Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.68	Explicit VR Little Endian Explicit VR Big Endian (Retired) Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Explicit VR Big Endian (Retired) Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Comprehensive SR Storage	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian Explicit VR Big Endian (Retired)	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

		Implicit VR Little Endian	1.2.840.10008.1.2		

2.3.3.2.1.2.1 SOP Specific DICOM Conformance Statement for X-Ray Radiation Dose Storage Classes, Enhanced SR , Secondary Capture Image Storage and Radiopharmaceutical Radiation Dose Structured Report

Following are the status codes that are more specifically processed when receiving a response from a RDSR SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	Status Processing error “F” is associated to the send request. DICOM status is available in the DICOM logs of DoseWatch or in the gateway logs.
Success	0000		RDSR/RRDSR/SC/Enhanced SR message is sent.

2.3.4 DW_MWL_SCU AE Specification.

The DW_MWL_SCU Application Entity (real Application Entity is the AE Title defined for the device configured in DoseWatch) provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP**:

SOP Class Name	SOP Class UID	SCU	SCP
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

2.3.4.1 Association Establishment Policies

2.3.4.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the DW_MWL_SCU AE is:

Maximum Length PDU	16KB (configurable)

2.3.4.1.2 Number of Associations

The DW_MWL_SCU AE will initiate a maximum of 1 simultaneous association to remote nodes.

The DW_MWL_SCU AE does not accept DICOM associations.

2.3.4.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.4.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	1.2.840.113619.6.326
DoseWatch Implementation Version Name	DW-2020.2.0

2.3.4.2 Association Initiation Policy

When the DW_MWL_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_MWL_SCU proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.4.3 Real-World Activity "Display Scheduled Exams"

2.3.4.3.1.1 Associated Real-World Activity

On a regular basis (configurable) or upon user request, the DoseWatch system shall query the DICOM Modality Worklist server associated to each device selected in DoseWatch configuration.

DoseWatch queries the worklist provider using each modality AE Title or can use its own AE Title, hence the association is kept open until each modality's worklist has been queried.

2.3.4.3.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_MWL_SCU for Activity "Display Scheduled Exams"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

2.3.4.3.1.2.1 SOP Specific DICOM Conformance Statement for the Modality Worklist Information Model - FIND SOP Class

The DW_MWL_SCU AE includes matching keys in the Modality Worklist queries as described in Section 2.3.4.3.1.2.1.1.

Modality Scheduled Procedure Steps returned by the SCP are displayed in the Scheduled Studies Worklist of DoseWatch and stored in the database for further processing. A Modality Worklist Request is sent by DoseWatch when the final user requests the list of scheduled studies or every 15 minutes (configurable) by a batch job.

Following are the status codes that are more specifically processed when receiving messages from a **Modality Worklist** SCP equipment:

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	The resulting list is considered as empty (not displayed or not stored). Details of the error are available in the DICOM or application logs.
Success	0000	Matching is complete - No final identifier is supplied	

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving of matches continues.

DoseWatch does not generate C-FIND-CANCEL commands.

2.3.4.3.1.2.1.1 Modality Worklist Query Details

The following DICOM tags are sent in the Modality Worklist query:

- ScheduledProcedureStepSequence/ScheduledProcedureStepStartDate with the current date or the X days to come (specified in the UI)
- ScheduledProcedureStepStartTime with the value "000000-235959"
- ScheduledStationAETitle with the AE Title that has initiated the DICOM association

The complete detail of the query sent can be found in section 16.

2.3.4.4 Association Acceptance Policy

The DW_MWL_SCU Application Entity does not accept any DICOM associations.

2.3.5 DW_QR_SCU AE Specification.

The DW_QR_SCU Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU** and/or as an **SCP**:

SOP Class Name	SOP Class UID	SCU	SCP
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No

2.3.5.1 Association Establishment Policies

2.3.5.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the DW_QR_SCU AE is:

Maximum Length PDU	16KB (configurable)

2.3.5.1.2 Number of Associations

The DW_QR_SCU AE will initiate a maximum of 1 simultaneous association to remote nodes.

The DW_QR_SCU AE does not accept DICOM associations.

2.3.5.1.3 Asynchronous Nature

2.3.5.1.4 Asynchronous mode is not supported. All operations will be performed synchronously.Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

DoseWatch Implementation UID	**1.2.840.113619.6.326**
DoseWatch Implementation Version Name	**DW-2020.2.0**

2.3.5.2 Association Initiation Policy

When the DW_QR_SCU Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities; i.e., there is only a single, comprehensive Presentation Context Negotiation proposed for the AE.

The DW_QR_SCU proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.5.2.1 Real-World Activity "Query/Retrieve Exams"

2.3.5.2.1.1 Associated Real-World Activity

When configured, DoseWatch can query a query/retrieve provider (i.e. PACS, Workstation, device...) to complete information previously received from a device. This may be triggered upon the reception of specific type of file (MPPS, Images, RDSR...) or periodically to retrieve examinations for specific day or specific device.

2.3.5.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE DW_QR_SCU for Activity "Query/Retrieve Exams"					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Patient Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	yes(1)

(1) One extended negotiation is added for the relational-query support. If not supported, DoseWatch use the hierarchical mode.

2.3.5.2.1.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - MOVEand Study Root Query/Retrieve Information Model - MOVE

The C-MOVE-RQ will use the AE Title of the DoseWatch Application Entity as the Move Destination AE Title.

The DoseWatch does not generate any C-MOVE-CANCEL operation.

Following are the status codes that are more specifically processed when receiving messages from a **Retrieve** SCP equipment :

Service Status	Status Code	Further Meaning	Application Behavior When Receiving Status Code
Failure	*	*	The resulting list is considered as empty (not displayed or not stored). Details of the error are available in the DICOM or application logs.
Success	0000	Matching is complete - No final identifier is supplied	
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving of matches continues.

2.3.5.2.1.2.1.1 Query Retrieve Details

The DoseWatch performs in the same association a C-FIND and C-MOVE on the entities returned by the C-FIND. Usually the C-FIND query is controlled by a template configured in the DoseWatch. This template describe the keys to query (described in section 18.2).

The DoseWatch does not support the C-FIND Cancel operation. If a failure status code is returned by the SCP during the C-FIND or the C-MOVE, the query/retrieve operation is stopped. DoseWatch generates an APPLICATION_ERROR status message in the UI.

2.3.5.3 Association Acceptance Policy

The DW_QR_SCU Application Entity does not accept any DICOM associations.

2.3.6 STOW-RS Specifications

This transaction uses the POST method to Store representations of Studies, Series, and Instances contained in the request payload.

The Store transaction supports only DICOM resources. The resource can be supplied as a single Instance, or as separate Metadata and Bulkdata.

The Store transaction user agent can request Resources listed in the table below:

Resource	URI Template	Description
Studies	/studies	Stores a set of representations that may have different Study Instance UIDs.
Study	/studies/{study}	Stores a set of representations that belong to the same Study, i.e., each representation shall have the same Study Instance UID.

The Store transaction user agent supports Header Fields listed in the table below:

Header Field	Supported values	Comments
Content-Type	multipart/related; type="application/dicom" transfer-syntax={uid}	Transfer Syntaxes supported are the same as in 2.3.1.3.2.2
	multipart/related; type=" application/dicom+xml" transfer-syntax={uid}	Transfer Syntaxes supported are the same as in 2.3.1.3.2.2
	multipart/related; type=" application/dicom+json" transfer-syntax={uid}	Transfer Syntaxes supported are the same as in 2.3.1.3.2.2

Existing HTTP response codes are the following:

Service Status	HTTP Status Code	STOW-RS Description
Failure	415 – Unsupported Media Type	Unsupported Media Type in the HTTP request.
	409 - Conflict	Error during reading and storage of the instances.
	500 – Internal Server Error	The STOW-RS is unable to build a response from the instances received.
Success	200 - OK	The STOW-RS successfully stored all the instances.

Web service endpoint URL is: http[s]://<host>:<port>/ stow/studies

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks

The DICOM Upper Layer Protocol is supported using TCP/IP, as specified in DICOM PS3.8.

The TCP/IP stack is inherited from the Windows Server Operating System.

TLS configuration is supported on the DICOM Listener with TLSv1, TLSv1.1, TLSv1.2, TLSv1.3 and SSLv3 protocols.

2.4.2 Physical Media Support

The DoseWatch product is a software only solution and is expected to run with a 10/100 Mb/s or 1Gb/s auto-sensing Ethernet interface. Additional or alternate network interfaces may be available.

2.4.3 Additional Protocols

The DoseWatch DICOM Stack is based on the standard Java Network stack and supports the DHCP protocol.

2.4.4 IPV4 and IPv6 Support

The DoseWatch DICOM Stack is based on the standard Java Network stack and supports IPv4 and IPv6 protocols.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Standard Extended / Specialized / Private SOP Classes

2.5.1.1 Standard Extended SOP Classes

The product provides Standard Extended Conformance to all supported SOP Classes, through the inclusion of additional Type 3 Standard Elements and Private Data Elements.

Some private data elements can be read and processed by DoseWatch provided that they are specified in the source system DICOM Conformance Statement.

DoseWatch's feature "RRA for Pristina" does create Private Data Elements to provide the dose information and reason for Reject and Repeat Analysis (images deleted on the mammography device).

2.5.1.2 Private SOP Classes

DoseWatch can be configured to support private SOP classes for storage.

2.5.1.3 Private Transfer Syntaxes

No Private Transfer Syntax is supported.

2.6 CONFIGURATION

The exact method for configuring each configurable item is specified in other DoseWatch documentations. The following sections only describe some items that are configurable.

2.6.1 AE Title/Presentation Address Mapping

2.6.1.1 Configurable Parameters

The following fields are configurable for this AE (local):

- Local AE Title
- Local Listening Port Number

The table below provides the default DoseWatch AE Titles and TCP port numbers:

Application Entity	AE Title	TCP Port
DoseWatch DICOM Modality Worklist SCU	DoseWatch uses connected devices' AET or DW_MWL_SCU	n/a
DoseWatch AEs	DW_SCP	2001

	DW_MPPS_SCP (Instance 2) (optional)	2002
	DW_RDSR_SCP (Instance 3) (optional)	2003
DoseWatch MPPS sender	When forwarding MPPS, DoseWatch uses MPPS origin's AET or DW_MPPS_SCU	n/a
DoseWatch RDSR Sender	When forwarding RDSR, DoseWatch uses RDSR origin's AET or DW_RDSR_SCU	n/a
DoseWatch Query/Retrieve SCU	DW_QR_SCU	n/a

The following fields are configurable for every remote DICOM AE:

- Remote AE Title
- Remote IP Address
- TCP/IP Port Number

Note: All configurations must be performed by a GE Field Engineer.

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The DoseWatch supports ISO_IR 100 (Latin alphabet Number 1 supplementary set) as default and character sets such as ISO 2022 IR 13 and ISO 2022 IR 87 for Japanese are supported. Other character sets may be supported but have not been tested.

2.8 CODES AND CONTROLLED TERMINOLOGY

The product uses no coded terminology.

2.9 SECURITY PROFILES

2.9.1 Supported Profiles

The product supports the following DICOM security profiles:

- Basic TLS Secure Transport Connection Profile.
- AES TLS Secure Transport Connection Profile.
- BCP 195 TLS Secure Transport Connection Profile.
- Non-Downgrading BCP 195 TLS Secure Transport Connection Profile.

The supported profiles are for both SCU and SCP use cases.

2.9.2 Supported Protocols

The product supports the following TLS protocols, for both SCU and SCP use cases: SSLv3, TLSv1.0, TLSv1.1, TLSv1.2 and TLSv1.3.

2.9.3 Supported Cipher suites

The following cipher suites are supported within DoseWatch :

	TLSv1.3	TLSv1.2	TLSv1.1	TLSv1	SSLv3
SSL_DHE_RSA_EXPORT_WITH_DES40_CBC_SHA	FALSE	FALSE	FALSE	TRUE	TRUE
SSL_DHE_RSA_WITH_3DES_EDE_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_DHE_RSA_WITH_DES_CBC_SHA	FALSE	FALSE	TRUE	TRUE	TRUE
SSL_DH_anon_EXPORT_WITH_DES40_CBC_SHA	FALSE	FALSE	FALSE	TRUE	TRUE
SSL_DH_anon_EXPORT_WITH_RC4_40_MD5	FALSE	FALSE	FALSE	TRUE	TRUE
SSL_DH_anon_WITH_3DES_EDE_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_DH_anon_WITH_DES_CBC_SHA	FALSE	FALSE	TRUE	TRUE	TRUE
SSL_DH_anon_WITH_RC4_128_MD5	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_RSA_WITH_3DES_EDE_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_RSA_WITH_DES_CBC_SHA	FALSE	FALSE	TRUE	TRUE	TRUE
SSL_RSA_WITH_NULL_MD5	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_RSA_WITH_NULL_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_RSA_WITH_RC4_128_MD5	FALSE	TRUE	TRUE	TRUE	TRUE
SSL_RSA_WITH_RC4_128_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_AES_128_GCM_SHA256	TRUE	FALSE	FALSE	FALSE	FALSE
TLS_AES_256_GCM_SHA384	TRUE	FALSE	FALSE	FALSE	FALSE
TLS_DHE_RSA_WITH_AES_128_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_DHE_RSA_WITH_AES_128_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DHE_RSA_WITH_AES_256_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_DHE_RSA_WITH_AES_256_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DHE_RSA_WITH_AES_256_GCM_SHA384	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DH_anon_WITH_AES_128_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_DH_anon_WITH_AES_128_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DH_anon_WITH_AES_128_GCM_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DH_anon_WITH_AES_256_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_DH_anon_WITH_AES_256_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_DH_anon_WITH_AES_256_GCM_SHA384	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_ECDHE_RSA_WITH_NULL_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDHE_RSA_WITH_RC4_128_SHA	FALSE	TRUE	TRUE	TRUE	TRUE

TLS_ECDH_anon_WITH_3DES_EDE_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDH_anon_WITH_AES_128_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDH_anon_WITH_AES_256_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDH_anon_WITH_NULL_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_ECDH_anon_WITH_RC4_128_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_RSA_WITH_AES_128_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_RSA_WITH_AES_128_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_RSA_WITH_AES_128_GCM_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_RSA_WITH_AES_256_CBC_SHA	FALSE	TRUE	TRUE	TRUE	TRUE
TLS_RSA_WITH_AES_256_CBC_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_RSA_WITH_AES_256_GCM_SHA384	FALSE	TRUE	FALSE	FALSE	FALSE
TLS_RSA_WITH_NULL_SHA256	FALSE	TRUE	FALSE	FALSE	FALSE

The protocols TLSv1.3 and SSLv3 are deactivated by default, but can be activated if needed. The cypher suites which are in gray are also deactivated by default, and can be activated if needed.

The default proposed configuration in the product is the protocol TLSv1.2, and the cypher suites :

- TLS_DHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_DHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

The default TLS configuration is following the recommendations of IHE TLS 1.2 floor using BCP195 Option.

2.9.4 Security Considerations

When the product is configured with TLS, by default, it is using the same default port number as defined in non TLS configuration, within the paragraph 2.6.1.1.

It is assumed that the product is used within a secured environment. It is assumed that a secured environment includes at a minimum:

1. Firewall or router protections to ensure that only approved external hosts have network access to the product.
2. Firewall or router protections to ensure that the product only has network access to approved external hosts and services.
3. Any communications with external hosts and services outside the locally secured environment use appropriate secure network channels (such as a Virtual Private Network (VPN)).

3. CT INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

This section specifies the use of the DICOM CT Image IOD to represent the information included in CT Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

3.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 3-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/CTStudy
Series	Series/CTSeries
Image	DicomRawImage

3.3 IOD MODULE TABLE

The Computed Tomography Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 3.5.

TABLE 3-2
CT IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Frame of Reference	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Plane	Used	3.4.5.2
	Image Pixel	Used	3.4.5.3
	Contrast/Bolus	Used Required if contrast media was used in this image	3.4.5.4

	Device	Not Used	
	Specimen	Not Used	
	CT Image	Used	3.4.5.5
	Multi-energy CT Image	Not Used	
	Overlay Plane	Not Used	
	VOI LUT	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	

3.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the CT Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

3.4.1 Patient Entity Modules

3.4.1.1 Patient Module

TABLE 3-3
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Used: extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields.
Patient ID	(0010,0020)	2	Used: extracted for every DICOM Type received. Max length 255 characters.
Issuer of Patient ID	(0010,0021)	3	Used: max length 50 characters, issuer of patient ID has to be declared in DoseWatch before receiving data. Named “Domain” in DoseWatch – IHE denomination. If not configured, a default domain configured in DoseWatch is used.
Patient's Birth Date	(0010,0030)	2	Used and combined with Patient's Birth Time into a single value: date value in database.
Patient's Birth Time	(0010,0032)	3	Used and combined with Patient's Birth Date into a single value: date value in database
Patient's Sex	(0010,0040)	2	Used, possible values used are O: other, F: female, M: male.

3.4.2 Study Entity Modules

3.4.2.1 General Study Module

TABLE 3-4
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Used: max value 255 characters.
Study Date	(0008,0020)	2	Used: combined with Study Time. Use the timezone of DoseWatch (or a manually selected one) to persist the study. Another field exists in DoseWatch where the date is also stored in GMT.
Study Time	(0008,0030)	2	Used: combined with Study Date.
Referring Physician's Name	(0008,0090)	2	Used: Extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields.
Study ID	(0020,0010)	2	Used: max 255 characters.
Accession Number	(0008,0050)	2	Used: max 255 characters.

Study Description	(0008,1030)	3	Used: max 255 characters. Attached to site in DoseWatch and modality type for statistics.
Name of Physician(s) Reading Study	(0008,1060)	3	Used: extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields.
Referenced Study Sequence	(0008,1110)	3	Used.
>Referenced SOP Class UID	(0008,1150)	1	Not Used.
>Referenced SOP Instance UID	(0008,1155)	1	Used.

3.4.2.2 Patient Study Module

TABLE 3-5
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Size	(0010,1020)	3	Used. Unit: stored converted in centimeters.
Patient's Weight	(0010,1030)	3	Used. Unit: kilograms.

3.4.3 Series Entity Modules

3.4.3.1 General Series Module

Table 3-6
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used. Modality managed by DoseWatch: CT, XA, MG, RF, CR, NM, PT, US, MR, SR, PX, DX.
Series Instance UID	(0020,000E)	1	Used: max 255 characters.
Series Number	(0020,0011)	2	Used: max int length 11.
Laterality	(0020,0060)	2C	Used only in RF, CR, DX and MG.
Series Date	(0008,0021)	3	Used: combined with Series Time. Use the timezone of DoseWatch to persist the Series.
Series Time	(0008,0031)	3	Used: combined with Series Date.
Performing Physicians' Name	(0008,1050)	3	Used: extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields. In DoseWatch, stored at study level.
Protocol Name	(0018,1030)	3	Used: max 255 characters.
Series Description	(0008,103E)	3	Used: max 255 characters. Attached in DoseWatch with the modality for statistics.

Operators' Name	(0008,1070)	3	Used: extracted for every DICOM Type received. Shall be formatted with LAST_NAME^FIRST_NAME^MIDDLE_NAME^SUFFIX^PREFIX Max length 255 characters for each subfields. In DoseWatch, stored at study level.
Body Part Examined	(0018,0015)	3	Used. Stored as a target region.
Patient Position	(0018,5100)	2C	Used, values stored are HFP= Head First-prone, HFS=Head First-Supine, HFDR= Head First-Decibitus Right, HFDL = Head First-Decubiturs Left, FFP = Feet First-Prone, FFS = Feet First-Supine, LFP = Left First-Prone, LFS = Left First-Supine, RFP = Right First-Prone, RFS = Right First-Supine, AFDR = Anterior First-Decubitus Right, AFDL = Anterior First-Decubitus Left, FFDR = Feet First-Decubitus Left, FFDL = Feet First-Decubitus Left, PFDR = Posterior First-Decubitus Right, PFDL = Posterior First-Decubitus Left.
Request Attributes Sequence	(0040,0275)	3	Used.
>Requested Procedure ID	(0040,1001)	1C	Used. Stored in an entity Requested Procedure.
>Accession Number	(0008,0050)	3	Used. Stored in an entity Requested Procedure.
>Study Instance UID	(0020,000D)	3	Used. Stored in an entity Requested Procedure.
>Requested Procedure Description	(0032,1060)	3	Used. Stored in an entity Requested Procedure.
>Requested Procedure Code Sequence	(0032,1064)	3	Used. Stored in an entity Requested Procedure.
>>Include 'Code Sequence Macro'			
>Reason for the Requested Procedure	(0040,1002)	3	Used. Stored in an entity Requested Procedure.
>Reason for Requested Procedure Code Sequence	(0040,100A)	3	Used. Stored in an entity Requested Procedure.
>>Include' Code Sequence Macro'			
>Scheduled Procedure Step ID	(0040,0009)	1C	Used. Stored in an entity Scheduled Procedure.
>Scheduled Procedure Step Description	(0040,0007)	3	Used. Stored in an entity Scheduled Procedure.
>Scheduled Protocol Code Sequence	(0040,0008)	3	Used. Stored in an entity Scheduled Procedure.
>>Include 'Code Sequence Macro'			
>>Protocol Context Sequence	(0040,0440)	3	Used. Stored in an entity Protocol.
>>>Include 'Content Item Macro'			

3.4.4 Equipment Entity Modules

3.4.4.1 General Equipment Module

TABLE 3-7
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Used sometimes when data are retrieved from a PACS to use the right data dictionary.
Institution Name	(0008,0080)	3	Used: max 255 characters.

Institution Address	(0008,0081)	3	Used: max 255 characters.
Station Name	(0008,1010)	3	Used sometimes when data are retrieved from a PACS to use the right data dictionary.
Institutional Department Name	(0008,1040)	3	Used: max 255 characters.
Manufacturer's Model Name	(0008,1090)	3	Used sometimes when data are retrieved from a PACS to use the right data dictionary.
Software Versions	(0018,1020)	3	Used.
Date of Last Calibration	(0018,1200)	3	Used only in MG.
Time of Last Calibration	(0018,1201)	3	Used only in MG.

3.4.5 Image Entity Modules

3.4.5.1 General Image Module

TABLE 3-8
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	2	Used only in MG, RF and US.
Patient Orientation	(0020,0020)	2C	Used only in XA, MG, RF and MR.
Content Date	(0008,0023)	2C	Used only in RF, US and MR.
Content Time	(0008,0033)	2C	Used only in RF, US and MR.
Image Type	(0008,0008)	3	Used. See 3.4.5.5.1.
Acquisition Number	(0020,0012)	3	Used.
Acquisition Date	(0008,0022)	3	Used.
Acquisition Time	(0008,0032)	3	Used.
Acquisition DateTime	(0008,002A)	3	Used.
Quality Control Image	(0028,0300)	3	Used only in RF.
Burned In Annotation	(0028,0301)	3	Used only in MG and RF.
Lossy Image Compression	(0028,2110)	3	Used only in RF.
Presentation LUT Shape	(2050,0020)	3	Used only in RF.
Irradiation Event UID	(0008,3010)	3	Used.
Image Laterality	(0020,0062)	3	Used only in MG and RF.

3.4.5.2 Image Plane Module

TABLE 3-9
IMAGE PLANE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Pixel Spacing	(0028,0030)	1	Used for the SSDE Feature.
Image Orientation (Patient)	(0020,0037)	1	Used for the SSDE Feature.
Image Position (Patient)	(0020,0032)	1	Used for the SSDE Feature.
Slice Thickness	(0018,0050)	2	Used.

3.4.5.3 Image Pixel Module

TABLE 3-10
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Used for DICOM export.
Photometric Interpretation	(0028,0004)	1	Used for DICOM export.
Rows	(0028,0010)	1	Used to read image by SSDE feature.
Columns	(0028,0011)	1	Used to read image by SSDE feature.
Bits Allocated	(0028,0100)	1	Used for DICOM export.
Bits Stored	(0028,0101)	1	Used for DICOM export.
High Bit	(0028,0102)	1	Used for DICOM export.
Pixel Representation	(0028,0103)	1	Used for DICOM export.
Pixel Data	(7FE0,0010)	1	PixelData are kept when the image is a localizer. Kept for Secondary Captures objects to perform OCR on them. Removed by default for other types but can be kept when configured.

3.4.5.4 Contrast/Bolus Module

TABLE 3-11
CONTRAST/BOLUS MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Contrast/Bolus Agent	(0018,0010)	2	Used or extracted from OCR in the contrast screenshot.
Contrast/Bolus Route	(0018,1040)	3	Used or extracted from OCR in the contrast screenshot.
Contrast/Bolus Volume	(0018,1041)	3	Used or extracted from OCR in the contrast screenshot.
Contrast/Bolus Start Time	(0018,1042)	3	Used or extracted from OCR in the contrast screenshot.
Contrast/Bolus Total Dose	(0018,1044)	3	Used or extracted from OCR in the contrast screenshot.
Contrast Flow Rate(s)	(0018,1046)	3	Used or extracted from OCR in the contrast screenshot.
Contrast Flow Duration(s)	(0018,1047)	3	Used or extracted from OCR in the contrast screenshot.
Contrast/Bolus Ingredient	(0018,1048)	3	Used or extracted from OCR in the contrast screenshot.
Contrast/Bolus Ingredient Concentration	(0018,1049)	3	Used or extracted from OCR in the contrast screenshot.

3.4.5.5 CT Image Module

TABLE 3-12
CT IMAGE MODULE ATTRIBUTES

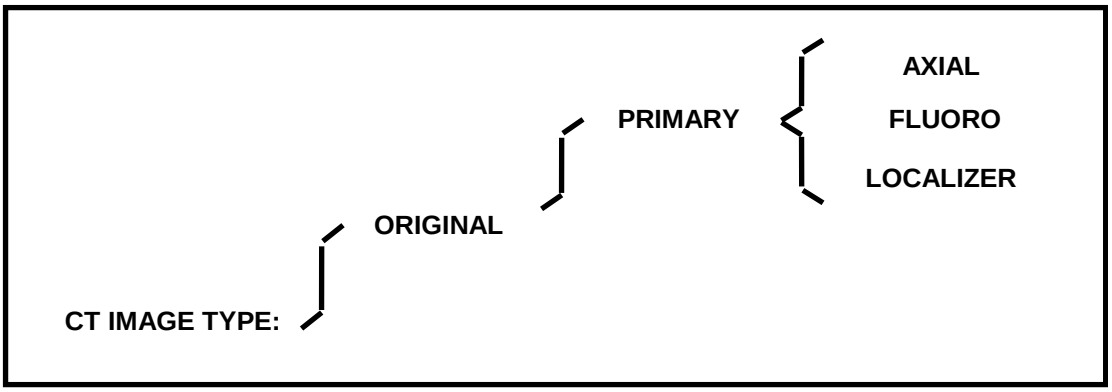
Attribute Name	Tag	Type	Use
Image Type	(0008,0008)	1	See 3.4.5.5.1. Used: store only images starting with ORIGINAL\PRIMARY\ and containing AXIAL, LOCALIZER or FLUORO.
Samples per Pixel	(0028,0002)	1	Not Used.
Photometric Interpretation	(0028,0004)	1	Not Used.
Bits Allocated	(0028,0100)	1	Not Used.
Bits Stored	(0028,0101)	1	Not Used.
High Bit	(0028,0102)	1	Not Used.
Rescale Intercept	(0028,1052)	1	Not Used.
Rescale Slope	(0028,1053)	1	Not Used.
KVP	(0018,0060)	2	Used at CTseries level.
Acquisition Number	(0020,0012)	2	Used at CTseries level.
Scan Options	(0018,0022)	3	Used at CTseries level.
Data Collection Diameter	(0018,0090)	3	Used at CTseries level.
Data Collection Center (Patient)	(0018,9313)	3	Used at CTseries level.
Reconstruction Diameter	(0018,1100)	3	Used at CTseries level.
Distance Source to Detector	(0018,1110)	3	Used at CTseries level.
Distance Source to Patient	(0018,1111)	3	Used at CTseries level.
Gantry/Detector Tilt	(0018,1120)	3	Used at CTseries level.
Table Height	(0018,1130)	3	Used at CTseries level.
Rotation Direction	(0018,1140)	3	Used at CTseries level.
Exposure Time	(0018,1150)	3	Used at CTseries level.
X-ray Tube Current	(0018,1151)	3	Used at CTseries level.
Exposure	(0018,1152)	3	Used at CTseries level.
Exposure in µAs	(0018,1153)	3	Used at CTseries level.
Filter Type	(0018,1160)	3	Used at CTseries level.
Generator Power	(0018,1170)	3	Used at CTseries level.
Focal Spot(s)	(0018,1190)	3	Used at CTseries level.
Convolution Kernel	(0018,1210)	3	Used at CTseries level.
Revolution Time	(0018,9305)	3	Used at CTseries level.
Single Collimation Width	(0018,9306)	3	Used at CTseries level.
Total Collimation Width	(0018,9307)	3	Used at CTseries level.
Table Speed	(0018,9309)	3	Used at CTseries level.
Table Feed per Rotation	(0018,9310)	3	Used at CTseries level.
Spiral Pitch Factor	(0018,9311)	3	Used at CTseries level.
CTDIvol	(0018,9345)	3	Used at CTseries level.

CTDI Phantom Type Code Sequence	(0018,9346)	3	Used at CTseries level.
>Include 'Code Sequence Macro Attributes'			
Water Equivalent Diameter	(0018,1271)	3	Used at CTseries level.

3.4.5.5.1 Image Type

For CTSeries DoseWatch supports the following type of images for processing.

ILLUSTRATION 3-1
CT IMAGE TYPE DECISION TREE



3.4.5.6 SOP Common Module

TABLE 3-13
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used: max 255 characters.
SOP Instance UID	(0008,0018)	1	Used: max 255 characters.
Specific Chararcter Set	(0008,0005)	1C	Used to read the object received, see 2.7.
Instance Number	(0020,0013)	3	Used.

3.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

3.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
Arineta	CardioGraphe
BrainLab	Airo
Canon	Activion 16
	Alexion
	Alphenix 4D CT
	Aquilion
	Aquilion CXL
	Aquilion Exceed LB
	Aquilion LB
	Aquilion Lightning
	Aquilion ONE Family
	Aquilion ONE GENESIS
	Aquilion ONE PRISM Edition
	Aquilion One ViSION Edition
	Aquilion Precision
	Aquilion Premium
	Aquilion PRIME
	Aquilion PRIME SP
	Aquilion RXL
	Aquilion Start
	Astelion
	Celesteion
	Infinix-i 4D CT
Carestream	CS 9000 3D System
Fujifilm	FCT Speedia
	FCT Speedia HD
General Electric	BrightSpeed Edge 16 Slices
	BrightSpeed Edge 4/8 slices
	BrightSpeed Edge Select 16 slices
	BrightSpeed Edge Select 4/8 slices
	BrightSpeed Elite 16 Slices
	BrightSpeed Elite 4/8 Slices
	BrightSpeed Elite Select 16 slices
	BrightSpeed Elite Select 4/8 slices
	BrightSpeed Excel 16 slices
	BrightSpeed Excel 4/8 slices
	BrightSpeed Excel Select 16 slices
	BrightSpeed Excel Select 4/8 slices
	BrightSpeed QX/i
	Brivo CT315
	Brivo CT325
	Brivo CT385
	Discovery CT590 RT
	Discovery CT750 HD
	Discovery IQ
	Discovery LS
	Discovery MI
	Discovery NM/CT 570c
	Discovery NM/CT 670
	Discovery NM/CT 670 CZT
	Discovery NM/CT 670 ES
	Discovery NM/CT 670 Pro
	Discovery NM/CT 860
	Discovery NM/CT 870 CZT
	Discovery NM/CT 870 DR
	Discovery PET/CT 600
	Discovery PET/CT 610
	Discovery PET/CT 690
	Discovery PET/CT 710
	Discovery RT
	Discovery RX
	Discovery RX VCT
	Discovery ST
	Discovery ST 16
	Discovery STE
	Discovery VCT
	HiSpeed Advantage
	HiSpeed CT/e
	HiSpeed CT/i
	HiSpeed DX/i
	HiSpeed DX/iB
	HiSpeed FX/i
	HiSpeed LX/i
	HiSpeed NX/i
	HiSpeed NX/i PRO
	HiSpeed QX/i
	HiSpeed ZX/i
	LightSpeed 16
	LightSpeed Plus
	LightSpeed Pro16
	LightSpeed Pro32
	LightSpeed QX/i
	LightSpeed RT16
	LightSpeed RT
	LightSpeed Ultra
	LightSpeed VCT
	LightSpeed VCT Select
	LightSpeed VCT XT
	LightSpeed VCT XTe
	LightSpeed Xtra
	Optima CT520
	Optima CT540

	Optima CT580
	Optima CT660
	Optima CT670
	Optima CT680
	Optima NM/CT 640
	Optima NM/CT 850
	Optima PET/CT 560
	ProSpeed
	ProSpeed A/II
	ProSpeed AI
	ProSpeed E/II
	ProSpeed F/II
	ProSpeed FI
	Revolution ACT
	Revolution ACTs
	Revolution Apex
	Revolution Ascend
	Revolution CT
	Revolution EVO
	Revolution Frontier
	Revolution GSI
	Revolution HD
	Revolution Maxima
	Synergy
	Synergy HiLight
Hitachi	ECLOS
	Presto 4 Slice
	SCENARIA
	SCENARIA View
	Supria Family
KaVo	i-CAT Next Generation
Medtronic	O-arm MVS O2
	O-arm O2 Imaging System
Morita	3D Accuitomo 170
	Veraviewepocs 3D R100
NeuroLogica	BodyTom
	CereTom
	OTOscan
Neusoft	NeuViz 128 CT
	NeuViz 16
	NeuViz 16 Classic CT
	NeuViz 16 Essence CT
	NeuViz 64 In CT
	NeuViz Glory CT
	NeuViz Prime CT
NewTom	5G
	5G XL
	7G
	VGi
	VGi evo
Philips	BrightView X
	BrightView XCT
	Brilliance Big Bore
	Brilliance-10
	Brilliance-16
	Brilliance-16P
	Brilliance-40
	Brilliance-6
	Brilliance-64
	GEMINI
	GEMINI 16 Power
	GEMINI GXL 16
	GEMINI TF
	iCT
	iCT 128
	iCT 256
	Ingenuity Core
	Ingenuity Core 128
	Ingenuity CT
	Ingenuity Flex
	Ingenuity TF PET/CT
	IQon
	MX 16-Slice
	MX 4000 Dual
	Mx 8000 IDT
	TruFlight Select
	Vereos Digital PET/CT
	Vision
Planmed	Planmed Verity
Samsung	BodyTom
	CereTom
Siemens	Biograph 128 (mCT)
	Biograph 16 HI-REZ
	Biograph 16 True Point
	Biograph 20 (mCT)
	Biograph 40
	Biograph 40 (mCT)
	Biograph 6
	Biograph 6 HI-REZ
	Biograph 64
	Biograph 64 (mCT)
	Biograph Duo PET/CT
	Biograph Horizon
	Biograph mCT
	Biograph mCT Flow
	Biograph Vision
	SOMATOM Balance
	SOMATOM Confidence RT Pro
	SOMATOM Definition
	SOMATOM Definition AS
	SOMATOM Definition Edge
	SOMATOM Definition Flash
	SOMATOM Drive
	SOMATOM Edge Plus
	SOMATOM Emotion
	SOMATOM Emotion 16
	SOMATOM Emotion 6

	SOMATOM Emotion Duo
	SOMATOM Esprit
	SOMATOM Esprit+
	SOMATOM Force
	SOMATOM go.All
	SOMATOM go.Now
	SOMATOM go.Open Pro
	SOMATOM go.Sim
	SOMATOM Go.Top
	SOMATOM go.Up
	SOMATOM Huan Yue
	SOMATOM Huan Yue 6
	SOMATOM Huan Yue Duo
	SOMATOM Huan Yue Shuang
	SOMATOM On.site
	SOMATOM Perspective
	SOMATOM Scope
	SOMATOM Sensation 10
	SOMATOM Sensation 16
	SOMATOM Sensation 4
	SOMATOM Sensation 40
	SOMATOM Sensation 64
	SOMATOM Sensation Cardiac
	SOMATOM Sensation Cardiac 64
	SOMATOM Sensation Open
	SOMATOM Spirit
	SOMATOM Volume Access
	SOMATOM Volume Zoom
	SOMATOM X.cite

	Symbia Intevo
	Symbia Intevo 6
	Symbia T16
	Symbia T2
	Symbia T6
Spectrum Dynamics	VERITON
Toshiba	Activion 16
	Alexion
	Aquilion
	Aquilion CXL
	Aquilion LB
	Aquilion Lightning
	Aquilion ONE Family
	Aquilion ONE GENESIS
	Aquilion One ViSION Edition
	Aquilion Premium
	Aquilion PRIME
	Aquilion RXL
	Astelion
	Infinix-i 4D CT
United Imaging	uCT 510
	uCT 528
	uCT 530
	uCT 550
	uCT 710
	uCT 760
	uCT 780
	uMI 780

4. DIGITAL MAMMOGRAPHY X-RAY INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

This section specifies the use of the DICOM Digital Mammography X-Ray Image IOD to represent the information included in MG Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

All field listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

4.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 4-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/MGStudy
Series	Series/MGSeries
Image	DicomRawImage

4.3 IOD MODULE TABLE

The MG Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 4.5.

TABLE 4-2
MG IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
	DX Series	Used	4.4.1.1
	Mammography Series	Used	4.4.1.2
Frame of Reference	Frame of Reference	Used Required if multiple images are obtained without releasing breast compression	4.4.2.1
Equipment	General Equipment	Used	3.4.4.1

Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Pixel	Used	3.4.5.3
	Contrast/Bolus	Used	3.4.5.4
	Display Shutter	Not Used	
	Device	Not Used	
	Intervention	Not Used	
	Specimen	Not Used	
	DX Anatomy Imaged	Used	4.4.3.1
	DX Image	Used	4.4.3.2
	DX Detector	Used	4.4.3.3
	X-Ray Collimator	Used	4.4.3.4
	DX Positioning	Used	4.4.3.5
	X-Ray Tomography Acquisition	Not Used	
	X-Ray Acquisition Dose	Used	4.4.3.6
	X-Ray Generation	Used	4.4.3.7
	X-Ray Filtration	Used	4.4.3.8
	X-Ray Grid	Used	4.4.3.9
	Mammography Image	Used	4.4.3.10
	Overlay Plane	Not Used	
	VOI LUT	Not Used	
	Image Histogram	Not Used	
	Acquisition Context	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	

4.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the Digital Mammography X-Ray Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional expected. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance as well as what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

4.4.1 Series Entity Modules

4.4.1.1 DX Series Module

TABLE 4-3
DX SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used: shall be MG.
Presentation Itent Type	(0008,0068)	1	Used.

4.4.1.2 Mammography Series Module

TABLE 4-4
MAMMOGRAPHY SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used. Value is MG.
Request Attributes Sequence	(0040,0275)	3	Used.
>Requested Procedure ID	(0040,1001)	1C	Used.
>Accession Number	(0008,0050)	3	Used.
>Referenced Study Sequence	(0008,1110)	3	Used.
>> Include 'SOP Instance Reference Macro'			
>Requested Procedure Description	(0032,1060)	3	Used.
>Requested Procedure Code Sequence	(0032,1064)	3	Used.
>>Include 'Code Sequence Macro'			
>Reason for the Requested Procedure	(0040,1002)	3	Used. Stored in an entity Requested Procedure.
>Reason for Requested Procedure Code Sequence	(0040,100A)	3	Used.
>>Include' Code Sequence Macro'			
>Scheduled Procedure Step ID	(0040,0009)	1C	Used. Stored in an entity Scheduled Procedure.
>Scheduled Procedure Step Description	(0040,0007)	3	Used. Stored in an entity Scheduled Procedure.
>Scheduled Protocol Code Sequence	(0040,0008)	3	Used.
>>Include 'Code Sequence Macro'			
>>Protocol Context Sequence	(0040,0440)	3	Used. Stored in an entity Protocol.
>>>Include 'Content Item Macro'			

4.4.2 Frame Of Reference Entity Modules

4.4.2.1 Frame Of Reference Module

TABLE 4-5
FRAME OF REFERENCE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame of Reference UID	(0020,0052)	1	See 4.4.2.1.1 for further explanation.
Position Reference Indicator	(0020,1040)	2	Not Used.

4.4.2.1.1 Frame Of Reference UID

Frame of Reference UID is stored in database for a futur usage. It's currently not used.

4.4.3 Image Entity Modules

4.4.3.1 DX Anatomy Imaged Module

TABLE 4-6
DX ANATOMY IMAGED MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Laterality	(0020,0062)	1	Used.
Anatomic Region Sequence	(0008,2218)	2	Not Used.

4.4.3.2 DX Image Module

TABLE 4-7
DX IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Used: Image type with the following keywords are kept : • Starting with ORIGINAL\PRIMARY • DERIVED\PRIMARY • DERIVED\PRIIMARY\\ • DERIVED\PRIMARY\TOMOSYNTHESIS\ NONE • DERIVED\PRIMARY\\\\150000 •
Samples per Pixel	(0028,0002)	1	Not Used. No image read and displayed.
Photometric Interpretation	(0028,0004)	1	Not Used. No image read and displayed.
Bits Allocated	(0028,0100)	1	Not Used. No image read and displayed.
Bit Stored	(0028,0101	1	Not Used. No image read and displayed.
High Bit	(0028,0102)	1	Not Used. No image read and displayed.
Pixel Representation	(0028,0103)	1	Not Used. No image read and displayed.
Pixel Intensity Relationship	(0028,1040)	1	Not Used. No image read and displayed.
Pixel Intensity Relationship Sign	(0028,1041)	1	Not Used. No image read and displayed.
Rescale Intercept	(0028,1052)	1	Not Used. No image read and displayed.
Rescale Slope	(0028,1053)	1	Not Used. No image read and displayed.
Rescale Type	(0028,1054)	1	Not Used. No image read and displayed.

Presentation LUT Shape	(2050,0020)	1	Not Used. No image read and displayed.
Lossy Image Compression	(0028,2110)	1	Not Used. No image read and displayed.
Lossy Image Compression Ratio	(0028,2112)	1C	Not Used. No image read and displayed.
Patient Orientation	(0020,0020)	1C	Used.
Burned In Annotation	(0028,0301)	1	Used.

4.4.3.3 DX Detector Module

TABLE 4-8
DX DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Field of View Shape	(0018,1147)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.
Imager Pixel Spacing	(0018,1164)	1	Not Used.
Field of View Origin	(0018,7030)	1C	Used.
Field of View Rotation	(0018,7032)	1C	Used.
Field of View Horizontal Flip	(0018,7034)	1C	Used.

TABLE 4-9
DIGITAL X-RAY DETECTOR MACRO ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Detector Type	(0018,7004)	2	Used.
Detector Configuration	(0018,7005)	3	Used.
Detector Description	(0018,7006)	3	Used.
Detector ID	(0018,700A)	3	Used.
Date of Last Detector Calibration	(0018,700C)	3	Used.
Time of Last Detector Calibration	(0018,700E)	3	Used.
Detector Binning	(0018,701A)	3	Used.
Detector Conditions Nominal Flag	(0018,7000)	3	Used.
Detector Temperature	(0018,7001)	3	Used.
Sensitivity	(0018,6000)	3	Used.
Detector Element Physical Size	(0018,7020)	3	Used.
Detector Element Spacing	(0018,7022)	3	Used.
Detector Active Shape	(0018,7024)	3	Used.
Detector Active Dimension(s)	(0018,7026)	3	Used.

4.4.3.4 X-Ray Collimator Module

TABLE 4-10
X-RAY COLLIMATOR MODULE

Attribute Name	Tag	Type	Attribute Description
Collimator Shape	(0018,1700)	1	Used.
Collimator Left Vertical Edge	(0018,1702)	1C	Used.

Collimator Right Vertical Edge	(0018,1704)	1C	Used.
Collimator Upper Horizontal Edge	(0018,1706)	1C	Used.
Collimator Lower Horizontal Edge	(0018,1708)	1C	Used.

4.4.3.5 DX Positioning Module

TABLE 4-11
DX POSITIONING MODULE

Attribute Name	Tag	Type	Attribute Description
View Position	(0018,5101)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Estimated Radiographic Magnification Factor	(0018,1114)	3	Used.
Positioner Type	(0018,1508)	2	Used.
Positioner Primary Angle	(0018,1510)	3	Used.
Positioner Secondary Angle	(0018,1511)	3	Used.
Detector Secondary Angle	(0018,1531)	3	Used.
Column Angulation	(0018,1450)	3	Used.
Body Part Thickness	(0018,11A0)	3	Used.
Compression Force	(0018,11A2)	3	Used.
Compression Pressure	(0018,1143)	3	Used.
Compression Contact Area	(0018,11A5)	3	Used.
Paddle Description	(0018,11A4)	3	Used.

4.4.3.6 X-Ray Acquisition Dose Module

TABLE 4-12
X-RAY ACQUISITION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	3	Used.
X-Ray Tube Current	(0018,1151)	3	Used.
X-Ray Tube Current in µA	(0018,8151)	3	Used.
Exposure Time	(0018,1150)	3	Used.
Exposure Time in µS	(0018,8150)	3	Used.
Exposure	(0018,1152)	3	Used.
Exposure in µAs	(0018,1153)	3	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Body Part Thickness	(0018,11A0)	3	Used.
Relative X-Ray Exposure	(0018,1405)	3	Used.
Entrance Dose	(0040,0302)	3	Used.
Entrance Dose in mGy	(0040,8302)	3	Used.

Distance Source to Entrance	(0040,0306)	3	Used.
Comments on Radiation Dose	(0040,0310)	3	Used.
Half Value Layer	(0040,0314)	3	Used.
Organ Dose	(0040,0316)	3	Used.
Anode Target Material	(0018,1191)	3	Used.

4.4.3.7 X-Ray Generation Module

TABLE 4-13
X-RAY GENERATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	3	Used.
X-Ray Tube Current	(0018,1151)	3	Used.
X-Ray Tube Current in μA	(0018,8151)	3	Used.
Exposure Time	(0018,1150)	3	Used.
Exposure Time in μS	(0018,8150)	3	Used.
Exposure	(0018,1152)	3	Used.
Exposure in μAs	(0018,1153)	3	Used.
Exposure Control Mode	(0018,7060)	3	Used.
Exposure Control Mode Description	(0018,7062)	3	Used.
Focal Spot(s)	(0018,1190)	3	Used.
Anode Target Material	(0018,1191)	3	Used.

4.4.3.8 X-Ray Filtration Module

TABLE 4-14
X-RAY FILTRATION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Filter Type	(0018,1160)	3	Used.
Filter Material	(0018,7050)	3	Used.
Filter Thickness Minimum	(0018,7052)	3	Used
Filter Thickness Maximum	(0018,7054)	3	Used.

4.4.3.9 X-Ray Grid Module

TABLE 4-15
X-RAY GRID MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Grid	(0018,1166)	3	Used.

4.4.3.10 Mammography Image Module

TABLE 4-16
MAMMOGRAPHY IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Used.
Positioner Type	(0018,1508)	1	Used.

Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Positioner Primary Angle	(0018,1510)	3	Used.
Positioner Secondary Angle	(0018,1511)	3	Used.
Image Laterality	(0020,0062)	1	Used.
Organ Exposed	(0040,0318)	1	Used. Usually use tag ”Body Part Examined”
Breast Implant Present	(0028,1300)	3	Used.
View Code Sequence	(0054,0220)	1	Not Used.

4.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won’t be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

4.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
Canon	MAMMOREX Peruru
	MGU-1000D
Fujifilm	AMULET
	AMULET f
	AMULET Innovality
	AMULET s
	Aspire HD
General Electric	Senographe 2000
	Senographe 2000D
	Senographe Care
	Senographe Crystal
	Senographe Crystal Nova
	Senographe Essential
	Senographe Pristina
	Senographe DS
Hologic	Affirm Prone Biopsy System
	MultiCare Platinum
	Selenia Dimensions 3D
	Selenia Dimensions 2D
	Selenia Performance
	Lorad Selenia
IMS	Raffaello Giotto Image
	Raffaello Giotto Tomo
Philips	MicroDose L30
	MicroDose L50
	MicroDose SI
	MammoDiagnost DR
Planmed	Planmed Clarity
	Planmed Nuance
Siemens	MAMMOMAT Fusion
	Mammomat INSPIRATION
	MAMMOMAT Novation
	MAMMOMAT Revelation
Toshiba	MGU-1000D
United Imaging	uMammo 590i
Volpara	Volpara Server

5. MR INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM MR Image IOD to represent the information included in MR Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

5.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 5-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/MRStudy
Series	Series/MRSeries
Image	DicomRawImage

5.3 IOD MODULE TABLE

The Magnetic Resonance Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 5.5

TABLE 5-2
MR IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Frame of Reference	Used	4.4.2.1
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Plane	Used	3.4.5.2
	Image Pixel	Used	3.4.5.3
	Contrast/Bolus	Used	3.4.5.4
	Device	Not Used	

	Specimen	Not Used	
	MR Image	Used	5.4.1.1
	Overlay Plane	Not Used	
	VOI LUT	Used	5.4.1.2
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	

5.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the MR Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

5.4.1 Image Entity Modules

5.4.1.1 MR Image Module

TABLE 5-3
MR IMAGE MODULE ATTRIBUTES

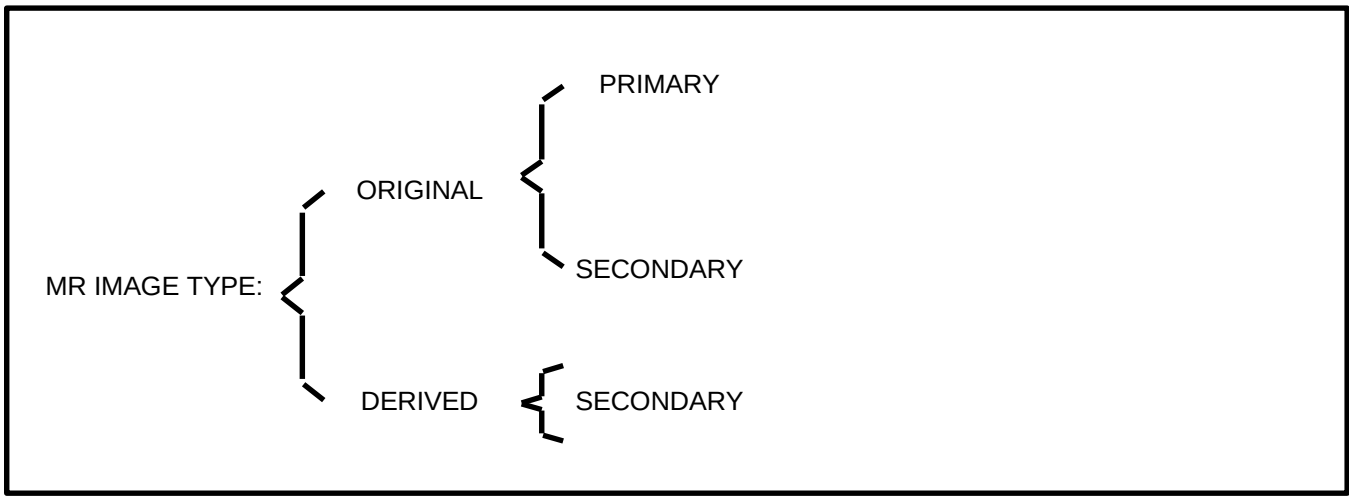
Attribute Name	Tag	Type	Use
Image Type	(0008,0008)	1	Used. By default only the value of the first image is used
Samples per Pixel	(0028,0002)	1	Used. By default only the value of the first image is used
Photometric Interpretation	(0028,0004)	1	Used. By default only the value of the first image is used
Bits Allocated	(0028,0100)	1	Used. By default only the value of the first image is used
Bits Stored	(0028,0101)	1	Not Used.
High Bit	(0028,0102)	1	Not Used.
Scanning Sequence	(0018,0020)	1	Used. By default only the value of the first image is used
Sequence Variant	(0018,0021)	1	Used. By default only the value of the first image is used
Scan Options	(0018,0022)	2	Used. By default only the value of the first image is used
MR Acquisition Type	(0018,0023)	2	Used. By default only the value of the first image is used
Repetition Time	(0018,0080)	2C	Used. By default only the value of the first image is used
Echo Time	(0018,0081)	2	Used. By default only the value of the first image is used

Echo Train Length	(0018,0091)	2	Used. By default only the value of the first image is used
Inversion Time	(0018,0082)	2C	Used. By default only the value of the first image is used
Trigger Time	(0018,1060)	2C	Not Used.
Sequence Name	(0018,0024)	3	Used. By default only the value of the first image is used
Angio Flag	(0018,0025)	3	Not Used.
Number of Averages	(0018,0083)	3	Used. By default only the value of the first image is used
Imaging Frequency	(0018,0084)	3	Used. By default only the value of the first image is used
Imaged Nucleus	(0018,0085)	3	Used. By default only the value of the first image is used
Echo Number(s)	(0018,0086)	3	Used. By default only the value of the first image is used
Magnetic Field Strength	(0018,0087)	3	Used. By default only the value of the first image is used
Spacing Between Slices	(0018,0088)	3	Used. By default only the value of the first image is used
Number of Phase Encoding Steps	(0018,0089)	3	Used. By default only the value of the first image is used
Percent Sampling	(0018,0093)	3	Used. By default only the value of the first image is used
Percent Phase Field of View	(0018,0094)	3	Used. By default only the value of the first image is used
Pixel Bandwidth	(0018,0095)	3	Used. By default only the value of the first image is used
Reconstruction Diameter	(0018,1100)	3	Used. By default only the value of the first image is used
Receive Coil Name	(0018,1250)	3	Used. By default only the value of the first image is used
Transmit Coil Name	(0018,1251)	3	Used. By default only the value of the first image is used
Acquisition Matrix	(0018,1310)	3	Used. By default only the value of the first image is used
Flip Angle	(0018,1314)	3	Used. By default only the value of the first image is used
SAR	(0018,1316)	3	Used. By default only the value of the first image is used
dB/dt	(0018,1318)	3	Used. By default only the value of the first image is used
Anatomic Region Sequence	(0008,2218)	3	Used. By default only the value of the first image is used
> Include 'Code Sequence Macro'			Used. By default only the value of the first image is used

5.4.1.1.1 Image Type

DoseWatch store any type of image for the MR modality, this allows to retrieve as much information as possible.

ILLUSTRATION 5.4-1
MR IMAGE TYPE DECISION TREE



5.4.1.2 VOI LUT module

TABLE 5-3
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	1C	Not Used.
>LUT Descriptor	(0028,3002)	1	Not Used.
>LUT Data	(0028,3006)	1	Not Used.
Window Center	(0028,1050)	1C	Used. Only the first pair is read.
Window Width	(0028,1051)	1C	Used. Only the first pair is read.

5.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

5.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
Canon	MRT-1503
	Vantage Orian Premium 1.5T
	Vantage Titan 1.5T
General Electric	Brivo MR355 1.5T
	Discovery MR450 1.5T
	Discovery MR750 3.0T
	Discovery MR750w 3.0T
	Optima MR360 1.5T
	Optima MR360 Advance
	Optima MR430s 1.5T
	Optima MR450w 1.5T
	SIGNA Architect - 70cm 3.0T
	SIGNA Artist
	Signa Creator
	Signa EXCITE 3.0T/1.5T
	Signa EXCITE HD 3.0T/1.5T
	Signa EXCITE HDxt 1.5T EchoSpeed 8 Channel
	Signa EXCITE Ovation/OpenSpeed
	SIGNA Explorer
	Singa HDe 1.5T
	Signa HDi 1.5T
	Signa HDx 3.0T/1.5T
	Signa HDxt 1.5T EchoSpeed 16 Channel
	Signa HDxt 1.5T EchoSpeed 8 Channel
	Signa HDxt 3.0T/1.5T
	SIGNA PET/MR
	SIGNA Pioneer 3.0T
	SIGNA Premier
	Signa Profile HD
	Signa TwinSpeed
	SIGNA Voyager – 70cm 1.5T
Hitachi	AIRIS Elite
	Altaire
	Oasis 1.2T
Siemens	MAGNETOM Aera 1.5T
	MAGNETOM Altea 1.5T
	MAGNETOM Amira 1.5T
	MAGNETOM Avanto 1.5T
	MAGNETOM Avantofit 1.5T
	MAGNETOM Biograph mMR 3.0T
	MAGNETOM C! 0.35T
	MAGNETOM Concerto 0.2T
	MAGNETOM Espree 1.5T
	MAGNETOM Espree eco 1.5T
	Magnetom Essenza 1.5T
	MAGNETOM Harmony 1.0T
	MAGNETOM Harmony Expert 1.0T
	MAGNETOM Lumina 3.0T
	MAGNETOM Prisma 3.0T
	MAGNETOM Prismafit 3.0T
	MAGNETOM Sempra 1.5T
	MAGNETOM Skyra 3.0T
	MAGNETOM Skyrafit 3.0T
	MAGNETOM Sola 1.5T
	MAGNETOM Sonata 1.5T
	MAGNETOM Spectra 3.0T
	MAGNETOM Symphony 1.5T
	MAGNETOM Terra 7.0T
	MAGNETOM Trio 3.0T
	MAGNETOM Verio 3.0T
	MAGNETOM Vida 3.0T
Philips	Achieva 1.5T
	Achieva 1.5T SE
	Achieva 1.5T XR
	Achieva 3.0T TX
	Achieva dStream 1.5T
	Achieva dStream 3.0T
	Gyroscan 1.5T
	Gyroscan Intera 1.5T
	Ingenia 1.5T
	Ingenia 1.5T CX

	Ingenia 1.5T S
	Ingenia 3.0T
	Ingenia 3.0T CX
	Intera 1.5T
	Multiva 1.5T
	Panorama 1.0T

United Imaging	uMR 560
	uMR 570
	uMR 588
	uMR 770
	uMR 780
	uMR 790

6. SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION

6.1 INTRODUCTION

This section specifies the use of the DICOM Secondary Capture Image IOD to represent the information included in SC Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

DoseWatch uses Secondary Captures of type Dose Report or Injection Report. For example, series 996 and 999 for GE CT are stored as images and processed with an OCR engine if needed.

Secondary captures are used to extract information not available in other cases. They are used for CT studies, MG Studies, RF Studies, XA Studies and NM Studies.

6.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 6-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/CTStudy Study/MGStudy Study/RFStudy Study/XAStudy Study/NMStudy
Series	Series/CTSeries Series/MGSeries Series/RFSeries Series/XASeries Series/NMSeries
Image	DicomRawImage

6.3 IOD MODULE TABLE

The Secondary Capture Information Object Definition comprises the modules of the following table.

TABLE 6-2
SC IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Not Used	
	Clinical Trial Series	Not Used	
Equipment	General Equipment	Used	3.4.4.1
	SC Equipment	Not Used	
Image	General Image	Not Used	
	General Reference	Not Used	
	Image Pixel	Used	3.4.5.3
	Device	Not Used	
	Specimen	Not Used	
	SC Image	Not Used	
	Overlay Plane	Not Used	
	Modality LUT	Not Used	
	VOI LUT	Not Used	
	ICC Profile	Not Used	
	SOP Common	Not Used	
	Common Instance Reference	Not Used	

6.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the SC Information Object.

6.4.1 Image Entity Modules

6.4.1.1 Secondary captures used with OCR

Grayscale and RGB secondary captures are supported for CT, XA, NM, RF, MG and NM with square pixels. Non square pixels may have a limited support.

OCR is used to extract specific information which can be found in the pixel data.

For GE CT systems the following secondary captures are used :

- series 996 is used to extract contrast information.
- series 999 is used to extract dose information.

For GE OEC systems, the series 1 is used to extract dose information.

For Toshiba/Canon systems, the series 9000 (may differ depend of the system or examination) is used to extract dose information.

For Siemens CT, the series 501 or 502 is used to extract contrast information.

7. US INFORMATION OBJECT IMPLEMENTATION

7.1 INTRODUCTION

This section specifies the use of the DICOM US Image IOD to represent the information included in US Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

7.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 7-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/USStudy
Series	Series/USSeries
Image	DicomRawImage

7.3 IOD MODULE TABLE

The Ultrasound Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 7.5

TABLE 7-2
US IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Frame of Reference	Not Used	
	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Pixel	Not Used	
	Contrast/Bolus	Used	3.4.5.4
	Palette Color Lookup Table	Not Used	
	Device	Not Used	

	Specimen	Not Used	
	US Region Calibration	Not Used	
	US Image	Used	7.4.1.1
	Overlay Plane	Not Used	
	VOI LUT	Not Used	
	ICC Profile	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	

7.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the US Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

7.4.1 Image Entity Modules

7.4.1.1 US Image Module

This section specifies the Attributes that describe ultrasound images.

TABLE 7-3
US IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Samples Per Pixel	(0028,0002)	1	Not Used.
Photometric Interpretation	(0028,0004)	1	Not Used.
Bits Allocated	(0028,0100)	1	Not Used.
Bits Stored	(0028,0101)	1	Not Used.
High Bit	(0028,0102)	1	Not Used.
Planar Configuration	(0028,0006)	1C	Not Used.
Pixel Representation	(0028,0103)	1	Not Used.
Frame Increment Pointer	(0028,0009)	1C	Not Used.
Image Type	(0008,0008)	2	Used.
Lossy Image Compression	(0028,2110)	1C	Not Used.
Number of Stages	(0008,2124)	2C	Not Used.
Number of Views in Stage	(0008,212A)	2C	Not Used.
Acquisition Datetime	(0008,002A)	1C	Not Used.
IVUS Acquisition	(0018,3100)	1C	Not Used.
IVUS Pullback Rate	(0018,3101)	1C	Not Used.
IVUS Gated Rate	(0018,3102)	1C	Not Used.

IVUS Pullback Start Frame Number	(0018,3103)	1C	Not Used.
IVUS Pullback Stop Frame Number	(0018,3104)	1C	Not Used.
Transducer Data	(0018,5010)	3	Used.
Transducer Type	(0018,6031)	3	Used.

7.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

7.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
BK Medical	bk3000
	bk5000
	Flex Focus 500
Canon	Aplio 300
	Aplio 400
	Aplio 500
	Aplio a
	Aplio a450
	Aplio a550
	Aplio i600
	Aplio i700
	Aplio i800
	Aplio i900
	Xario 100
	Xario 200
General Electric	Invenia ABUS 2.0
	LOGIQ e
	LOGIQ E10
	LOGIQ E9 (with/without XDclear)
	LOGIQ F8
	LOGIQ i
	LOGIQ P6
	LOGIQ P9
	LOGIQ S7
	LOGIQ S8 (with/without XDclear)
	Venue 40
	Versana Essential
	Versana Premier
	Vivid E80
	Vivid E9 (with/without XDclear)
	Vivid E95
	Vivid iq
	Vivid S5
	Vivid S6
	Vivid S60
	Vivid S70
	Vivid T8
	Vivid T9
	Voluson 730
	Voluson e
	Voluson E10
	Voluson E6
	Voluson E8
	Voluson i
	Voluson P6
	Voluson P8
	Voluson P9
	Voluson S10
	Voluson S6
	Voluson S8
	Voluson SWIFT
Hitachi	ARIETTA 70
	HI VISION Preirus
Philips	Affiniti 30
	Affiniti 50

	Affiniti 70
	EPIQ 5
	EPIQ 7
	EPIQ CVx
	EPIQ CVxi
	HD15
	iE33
	iU22
Siemens	ACCUVIX XG
	ACUSON Antares
	ACUSON Bonsai
	ACUSON Freestyle
	ACUSON Juniper
	ACUSON NX2
	ACUSON NX3
	ACUSON NX3 Elite

	ACUSON OXANA Family
	ACUSON P300
	ACUSON P500
	ACUSON S1000
	ACUSON S2000
	ACUSON S3000
	ACUSON SC2000
	ACUSON Sequoia
	ACUSON X150
	ACUSON X300
	ACUSON X300 PE
	ACUSON X500
	ACUSON X600
	ACUSON X700
	SONOVISTA FX

8. US MULTI-FRAME INFORMATION OBJECT IMPLEMENTATION

8.1 INTRODUCTION

This section specifies the use of the DICOM US Multi-Frame Image IOD to represent the information included in US Multi-Frame Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

8.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 8-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/USStudy
Series	Series/USSeries
Image	DicomRawImage

8.3 IOD MODULE TABLE

The Ultrasound Image Multi-Frame Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 8.5.

TABLE 8-2
US MULTI-FRAME IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Frame of Reference	Not Used	
	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Pixel	Not Used	
	Contrast/Bolus	Used	3.4.5.4
	Cine	Not Used	

	Multi-Frame	Used	8.4.1.1
	Frame Pointers	Not Used	
	Palette Color Lookup Table	Not Used	
	Device	Not Used	
	Specimen	Not Used	
	US Region Calibration	Not Used	
	US Image	Used	7.4.1.1
	VOI LUT	Not Used	
	ICC Profile	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	
	Frame Extraction	Not Used	

8.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the US Multi-Frame Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

8.4.1 Image Entity Modules

8.4.1.1 Multi-Frame Module

TABLE 8-3
MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Used.
Frame Increment Pointer	(0028,0009)	1	Not Used.

8.4.1.1.1 Number Of Frames and Frame Increment Pointer

The number of frames is read and only the first frame is kept to run an OCR process.

8.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

8.6 DEVICES SUPPORTED BY DOSEWATCH

See 7.6.

9. X-RAY ANGIOGRAPHIC INFORMATION OBJECT IMPLEMENTATION

9.1 INTRODUCTION

This section specifies the use of the DICOM X-Ray Angiographic Image IOD to represent the information included in X-Ray Angiographic Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

The DICOM fields read for X-Ray Angiographic is limited in DoseWatch and completed with the usage of private interfaces for certain modalities.

9.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 9-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/XAStudy
Series	Series/XASeries
Image	DicomRawImage

9.3 IOD MODULE TABLE

The X-Ray Angiographic Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 9.5.

TABLE 9-2
X-RAY ANGIOGRAPHIC IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Not Used	
	General Reference	Not Used	
	Image Pixel	Not Used	
	Contrast/Bolus	Used	3.4.5.4
	Cine	Not Used	

	Multi-Frame	Not Used	
	Frame Pointers	Not Used	
	Mask	Not Used	
	Display Shutter	Not Used	
	Device	Not Used	
	Intervention	Not Used	
	Specimen	Not Used	
	X-Ray Image	Not Used	
	X-Ray Acquisition	Used	9.4.1.1
	X-Ray Collimator	Not Used	
	X-Ray Table	Not Used	
	XA Positioner	Used	9.4.1.2
	DX Detector	Not Used	
	Overlay Plane	Not Used	
	Multi-Frame Overlay	Not Used	
	Modality LUT	Not Used	
	VOI LUT	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	
	Frame Extraction	Not Used	

9.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the X-Ray Angiographic Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

9.4.1 Image Entity Modules

9.4.1.1 X-Ray Acquisition Module

TABLE 9-3
X-RAY ACQUISITION MODULE

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	2	Used.
Radiation Setting	(0018,1155)	1	Not Used.
X-Ray Tube Current	(0018,1151)	2C	Used.
X-Ray Tube Current in µA	(0018,8151)	3	Used.
Exposure Time	(0018,1150)	2C	Used.
Exposure Time in µS	(0018,8150)	3	Used.
Exposure	(0018,1152)	2C	Used.
Exposure in µAs	(0018,1153)	3	Used.
Grid	(0018,1166)	3	Used.
Average Pulse Width	(0018,1154)	3	Used.
Radiation Mode	(0018,115A)	3	Used.
Type of Filters	(0018,1161)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.
Focal Spot(s)	(0018,1190)	3	Used.
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	Used.

9.4.1.2 XA Positioner Module

TABLE 9-4
XA POSITIONER MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Distance Source to Patient	(0018,1111)	3	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Positioner Primary Angle	(0018,1510)	2	Used.
Positioner Secondary Angle	(0018,1511)	2	Used.

9.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

9.6 DEVICES SUPPORTED BY DOSEWATCH

Here is the list of devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
ATS	ARCO FP
Canon	Adora DRFi
	Adora DRi
	Alphenix Biplane
	Alphenix Core Plus
	Alphenix Hybrid
	Alphenix Hybrid Plus
	Alphenix Sky
	Alphenix Sky Plus
	DFP-2000A with XDIF-058A
	HDR-08A
	Infinix CC-i
	Infinix Celeve-i series
	Infinix CF-i/BP
	Infinix CF-i/SP
	Infinix DFP-8000 series
	Infinix DFP-8000D
	Infinix VC-i
	Infinix VF-i/BP
	Infinix VF-i/SP
	Infinix-i Biplane
	Infinix-i Core
	Infinix-i Core +
	Infinix-i Dual plane
	Infinix-i Series
	Infinix-i Sky
	Infinix-i Sky +
	INFX-8000C
	INFX-8000F
	INFX-8000H
	INFX-8000V
	INFX-8000V Biplane
	INFX-9000C
	INFX-9000F
	INFX-9000V
Eurocolumbus	Alien 12 75
	Alien 2020 75
	Alien 2020 Cardio
	Alien 3030
	Alien 9
	Alien 9 75
	Alien 9 Cardio
	Alien 966
	Alien e 3030 75
	Euroampli Alien Cardio 2020
	Euroampli Alien Cardio 3030
	Euroampli Alien Cardio 9
General Electric	Brivo OEC 715
	Brivo OEC 785
	Brivo OEC 850
	Brivo OEC 865
	Discovery IGS 7 OR with AutoRight
	Discovery IGS 7 with AutoRight
	Discovery IGS 730
	Discovery IGS 740
	Innova 2000
	Innova 2100-IQ
	Innova 2100-IQ Plus
	Innova 2121-IQ
	Innova 3100
	Innova 3100-IQ
	Innova 3100-IQ Plus
	Innova 3131-IQ
	Innova 4100
	Innova 4100-IQ
	Innova 4100-IQ Plus
	Innova IGS 520
	Innova IGS 530
	Innova IGS 540
	Innova IGS 6 with AutoRight
	Innova IGS 620
	Innova IGS 630
	OEC 6800 Miniview
	OEC 7700 Series
	OEC 7900 Fluorostar
	OEC 8800 Flexiview
	OEC 9800
	OEC 9900
	OEC 9900 Elite
	OEC Brivo Plus
	OEC Elite
	OEC Elite CFD Vascular
	OEC Elite Miniview
	OEC One
	OEC One CFD
	OEC 2800 Uroview
	Optima CL320i
	Optima CL323i
	Optima IGS 320
	Optima IGS 330
	Uroview FD
Hitachi	DHF-105CX
Hologic	Fluoroscan InSight
	Fluoroscan InSight 2
OrthoScan	OrthoScan FD Pulse
	OrthoScan Mobile DI
Philips	Allura Centron

	Allura Clarity
	Allura CV20
	Allura FD20/15
	Allura Xper
	Allura Xper FD10
	Allura Xper FD10/10
	Allura Xper FD20
	Allura Xper FD20/10
	Allura Xper FD20/20
	Azurion
	Azurion 3 F12
	Azurion 3 F15
	Azurion 3 M15
	Azurion 7 B12/12
	Azurion 7 B20/12
	Azurion 7 B20/15
	Azurion 7 C12
	Azurion 7 C20
	Azurion 7 C20 with FlexArm
	Azurion 7 F12
	Azurion 7 F20
	Azurion 7 M12
	Azurion 7 M20
	BV 212
	BV 25
	BV 26
	BV 29
	BV Endura
	BV Family
	BV Libra
	BV Pulsera
	BV Vectra
	Integris Allura
	Integris BH5000
	Integris H
	Integris H5000
	Integris HM5000
	Integris Systems
	Integris V
	Integris V5000
	MultiDiagnost Eleva FD
	Veradius
	Veradius Neo
	Veradius Unity
	Zenition 50
	Zenition 70
PrimaX	Cyberbloc
	Cyberbloc Rk 15
	Cyberbloc Rk 5
Shimadzu	BRANSIST alexa
	BRANSIST safire
	OPESCOPE ACTENO
	OPESCOPE ACTIVO
	Trinias B12 unity edition
	Trinias B8 unity edition
	Trinias C12 unity edition
	Trinias C16 unity edition
	Trinias C8 unity edition
	Trinias F8 unity edition
Siemens	ARCADIS Avantic
	ARCADIS Orbic
	ARCADIS Orbic (3D)
	ARCADIS Varic
	ARTIS icono
	Artis one
	Artis Pheno
	Artis Q
	Artis Q Biplane
	Artis Q Ceiling
	Artis Q Floor
	Artis Q.zen
	Artis Q.zen Biplane
	Artis Q.zen Ceiling
	Artis Q.zen Floor
	Artis zee (with/without Pure)
	Artis zee Biplane (with/without Pure)
	Artis zee Ceiling
	Artis zee Floor
	Artis zee Multi-Purpose
	Artis zeego
	Artis zeego.zen
	AXIOM Artis
	AXIOM Artis BA
	AXIOM Artis BC
	AXIOM Artis dBA
	AXIOM Artis dBC
	AXIOM Artis dFA
	AXIOM Artis dFC
	AXIOM Artis dMP
	AXIOM Artis dTA
	AXIOM Artis dTC
	AXIOM Artis FA
	AXIOM Artis FC
	AXIOM Artis MP
	AXIOM Artis TA
	AXIOM Artis U
	BICOR
	Cios Alpha
	Cios Connect
	Cios Fusion
	Cios Select
	Cios Spin
	COROSKOP
	POLYSTAR
	SIREMOBIL Compact L
Stephanix	Omniscop DReam-S
	Biplanar 500E

Swemac Imaging	Biplanar 600S
	Hologic Fluoroscan InSight
Thales	Duet DRF
Toshiba	DFP-2000A with XDIF-058A
	HDR-08A
	Infinix CC-i
	Infinix Celeve-i series
	Infinix CF-i/BP
	Infinix DFP-8000 series
	Infinix DFP-8000D
	Infinix VF-i/BP
	Infinix VF-i/SP
	Infinix-i Biplane
	Infinix-i Core
	Infinix-i Core +
	Infinix-i Dual plane
	Infinix-i Series
	Infinix-i Sky
	Infinix-i Sky +
	INFX-8000C
	INFX-8000F
	INFX-8000H
	INFX-8000V
	INFX-8000V Biplane
Ziehm	OrthoScan FD Pulse
	OrthoScan HD (with/without Flat Detector)
	Ziehm 7000 Plus
	Ziehm 8000
	Ziehm Compact
	Ziehm Solo
	Ziehm Solo FD
	Ziehm Vision
	Ziehm Vision FD
	Ziehm Vision R
	Ziehm Vision RFD
	Ziehm Vision RFD 3D
	Ziehm Vision RFD Hybrid Edition
	Ziehm Vision²
	Ziehm Vision² FD Vario 3D
	Ziehm Vista

10. X-RAY RF INFORMATION OBJECT IMPLEMENTATION

10.1 INTRODUCTION

This section specifies the use of the DICOM X-Ray RF Image IOD to represent the information included in XRF Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

All fields listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

10.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 10-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/RFStudy
Series	Series/RFSeries
Image	DicomRawImage

10.3 IOD MODULE TABLE

The XRF Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 10.5.

TABLE 10-2
XRF IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
Frame of Reference	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Pixel	Used	3.4.5.3

	Contrast/Bolus	Used	3.4.5.4
	Cine	Not Used	
	Multi-Frame	Not Used	
	Frame Pointers	Not Used	
	Mask	Not Used	
	Display Shutter	Not Used	
	Device	Not Used	
	Intervention	Not Used	
	Specimen	Not Used	
	X-Ray Image	Used	10.4.1.1
	X-Ray Acquisition	Used	10.4.1.2
	X-Ray Collimator	Used	10.4.1.3
	X-Ray Table	Not Used	
	XRF Positioner	Used	10.4.1.4
	X-Ray Tomography Acquisition	Used	10.4.1.5
	DX Detector	Used	10.4.1.6
	Overlay Plane	Not Used	
	Multi-Frame Overlay	Not Used	
	Modality LUT	Used	10.4.1.7
	VOI LUT	Used	10.4.1.8
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	
	Frame Extraction	Not Used	

10.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the X-Ray RF Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

10.4.1 Image Entity Modules

10.4.1.1 X-Ray Image Module

TABLE 10-3
X-RAY IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Frame Increment Pointer	(0028,0009)	1C	Not Used.
Lossy Image Compression	(0028,2110)	1C	Used.
Image Type	(0008,0008)	1	Used.
Pixel Intensity Relationship	(0028,1040)	1	Used.
Samples per Pixel	(0028,0002)	1	Used.
Photometric Interpretation	(0028,0004)	1	Used.
Bits Allocated	(0028,0100)	1	Used.
Bits Stored	(0028,0101)	1	Used.
High Bit	(0028,0102)	1	Used.
Pixel Representation	(0028, 0103)	1	Used.

10.4.1.2 X-Ray Acquisition Module

TABLE 10-4
X-RAY ACQUISITION MODULE

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	2	Used.
Radiation Setting	(0018,1155)	1	Not Used.
X-Ray Tube Current	(0018,1151)	2C	Used.
X-Ray Tube Current in µA	(0018,8151)	3	Used.
Exposure Time	(0018,1150)	2C	Used.
Exposure Time in µS	(0018,8150)	3	Used.
Exposure	(0018,1152)	2C	Used.
Exposure in µAs	(0018,1153)	3	Used.
Grid	(0018,1166)	3	Used.
Type of Filters	(0018,1161)	3	Used.
Field of View Shape	(0018,1147)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.
Imager Pixel Spacing	(0018,1164)	3	Used.
Pixel Spacing	(0028,0030)	1C	Used.
Focal Spot(s)	(0018,1190)	3	Used.
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	Used.

10.4.1.3 X-Ray Collimator

TABLE 10-5
X-RAY COLLIMATOR MODULE

Attribute Name	Tag	Type	Attribute Description
Collimator Shape	(0018,1700)	1	Used.

10.4.1.4 XRF Positioner Module

TABLE 10-6
XRF POSITIONER MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.

10.4.1.5 X-Ray Tomo Acquisition Module

TABLE 10-7
X-RAY TOMO ACQUISITION MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Tomo Layer Height	(0018,1460)	1	Used.
Tomo Angle	(0018,1470)	3	Used.
Tomo Time	(0018,1480)	3	Used.
Tomo Type	(0018,1490)	3	Used.
Tomo Class	(0018,1491)	3	Used.
Number of Tomosynthesis Source Images	(0018,1495)	3	Used.

10.4.1.6 DX Detector Module

TABLE 10-8
DX DETECTOR MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Detector Type	(0018,7004)	2	Used.
Detector Configuration	(0018,7005)	3	Used.
Detector ID	(0018,700A)	3	Used.
Detector Binning	(0018,701A)	3	Used.
Detector Conditions Nominal Flag	(0018,7000)	3	Used.
Detector Temperature	(0018,7001)	3	Used.
Sensitivity	(0018,6000)	3	Used.
Detector Element Physical Size	(0018,7020)	3	Used.
Detector Element Spacing	(0018,7022)	3	Used.
Detector Active Shape	(0018,7024)	3	Used.
Detector Active Dimension(s)	(0018,7026)	3	Used.
Field of View Shape	(0018,1147)	3	Used.
Field of View Dimension(s)	(0018,1149)	3	Used.

Field of View Origin	(0018,7030)	1C	Used.
Field of View Rotation	(0018,7032)	1C	Used.
Field of View Horizontal Flip	(0018,7034)	1C	Used.
Imager Pixel Spacing	(0018,1164)	1	Used.
Pixel Spacing	(0028,0030)	1C	Used.

10.4.1.7 Modality LUT module

TABLE 10-9
MODALITY LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Rescale Slope	(0028,1052)	1C	Used.
Rescale Intercept	(0028,1053)	1C	Used.
Rescale Type	(0028,1054)	1C	Used.

10.4.1.8 VOI LUT module

TABLE 10-10
VOI LUT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
VOI LUT Sequence	(0028,3010)	1C	Used.
>LUT Descriptor	(0028,3002)	1	Used.
>LUT Explanation	(0028,3003)	3	Used.
>LUT Data	(0028,3006)	1	Used.
Window Center	(0028,1050)	1C	Used.
Window Width	(0028,1051)	1C	Used.
Window Center & Width Explanation	(0028,1055)	3	Used.

10.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary proprietary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

10.6 DEVICES SUPPORTED BY DOSEWATCH

Here are devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
ADORA	Adora
AGFA	DR 100e
	DR 100s
	DR 400
	DR 600
	DX-D 100
	DX-D 300
	DX-D 500
	DX-D 600
	DX-D 800
Apelem	Baccara 90/20
	Baccara 90/25 HV
	Baccara dRF 43
	Da Vinci Duo
	Da Vinci Solo
	Da Vinci Verso
	Optima
	Platinum
	Rafale EV30
	Stratos dR
Arcoma	Intuition
	Precision
BMS Austria	EasyDose
BrainLab	Loop-X
Canon	Aceso+
	CXDI-401C Wireless
	CXDI-701C Wireless
	CXDI-801C Wireless
	CXDI-810C Wireless
	DRAD-3000A
	DRAD-3000E
	IME-2000D
	MRAD
	RadPro 40KW
	RadPRO 4kW
	RadPRO D2-50RF
	RadPro ELITE
	RadPRO FM
	RadPRO OMNERA 400A
	RadPRO OMNERA 400T
	RadPRO URS
	RADREX-i - TFD-3000A
	RADREX-i – TFD-3000B
	SXT-2000A
	Ultimax-i
	WINSCOPE Plessart EX8
	Xantara
	Zexira DREX-ZX80
	ZEXIRA FPD Version
	ZEXIRA I.I. Version
	ZEXIRA PDR-04A
Carestream	8000C
	CS 2100
	CS 2200
	CS 8100
	CS 8100 3D
	CS 9300
	CS 9600
	DR 3500
	DR 7500
	DR 9500
	DRX-1
	DRX-Ascend
	DRX-Evolution
	DRX-Evolution Plus
	DRX-Excel Plus
	DRX-Mobile Retrofit
	DRX-Revolution
	Q-Rad
CAT Medical Systems	Helios DRF
	Helios SFD
Control-X Medical LTD	Perform-X AT
DelftDI	Celex
	Intuition DR
	Mobile DR
	Trauma DR
	Triathlon DR
DMS Imaging	Platinum
	Stratos DR
EOS Imaging	EOS
	EOSedge
Fujifilm	BENEO-eX
	BENEO-Fx
	CALNEO AQRO
	CALNEO Go
	DR-ID 300CL
	DR-ID 700CL
	DR-ID 800CL
	DR-ID 900CL
	FCR Go 2
	FCR XG-1
	FDR AcSelerate
	FDR AQRO
	FDR D-EVO Suite
	FDR Go
	FDR Go PLUS

	FDR nano
	FDR Smart f
	FDR Smart X
	FDR Visionary Suite
	FDX VISIONARY-RF Premium
	FXR MultiSuite
	Velocity Unity
General Electric	Brivo DR-F
	Brivo XR385
	Brivo XR575
	Compax 40E
	Connexity
	Definium 5000
	Definium 6000
	Definium 8000
	Definium AMX 700
	Discovery RF180
	Discovery XR650
	Discovery XR656
	Discovery XR656 HD
	LingLong DR-F
	Lunar DPX Bravo
	Lunar DPX Duo
	Lunar DPX-IQ
	Lunar DPX-MD+
	Lunar DPX-NT
	Lunar DPX-PRO
	Lunar iDXA
	Lunar Prodigy Advance
	Lunar prodigy Primo
	Lunar Prodigy Pro
	Optima XR200amx
	Optima XR220amx
	Optima XR240
	Optima XR240amx
	Optima XR640
	Optima XR646
	Optima XR646 HD
	Precision 500D
	Precision 600FP
	Precision MPi
	Precision RXi
	Prestige
	Proteus XR/a
	Proteus XR/f
	Proteus XR/i
	Revolution XQ/i
	Revolution XRd
General Medical Merate	ACCORD DR
	Calypso F
	KALOS
	Opera Swing
	Opera T2000tr

	Opera T90
	Opera T2000tr
	Polistat M
Hitachi	CUREVISTA
	CUREVISTA Open
	CUREVISTA Open GX
	DCS-600EXV
	DCS-900FX
	DIAVISTA
	DIAVISTA Luce
	ESPACIO AVANT
	EXAVISTA
	POPULUS So
	POPULUS Ti
	RadnextRX
	RadnextSX
	Sirius 130H Series
	Sirius Starmobile tiara
	Sirius Ubiquitas
	VersiFlex VISTA
Hologic	Delphi W
	Discovery DXA system
	Horizon DXA system
	QDR Explorer
	QDR system
Instrumentarium	FOCUS
	ORTHOCEPH OC100 D
	ORTHOCEPH OC200 D
	ORTHOPANTOMOGRAPH OP100 D
	ORTHOPANTOMOGRAPH OP200
	ORTHOPANTOMOGRAPH OP200 D
	ORTHOPANTOMOGRAPH OP30
	ORTHOPANTOMOGRAPH OP300
Italray	Clinodigit Omega
	X-Frame DR2T System
KaVo	FOCUS
	ORTHOPANTOMOGRAPH OP 2D
	ORTHOPANTOMOGRAPH OP 3D
	ORTHOPANTOMOGRAPH OP 3D Pro
Kodak	8000C
	9000 3D
	CR-ITX 560
	DR 3500
	DR 7500
	DR 9500

	Kodak 2100
Konica Minolta	AeroDR X30
	AeroDR X70
Mecall	Eidos 3000
	EIDOS RF430
	EIDOS RF 439
	PLURIMAT.D
Morita	Veraview X800
NewTom	GiANO
	GiANO HR
	GO
OrthoScan	OrthoScan HD (with /without Flat Detector)
Philips	CombiDiagnost R90
	DigitalDiagnost
	DigitalDiagnost C50
	DigitalDiagnost C90
	DuraDiagnost
	DuraDiagnost Compact
	EasyDiagnost
	EasyDiagnost Eleva
	EasyDiagnost Eleva DRF
	EasyUpgrade DR
	ELEVA DI (Ditto)
	ELEVA EDI
	Essenta DR Compact
	Juno DRF
	MobileDiagnost Opta
	MobileDiagnost wDR
	MultiDiagnost
	MultiDiagnost Eleva
	MultiDiagnost Eleva II/TV
	OmniDiagnost
	OmniDiagnost Eleva
	PCR Eleva CosimaX
	Primary Diagnost
	PrimaryDiagnost DR
	ProGrade
	Thoravision
	UroDiagnost
Planmeca	Planmeca ProMax 2D S2
	Planmeca ProMax 2D S3
	Planmeca ProMax 3D Classic
	Planmeca ProMax 3D Max
	Planmeca ProMax 3D Mid
	Planmeca ProMax 3D Plus
	Planmeca ProMax 3D s
	Planmeca ProOne
	Planmeca ProX
	Planmeca Viso G5
	Planmeca Viso G7
	Proline CC
	Proline EC
	Proline XC
PrimaX	CLISIS EVOLUTION
	CLISIS EXEL DRF
	Eidos 3000
	Kalos
	Primo-W
Radiología	Transportix B-D-C
	Transportix PLUS 4L
Samsung	GC70
	GF50
	GM85
	XGEO GC80
	XGEO GC85A
	XGEO GM60A Series
	XGEO GU60A
Shenzhen Browiner	Sparkler 300A
	Sparkler 300B
	Sparkler 300C
Shimadzu	DAR-8000 Series
	Digitex PRO
	FlexaVision FD
	FlexaVision HB
	FlexaVision SF
	FLUOROspeed 300
	MobileArt Eco
	MobileArt Evolution EFX Version
	MobileArt Evolution MX7 Version
	MobileDaRt Evolution
	RADspeed DR
	RADspeed fit
	RADspeed Pro
	RADspeed Pro EDGE
	RADspeed Pro MC
	RADspeed Pro MF
	RADspeed Pro V4
	SonialVision G4
	SonialVision Safire 17
	SonialVision Safire II
	SonialVision Versa 100R/100
	UD150V-40
Siemens	AXIOM Aristos FX Plus
	AXIOM Aristos MX
	AXIOM Aristos TX
	AXIOM Aristos VX
	AXIOM Aristos VX Plus
	AXIOM Iconos MD
	AXIOM Iconos R100
	AXIOM Iconos R200
	AXIOM Luminos TF

	AXIOM Multix MP
	AXIOM Multix MT
	AXIOM Multix MU
	AXIOM Sireskop SD
	Fluorospot Compact FD
	FLUOROSPOT H
	FLUOROSPOT H via MagicLink
	Heliodent 70
	Heliodent EC
	Heliodent MD
	LITHOSKOP
	Luminos
	Luminos Agile
	Luminos Agile Max
	Luminos dRF
	Luminos dRF Max
	Luminos Fusion
	Luminos Lotus Max
	Luminos Select
	Mobilett Elara Max
	Mobilett Mira
	Mobilett Mira Max
	Mobilett XP Digital
	Multitom Rax
	Multix
	Multix Compact K
	Multix CPH
	Multix DR-Upgrade
	Multix Fusion
	Multix Fusion Max
	MULTIX Impact
	MULTIX Impact C
	Multix Pro
	Multix Pro P
	Multix Select DR
	Multix Swing mFD
	Multix Top
	Multix Top ACSS
	Multix Top P
	Orthophos CD
	SIREGRAPH CF
	SIREGRAPH D2
	SIREGRAPH D3
	SIRESKOP CX
	UROSKOP Access
	UROSKOP Omnia
	UROSKOP Omnia Max
	Vertix Solitaire M
	Vertix Solitaire MD Trauma
	WINSCOPE Plessart VIVO
	Ysio
	Ysio Max
	YSIO X.pree

Sirona	GALILEOS Comfort PLUS
	HELIODENT PLUS
	ORTHOPHOS DS
	ORTHOPHOS Plus
	ORTHOPHOS SL 2D
	ORTHOPHOS SL 3D
	ORTHOPHOS XG 3
	ORTHOPHOS XG 3D
	ORTHOPHOS XG 3D Ready
	ORTHOPHOS XG 5
Solutions for tomorrow	Meet !M1
STEPHANIX	D²RS
	Evidence DReam
	Evolution HV
	Horizon DXA system
	MOVIX 4/8 DReam
	MOVIX Series DReam
	MOVIX Series E+
	STATIF DReam
	STATIF Pro DReam
	Xtreme DReam
Swissray	ddRCombi Plus
	ddRCruze
	ddRElement
	ddRFormula
	ddRModulaire
	ddRPortable
	ddRVersa
	XR-600
	XR-800
Toshiba	DRAD-3000A
	DRAD-3000E
	IME-2000D
	MRAD
	RADREX-i - TFD-3000A
	RADREX-i -TFD-3000B
	SXT-2000A
	Ultimax-i
	Xantara
	ZEXIRA FPD Version
	ZEXIRA I.I. Version
United Imaging	uDR 370i
	uDR 588i
	uDR 592h
	uDR 596i
	uDR 770i
	uDR 780i
Villa Sistemi Medicali	Apollo EZ DRF
	Explor X-70
	Moviplan 800
	Rotograph D

	Rotograph Evo D
	Rotograph Plus
	Rotograph Prime
	Visitor T30 M-DR

Xograph	buckyStar
	Intuition DR
	Triathlon T3

11. COMPUTED RADIOGRAPHY INFORMATION OBJECT IMPLEMENTATION

11.1 INTRODUCTION

This section specifies the use of the DICOM Computed Radiography Image IOD to represent the information included in CR Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

All fields listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

11.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 11-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/RFStudy
Series	Series/RFSeries
Image	DicomRawImage

11.3 IOD MODULE TABLE

The CR Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 11.4.2.

TABLE 11-2
CR IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	CR Series	Used	11.4.1.1
	Clinical Trial Series	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Pixel	Used	3.4.5.3
	Contrast/Bolus	Used	3.4.5.4

	Display Shutter	Not Used	
	Device	Not Used	
	Specimen	Not Used	
	CR Image	Used	11.4.2.1
	Overlay Plane	Not Used	
	Modality LUT	Used	10.4.1.7
	VOI LUT	Used	10.4.1.8
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	

11.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the CR Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

11.4.1 Series Entity Module

11.4.1.1 CR Series Module

TABLE 11-3
CR SERIES IOD MODULES

Attribute Name	Tag	Type	Attribute Description
Body Part Examined	(0018,0015)	2	Used as Target Region.
View Position	(0018,5101)	2	Used.
Filter Type	(0018,1160)	3	Used.
Collimator/grid Name	(0018,1180)	3	Used.
Focal Sport(s)	(0018,1190)	3	Used.

11.4.2 Image Entity Module

11.4.2.1 CR Image Module

TABLE 11-4
CR IMAGE MODULE

Attribute Name	Tag	Type	Attribute Description
Photometric Interpretation	(0028,0004)	1	Used.
KVP	(0018,0060)	3	Used.
Distance Source to Detector	(0018,1110)	3	Used.
Distance Source to Patient	(0018,1111)	3	Used.
Exposure Time	(0018,1150)	2C	Used.

X-Ray Tube Current	(0018,1151)	3	Used.
Exposure	(0018,1152)	2C	Used.
Exposure in µAs	(0018,1153)	3	Used.
Imager Pixel Spacing	(0018,1164)	3	Used.
Pixel Spacing	(0028,0030)	1C	Used.
Acquisition Device Processing Description	(0018,1400)	3	Used.
Acquisition Device Processing Code	(0018,1401)	3	Used.
Relative X-Ray Exposure	(0018,1405)	3	Used.
Sensitivity	(0018,6000)	3	Used.
Exposure Index	(0018,1411)	3	Used.
Target Exposure Index	(0118,1412)	3	Used.
Deviation Index	(0018,1413)	3	Used.

11.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary proprietary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

11.6 DEVICES SUPPORTED BY DOSEWATCH

See 10.6.

12. POSITRON EMISSION TOMOGRAPHY INFORMATION OBJECT IMPLEMENTATION

12.1 INTRODUCTION

This section specifies the use of the DICOM PET Image IOD to represent the information included in PET Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

All fields listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

12.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 12-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/NMStudy
Series	Series/NMSeries
Image	DicomRawImage

12.3 IOD MODULE TABLE

The PET Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 12.5.

TABLE 12-2
PET IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
	PET Series	Not Used	
	PET Isotope	Used	12.4.1.1
	PET Multi-gated Acquisition	Not Used	

	NM/PET Patient Orientation	Not Used	
Frame of Reference	Frame of Reference	Not Used	
	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Plane	Not Used	
	Image Pixel	Used	3.4.5.3
	Device	Not Used	
	Specimen	Not Used	
	PET Image	Used	12.4.2.1
	Overlay Plane	Not Used	
	VOI LUT	Not Used	
	Acquisition Context	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	

12.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the PET Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

12.4.1 Series Entity Module

12.4.1.1 PET Isotope Module

TABLE 12-3
PET ISOTOPE IOD MODULE

Attribute Name	Tag	Type	Attribute Description
Radiopharmaceutical Information Sequence	(0054,0016)	2	Used.
>Radionuclide Code Sequence	(0054,0300)	2	Used.
>>*Include 'Code Sequence Macro Attriutes'*			Used.
>Radiopharmaceutical Route	(0018,1070)	3	Used.
>Radiopharmaceutical Volume	(0018,1071)	3	Used.
>Radiopharmaceutical Start Time	(0018,1072)	3	Used.
>Radiopharmaceutical Start DateTime	(0018,1078)	3	Used.

>Radionuclide Total Dose	(0018,1074)	3	Used.
>Radiopharmaceutical	(0018,0031)	3	Used.

12.4.2 Image Entity Module

12.4.2.1 PET Image Module

TABLE 12-4
PET IMAGE MODULE

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	Used.
Samples per Pixel	(0028,0002)	1	Not Used.
Photometric Interpretation	(0028,0004)	1	Not Used.
Bits Allocated	(0028,0100)	1	Not Used.
Bits Stored	(0028,0101)	1	Not Used.
High Bit	(0028,0102)	1	Not Used.
Rescale Intercept	(0028,1052)	1	Not Used.
Rescale Slope	(0028,1053)	1	Not Used.
Frame Reference Time	(0054,1300)	1	Not Used.
Image Index	(0054,1330)	1	Not Used.
Acquisition Date	(0008,0022)	2	Used.
Acquisition Time	(0008,0032)	2	Used.
Actual Frame Duration	(0018,1242)	2	Not Used.

12.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary proprietary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

12.6 DEVICES SUPPORTED BY DOSEWATCH

Here are devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
Canon	Celesteion
	Cartesion Prime
General Electric	Discovery IQ
	Discovery LS
	Discovery MI
	Discovery MI DR
	Discovery PET/CT 600
	Discovery PET/CT 610
	Discovery PET/CT 690
	Discovery PET/CT 710
	Discovery RX
	Discovery RX VCT
	Discovery ST
	Discovery STE
	Discovery VCT
	Optima PET/CT 560
	SIGNA PET/MR
Philips	GEMINI
	GEMINI 16 Power
	GEMINI GXL 16
	GEMINI TF
	Ingenuity TF PET/CT
	Ingenuity TF PET/MR
	TrueFlight Select
	Vereos Digital PET/CT
Siemens	Biograph 128 (mCT)

	Biograph 16 TruePoint
	Biograph 16 HI-REZ
	Biograph 20 (mCT)
	Biograph 40
	Biograph 40 (mCT)
	Biograph 40 TruePoint
	Biograph 6
	Biograph 6 HI-REZ
	Biograph 6 TruePoint
	Biograph 64
	Biograph 64 (mCT)
	Biograph Duo PET/CT

	Biograph Horizon
	Biograph mCT
	Biograph mCT Flow
	Biograph Vision
	MAGNETOM Biograph mMR 3.0T
Toshiba	Celesteion
United Imaging	uMI 510
	uMI 550
	uMI 780
	uPMR 790

13. NUCLEAR MEDICINE INFORMATION OBJECT IMPLEMENTATION

13.1 INTRODUCTION

This section specifies the use of the DICOM NM Image IOD to represent the information included in NM Images **received** by this implementation. Corresponding attributes are conveyed using the module construct.

All fields listed below are fields stored in database. Not all fields are displayed but they can all be exported into data exports for statistics needs.

13.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 13-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/NMStudy
Series	Series/NMSeries
Image	DicomRawImage

13.3 IOD MODULE TABLE

The NM Image Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 13.5.

TABLE 13-2
PET IMAGE IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	General Series	Used	3.4.3.1
	Clinical Trial Series	Not Used	
	NM/PET Patient Orientation	Not Used	
Frame of Reference	Frame of Reference	Not Used	
	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1
Image	General Image	Used	3.4.5.1
	General Reference	Not Used	
	Image Pixel	Used	3.4.5.3

	Acquisition Context	Not Used	
	Device	Not Used	
	Specimen	Not Used	
	NM Image Pixel	Not Used	
	Multi-frame	Not Used	
	NM Multi-frame	Not Used	
	NM Image	Not Used	
	NM Isotope	Used	13.4.1.1
	NM Detector	Not Used	
	NM TOMO Acquisition	Not Used	
	NM Multi-gated Acquisition	Not Used	
	NM Phase	Not Used	
	NM Reconstruction	Not Used	
	Overlay Plane	Not Used	
	Multi-frame Overlay	Not Used	
	VOI LUT	Not Used	
	ICC Profile	Not Used	
	SOP Common	Used	3.4.5.6
	Common Instance Reference	Not Used	
	Frame Extraction	Not Used	

13.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the NM Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes expected. Type 1 & Type 2 Attributes are also included for completeness and to define what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

13.4.1 Image Entity Module

13.4.1.1 NM Isotope Module

TABLE 13-3
NM ISOTOPE MODULE

Attribute Name	Tag	Type	Attribute Description
Energy Window Information Sequence	(0054,0012)	2	Not Used.
Radiopharmaceutical Information Sequence	(0054,0016)	2	Used.
> Radionuclide Code Sequence	(0054,0300)	2	Used.

>>*Include 'Code Sequence Macro Attributes'*			Used.
> Radiopharmaceutical Route	(0018,1070)	3	Used.
> Radiopharmaceutical Volume	(0018,1071)	3	Used.
> Radiopharmaceutical Start Time	(0018,1072)	3	Used.
> Radiopharmaceutical Start DateTime	(0018,1078)	3	Used.
> Radionuclide Total Dose	(0018,1074)	3	Used.
> Radiopharmaceutical	(0018,0031)	3	Used.

13.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

As DoseWatch is based on dictionary proprietary technology it is possible to read and store advanced private data attributes. They won't be listed below as DoseWatch is a multi-manufacturer and multi-modalities Dose Tracking System, the list will be too exhaustive to produce.

13.6 DEVICES SUPPORTED BY DOSEWATCH

Here are devices managed by DoseWatch. Other devices can be integrated upon request.

Manufacturer	Model
Canon	GCA-9300R
General Electric	Brivo NM615
	Discovery MI DR
	Discovery NM 530c
	Discovery NM630
	Discovery NM 750b
	Discovery NM 830
	Discovery NM/CT 670
	Discovery NM/CT 860
	Discovery NM/CT 870 CZT
	Discovery NM/CT 870 DR
	Discovery VH
	Infinia
	Infinia 3/8
	Infinia 3/8 Hawkeye
	Infinia Acquisition
	Infinia Hawkeye 4
	Infinia II
	Infinia II 3/8
	Infinia II 3/8 Hawkeye
	Infinia II 3/8 Hawkeye 4
	Infinia II 5/8 Hawkeye 4
	Infinia II VC
	Infinia II VC Hawkeye
	Infinia II VC Hawkeye 4
	Infinia VC
	Infinia VC Hawkeye
	Infinia VC Hawkeye 4
	MAGICAM
	Millennium MC
	Millennium MG
	Millennium MPR
	Millennium MPS
	Millennium VG
	Millennium VG 3/8
	Millennium VG 3/8 Hawkeye
	Millennium VG 5/8
	Millennium VG 5/8 Hawkeye
	MyoSight
	Optima NM/CT 640
	Optima NM/CT 850 ES
	Optima NX
	Varicam
	Ventri
Mediso	Nucline CardioDESK
	Nucline TH
	Nucline X-Ring-4R

	Nucline X-Ring-R
NeuroLogica	inSPira HD
Numa	NumaStatus™
Philips	Axis
	BrightView - DS
	Forte
	Ingenuity
	SkyLight
	Vertex EPIC
Siemens	Basicam
	Biograph 40 TruePoint
	Biograph 6 TruePoint
	c.Cam
	e.Cam
	e.Cam Dual Head Eco
	Symbia E
	Symbia Evo Excel
	Symbia Intevo
	Symbia Intevo Excel
	Symbia T16
	Symbia T2
	Symbia T6
	Symbia S
Spectrum Dynamics	D-SPECT
	VERITON-CT
Tema Sinergie	Karl 100
	uDDS-A
Toshiba	Celesteion
	GCA-9300R
United Imaging	uMI 510
	uMI 550
	uPMR 790

14. CT/X-RAY RADIATION DOSE STRUCTURED REPORT INFORMATION OBJECT IMPLEMENTATION

14.1 INTRODUCTION

This section specifies the use of the DICOM CT/X-Ray Radiation Dose SR IOD to represent results **produced and received** by this implementation. Corresponding attributes are conveyed using the module construct.

14.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 14-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	CTStudy XAStudy MGStudy RFStudy
Series	CTSeries XASeries MGSeries RFSeries
Document	DicomMessage

14.3 IOD MODULE TABLE

The CT/X-Ray Radiation Dose Structured Report Information Object Definitions comprise the modules of the following tables.

The contents of the SR Document Content are constrained by the supported template, as identified in Section 14.4.3.4.1. Standard, Standard Extended and Private templates are further described in Section 14.5.

TABLE 14-2
X-RAY RADIATION DOSE SR IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	SR Document Series	Used	14.4.2.1
	Clinical Trial Series	Not Used	

Frame of Reference	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1(for SR Reading) 14.4.1.1 (for SR production)
	Enhanced General Equipment	Used	14.4.1.2
Document	SR Document General	Used	14.4.3.1
	SR Document Content	Used	14.4.3.2
	SOP Common	Used	14.4.3.3

14.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the SR Information Objects.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported and expected. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance as well as what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

14.4.1 Equipment Entity Modules

14.4.1.1 General Equipment Module

The module defined below is used only when DoseWatch is producing RDSR.

TABLE 14-3
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	Use “GE Medical Systems”.
Institution Name	(0008,0080)	3	Use the name of the institution if provided by the original modality.
Institution Address	(0008,0081)	3	Use the address of the institution if provided by the original modality.
Station Name	(0008,1010)	3	Use “DoseWatch”.
Institutional Department Name	(0008,1040)	3	Use the department name if provided by the original modality.
Manufacturer's Model Name	(0008,1090)	3	Use “DoseWatch”.
Software Versions	(0018,1020)	3	Use “3.3”.

14.4.1.2 Enhanced General Equipment Module

TABLE 14-4
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	1	Used. Use "GE Medical Systems" when producing RDSR.
Manufacturer's Model Name	(0008,1090)	1	Used. Use "DoseWatch" when producing RDSR.
Device Serial Number	(0018,1000)	1	Used. Use installation number when producing RDSR: format PYYXXXXXX where P is for Production, YY is for the year, XXXXXX is a random generated installation number
Software Version	(0018,1020)	1	Used. Use the current DoseWatch software version when producing RDSR.

14.4.2 Series Entity Modules

14.4.2.1 SR Document Series Module

TABLE 14-5
SR DOCUMENT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Used "SR" when producing RDSR.
Series Instance UID	(0020,000E)	1	Used when producing RDSR.
Series Number	(0020,0011)	1	Used when producing RDSR.
Series Date	(0008,0021)	3	Used when producing RDSR.
Series Time	(0008,0031)	3	Used when producing RDSR.
Series Description	(0008,103E)	3	Used when producing RDSR.
Referenced Performed Procedure Step Sequence	(0008,1111)	2	Used when producing RDSR.
> Referenced SOP Class UID	(0008,1150)	1	Used when producing RDSR.
>Referenced SOP Instance UID	(0008,1155)	1	Used when producing RDSR.

14.4.3 Document Entity Modules

14.4.3.1 SR Document General Module

TABLE 14-6
SR DOCUMENT GENERAL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	1	Used when producing RDSR.
Completion Flag	(0040,A491)	1	Used. Always use COMPLETED when producing RDSR.
Verification Flag	(0040,A493)	1	Used. Always use UNVERIFIED when producing RDSR.
Content Date	(0008,0023)	1	Used when producing RDSR.
Content Time	(0008,0033)	1	Used when producing RDSR.

Referenced Request Sequence	(0040,A370)	1C	Used when producing RDSR.
>Study Instance UID	(0020,000D)	1	Used when producing RDSR.
>Referenced Study Sequence	(0008,1110)	2	Not Used.
>>Include 'SOP Instance Reference Macro'			
>Accession Number	(0008,0050)	2	Used when producing RDSR.
>Placer Order Number/Imaging Service Request	(0040,2016)	2	Not Used.
>Filler Order Number/Imaging Service Request	(0040,2017)	2	Not Used.
>Requested Procedure ID	(0040,1001)	2	Used when producing RDSR.
>Requested Procedure Description	(0032,1060)	2	Used when producing RDSR.
>Requested Procedure Code Sequence	(0032,1064)	2	Not Used.
>>Include 'Code Sequence Macro'			
Performed Procedure Code Sequence	(0040,A372)	2	Used when producing RDSR.
>Include 'Code Sequence Macro'			

14.4.3.2 SR Document Content Module

TABLE 14-7
SR DOCUMENT CONTENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Use
Value Type	(0040,A040)	1	Used.
Concept Name Code Sequence	(0040,A043)	1C	Used.

>Include 'Code Sequence Macro'			
Text Value	(0040,A160)	1C	Used.
DateTime	(0040,A120)	1C	Used.
Date	(0040,A121)	1C	Used.
Time	(0040,A122)	1C	Used.
Person Name	(0040,A123)	1C	Used.
UID	(0040,A124)	1C	Used.
Measured Value Sequence	(0040,A300)	2	Not Used.
>Numeric Value	(0040,A30A)	1	Not Used.
>Floating Point Value	(0040,A161)	1C	Not Used.
>Rational Numerator Value	(0040,A162)	1C	Not Used.
>Rational Denominator Value	(0040,A163)	1C	Not Used.
>Measurement Units Code Sequence	(0040,08EA)	1	Not Used.
>>Include 'Code Sequence Macro Attributes'			
Concept Code Sequence	(0040,A168)	1	Not Used.
>Include 'Code Sequence Macro Attributes'			
Referenced SOP Sequence	(0008,1199)	1	Used.
>Include 'SOP Instance Reference Macro Attributes'			
Continuity of Content	(0040,A050)	1	Used.
Content Template Sequence	(0040,A504)	1C	Used.
>Mapping Resource	(0008,0105)	1	Used.
>Mapping Resource UID	(0008,0118)	3	Used.
>Template Identifier	(0040,DB00)	1	Used.
Observation DateTime	(0040,A032)	1C	Used.
Content Sequence	(0040,A730)	1C	Used.
> Relationship Type	(0040,A010)	1	Used.
> Insert SR DocumentContent Module			Recursive inclusion to create document content tree. See section 14.4.3.4 for the list of supported templates

14.4.3.3 SOP Common Module

TABLE 14-8
SOP COMMON MODULE ATTRIBUTES USED FOR RDSR GENERATION

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	Used. Use 1.2.840.10008.5.1.4.1.1.88.67 when producing RDSR.
SOP Instance UID	(0008,0018)	1	Used: max 255 characters.
Specific Chararcter Set	(0008,0005)	1C	Used to read the object received, see 2.7.
Instance Number	(0020,0013)	3	Used.
Contributing Equipment Sequence	(0018,A001)	3	Used.

>Purpose of Reference Code Sequence	(0040,A170)	1	Use (109101, DCM, "Acquisition Equipment") when producing RDSR.
>>Include 'Code Sequence Macro'			
>Manufacturer	(0008,0070)	1	Used. Use the Manufacturer of the device which sent the examination when producing RDSR.
>Station Name	(0008,1010)	3	Used. Use the station of the device which sent the examination as configured in DoseWatch when producing RDSR.
>Manufacturer's Model Name	(0008,1090)	3	Used. Use the Manufacturer's Model Name of the device which sent the examination when producing RDSR.

14.4.3.4 SR Document Content Descriptions

14.4.3.4.1 Content Template

The product supports the following root Templates for SR SOP Instances created, processed, or displayed by the product.

TABLE 14-9
SR ROOT TEMPLATES

SOP Class	Template ID	Template Name	Use
X-Ray Radiation Dose SR	10001	X-Ray Radiation Dose	Create/Display
X-Ray Radiation Dose SR	10011	CT Radiation Dose	Create/Display

Refer to section 14.5 for a detailed description of the supported templates.

14.5 STANDARD, STANDARD EXTENDED AND PRIVATE TEMPLATES

The Product supports the Standard Extended and Private Templates defined in the following sections.

14.5.1 Standard Templates

The Product supports the following standard templates for SOP Instances created by this product.

14.5.1.1 Template ID 10001 X-Ray Radiation Dose

This Template defines the structure of the X-Ray Radiation Dose SR **produced** by DoseWatch. The template declared in DoseWatch can be easily changed if needed. Currently the SR Generated is defined for XA and MG modalities. There is no SR generated for RF modality.

TABLE 14-10 TID 10001.
PROJECTION X-RAY RADIATION DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	1	M		Root node

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	M		DT (113704, DCM, "Projection X-Ray") DT (71651007, SCT, "Mammography")
3	>>	HAS CONCEPT MOD	CODE	EV (363703001, SCT, "Has Intent")	1	M		DCID 3629 “Procedure Intent”. Use (371931008, SCT, “Combined Diagnostic and Therapeutic Procedure”) in XA Modalities. Use (261004008, SCT, “Diagnostic Intent”) in MG devices.
4	>	CONTAINS	CODE	EV (122142, DCM, “Acquisition Device Type”)	1	U		DCID 10032 “Projection X-Ray Acquisition Device Types”. Use (113957, DCM, “Fluoroscopy-Guided Projection Radiography System”) for XA devices. Absent otherwise.
5	>		INCLUDE	DTID 1002 “Observer Context”	2	M		See Table 14-11 **TID 1002.** Observer context for device and TID 1002. Observer context for person
6	>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	M		(113014, DCM, “Study”) Always used
7	>>	HAS PROPERTIES	UIDREF	DCID 10001 “UID Types”	1	M		Use Study Instance UID
9	>	CONTAINS	CODE	EV (113943, DCM, “X-Ray Source Data Available”)	1	U		(373066001, SCT, “Yes”) when the data is available for export. Absent otherwise.
10	>	CONTAINS	CODE	EV (113944, DCM, “X-Ray Mechanical Data Available”)	1	U		(373066001, SCT, “Yes”) when the data is available for export. Absent otherwise.
11	>	CONTAINS	INCLUDE	DTID 10002 “Accumulated X-Ray Dose”	1	MC	IFF Single Plane system	$Plane = EV (113622, DCM, "Single Plane") See TID 10002. Accumulated X-Ray Dose
12	>	CONTAINS	INCLUDE	DTID 10002 “Accumulated X-Ray Dose”	1	MC	IFF Biplane system	$Plane = EV (113620, DCM, "Plane A") See TID 10002. Accumulated X-Ray Dose

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
13	>	CONTAINS	INCLUDE	DTID 10002 “Accumulated X-Ray Dose”	1	MC	IFF Biplane system	$Plane = EV (113621, DCM, "Plane B") See TID 10002. Accumulated X-Ray Dose
14	>	CONTAINS	INCLUDE	DTID 10003 “Irradiation Event X-Ray Data”	1-n	MC		See TID 10003. Irradiation Event X-Ray Data
18	>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1-n	M		(113856, DCM, “Automated Data Collection”) is always used

TABLE 14-11 TID 1002.
OBSERVER CONTEXT FOR DEVICE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		HAS OBS CONTEXT	CODE	EV (121005, DCM, "Observer Type")	1	MC	IF Observer type is device	(121007, DCM, “Device”) is used
3		HAS OBS CONTEXT	INCLUDE	DTID 1004 “Device Observer Identifying Attributes”	1	MC	IF Row 1 value = (121007, DCM, "Device")	See TID 1004.

Table 14-12 TID 1004.
DEVICE OBSERVER IDENTIFYING ATTRIBUTES

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			UIDREF	EV (121012, DCM, "Device Observer UID")	1	M		DoseWatch UID is used “1.2.840.113619.2.326”
2			TEXT	EV (121013, DCM, "Device Observer Name")	1	U		Use the AET of the device as configured in DoseWatch
3			TEXT	EV (121014, DCM, "Device Observer Manufacturer")	1	U		Use the manufacturer of the device as configured in DoseWatch
4			TEXT	EV (121015, DCM, "Device Observer Model Name")	1	U		Use the model name as configured in DoseWatch

TABLE 14-13 TID 1002.
OBSERVER CONTEXT FOR PERSON

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1		HAS OBS CONTEXT	CODE	EV (121005, DCM, "Observer Type")	1	MC	IF Observer type is device	(121006, DCM, "Person") is used
2		HAS OBS CONTEXT	INCLUDE	DTID 1003 "Person Observer Identifying Attributes"	1	MC	IF Row 1 value = (121006, DCM, "Person") or Row 1 is absent	See TID 1003. Person Observer Identifying Attributes

TABLE 14-14 TID 1003.
PERSON OBSERVER IDENTIFYING ATTRIBUTES

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			PNAME	EV (121008, DCM, "Person Observer Name")	1	M		Use the name of the operator who performed the study
3			CODE	EV (121010, DCM, "Person Observer's Role in the Organization")	1	U		Use (159016003, SCT, "Radiologic Technologist")
4			CODE	EV (121011, DCM, "Person Observer's Role in this Procedure")	1	U		Use (121099, DCM, "Assisting")

TABLE 14-15 TID 10002.
ACCUMULATED X-RAY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113702, DCM, "Accumulated X-Ray Dose Data")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	M		(113620, DCM, "Plane A") (113621, DCM, "Plane B") (113622, DCM, "Single Plane") used for Mammography.
10	>	CONTAINS	INCLUDE	DTID 10004 "Accumulated Fluoroscopy and Acquisition Projection X-Ray Dose"	1	MC	IFF TID (10001) Row 4 = (113957, DCM, "Fluoroscopy-Guided Projection Radiography System") or TID (10001) Row 2 = (113704, DCM, "Projection X-Ray") and TID (10001) Row 4 is absent)	See TID 10004. Accumulated Fluoroscopy and Acquisition Projection X-Ray Dose
11	>	CONTAINS	INCLUDE	DTID 10005 "Accumulated Mammography X-Ray Dose"	1	MC	IFF TID (10001) Row 2 = (71651007, SCT, "Mammography")	See Table 14-20 TID 10005.

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
								Accumulated Mammography X-Ray Dose
12	>	CONTAINS	INCLUDE	DTID 10007 “Accumulated Total Projection Radiography Dose”	1	MC	IFF TID (10001) Row 4 = (113958, DCM, "Integrated Projection Radiography System") or TID (10001) Row 4 = (113957, DCM, "Fluoroscopy-Guided Projection Radiography System") or TID (10001) Row 2 = (113704, DCM, "Projection X-Ray") and TID (10001) Row 4 is absent)	See Table 14-21 TID 10007. Accumulated Total Projection Radiography Dose

TABLE 14-16 TID 10003.
IRRADIATION EVENT X-RAY DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113706, DCM, "Irradiation Event X-Ray Data")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	1	M		(113620, DCM, “Plane A”) (113621 , DCM, “Plane B”) (113622, DCM, “Single Plane”) used for MG
3	>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	M		Use a DoseWatch generated UID
6	>	CONTAINS	DATETIME	DT (111526, DCM, "DateTime Started")	1	M		Use the series date if provided by the device. Use the study date if nothing was provided
7	>	CONTAINS	CODE	EV (113721, DCM, "Irradiation Event Type")	1	M		(44491008, SCT, “Fluoroscopy”) (113612, DCM, “Stepping Acquisition”) (113613, DCM, “Rotational Acquisition”) (113611, DCM, “Stationary Acquisition”) used by default if not provided by modality
8	>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	1	U		Use the series’ protocol name provided. If nothing provided the node won’t be added

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
11	>	CONTAINS	CODE	EV (111031, DCM, “Image View”)	1	U		Use values defined in DCID 4014 “View for Mammography” for MG devices.
14	>	CONTAINS	CODE	EV (113745, DCM, "Patient Table Relationship")	1	U		Use values defined in DCID 21 “Patient Equipment Relationship” (102540008, SCT, “headfirst”) used if not provided by modality for XA devices, absent otherwise.
15	>	CONTAINS	CODE	EV (113743, DCM, "Patient Orientation")	1	U		Use values defined in DCID 19 “Patient Orientation” (102538003, SCT, “recumbent”) used in XA if not provided by modality (C86043, NCIt, “erect”) used in Mammography.
16	>	CONTAINS	CODE	EV (113744, DCM, “Patient Orientation Modifier”	1	M		Use values defined in DCID 20 "Patient Orientation Modifier" (40199007, SCT, “supine”) used in XA if not provided by modality (1240000, SCT, “prone”) used in Mammography if not provided by modality.
17	>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	1	M		Use values defined in DCID 4031 “Common Anatomic Regions”. (38266002, SCT, “Entire body”) used in XA if not provided by modality (76752008, SCT, “Breast”) used in Mammography if not provided by modality.
17b	>>	HAS CONCEPT MODE	CODE	EV(272741003, SCT, “Laterality”)	1	UC	If anatomy is bi-lateral	Use values defined in CID 244 “Laterality”.
18	>	CONTAINS	NUM	EV (122130, DCM, "Dose Area Product")	1	MC		UNITS = EV (Gy.m2, UCUM, "Gy.m2")
20	>	CONTAINS	NUM	EV (111638, DCM, “Patient Equivalent Thickness”)	1	U		Units = EV (mm, UCUM, “mm”)
21	>	CONTAINS	NUM	EV (111636, DCM, “Entrance Exposure at RP”)	1	MC	IF TID (10001) Row 2 = (71651007, SCT, "Mammography") and (TID (10001) Row 9 is absent or value is (373066001, SRT, "Yes")) and (TID (10001) Row 10 is absent or value is (373066001, SRT, "Yes"))	UNITS = EV (mGy, UCUM, "mGy")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
22	>	CONTAINS	TEXT	EV (113780, DCM, “Reference Point Definition”)	1	MC	IF Row 21 is present and Row 23 is not present	“Entrance exposure to a 4.2 cm breast thickness” used in Mammography if not provided by modality.
23	>	CONTAINS	CODE	EV (113780, DCM, “Reference Point Definition”)	1	MC	IF Row 21 is present and Row 22 is not present	DCID 10025 “Radiation Dose Reference Points” (113860, DCM, “15cm from Isocenter toward Source”) used in XA if not provided by modality
25	>	CONTAINS	TEXT	EV (121106, DCM, “Comment”)	1	U		Depending on device integration, may contain RRA information.
28	>	CONTAINS	INCLUDE	DTID 10003B “Irradiation Event X-Ray Source Data”	1	MC	IFF TID 10001 Row 9 is absent or has a value of (373066001, SCT, “Yes”)	See Table 14-17 TID 10003B. Irradiation Event X-Ray Data
29	>	CONTAINS	INCLUDE	DTID 10003C “Irradiation Event X-Ray Mechanical Data”	1	MC	IFF TID 10001 Row 10 is absent or has a value of (373066001, SCT, “Yes”)	See Table 14-18 **TID 10003C.** Irradiation Event X-Ray Mechanical Data

TABLE 14-17 TID 10003B.
IRRADIATION EVENT X-RAY SOURCE DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113738, DCM, "Dose (RP) ")	1	MC	IF TID (10001) Row 2 = (113704, DCM, "Projection X-Ray") AND any of the values of TID (10001) Row 18 are not (113858, DCM, "MPPS Content")	UNITS = EV (Gy, UCUM, "Gy")
2			TEXT	EV (113780, DCM, “Reference Point Definition”)	1	MC	IF Row 1 is present and Row 3 is not present	“Entrance exposure to a 4.2 cm breast thickness” used in Mammography if not provided by modality.
3			CODE	EV (113780, DCM, "Reference Point Definition")	1	MC	IF Row 1 is present and Row 2 is not present	DCID 10025 “Radiation Dose Reference Points” (113860, DCM, “15cm from Isocenter toward Source”) used in XA if not provided by modality
4			NUM	EV (111631, DCM, “Average Glandular Dose”)	1	MC	IFF TID (10001) Row 2 = (71651007, SCT, "Mammography")	UNITS = EV (mGy, UCUM, "mGy")
5			CODE	EV(113732, DCM, “Fluoro Mode”	1	UC	IFF TID (1003) Row 7 value = (44491008, SCT, ”Fluoroscopy”)	(113630, DCM, ”Continuous”) used in XA if not provided by modality (113631, DCM,”Pulsed”)
6			NUM	EV (113791, DCM, “Pulse Rate”)	1	MC	IFF Row 5 value = (113631, DCM, ”Pulsed”)	UNITS = EV({pulse]/s, UCUM, “pulse/s”) Give the frames per second given by the device

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
7			NUM	EV (113768, DCM, "Number of Pulses")	1	MC	IFF Row 5 is not present or Row 5 is present and equals (113631, DCM, "Pulsed")	UNITS = EV (1, UCUM, "no units") 1 for Mammography
8	>	HAS CONCEPT MODE	CODE	EV (121401, DCM, “Derivation”)	1	MC	IFF count of pulses in Row 7 is estimated	EV (414135002, SCT, "Estimated")
9			NUM	EV (113793, DCM, "Pulse Width")	1	U		UNITS = EV (ms, UCUM, "ms")
10			NUM	EV (113742, DCM, “Irradiation Duration”	1	U		UNITS = EV (s, UCUM, “ms”)
11			NUM	EV (113733, DCM, "KVP")	1	M		UNITS = EV (kV, UCUM, "kV")
12			NUM	EV (113734, DCM, "X-Ray Tube Current")	1	MC	IF Row 15 is not present	UNITS = EV (mA, UCUM, "mA")
13			NUM	EV (113767, DCM, “Average X-Ray Tube Current”)	1	U		UNITS = EV (mA, UCUM, "mA")
14			NUM	EV (113824, DCM, "Exposure Time")	1	MC	IF Row 15 is not present	UNITS = EV (ms, UCUM, "ms")
15			NUM	EV (113736, DCM, “Exposure”)	1	MC	IF Row 12 and 14 are not present	UNITS = EV (uA.s, UCUM, "uA.s")
16			NUM	EV (113766, DCM, "Focal Spot Size")	1	U		UNITS = EV (mm, UCUM, "mm")
17			CODE	EV (111632, DCM, “Anode Target Material”)	1	U		DCID 10016 “Anode Target Material” (71128006, SCT, “Molybdenum”) used in Mammography if not provided by modality
18			CONTAINER	EV (113771, DCM, "X-Ray Filters")	2	U		
19	>	CONTAINS	CODE	EV (113772, DCM, "X-Ray Filter Type")	1	U		(113651, DCM, “Wedge filter”) (113652, DCM, “Butterfly filter”) (113653, DCM, “Flat filter”) (111609, DCM, “No Filter”) (113650, DCM, “Strip filter”) used in Mammography and XA if not provided by modality.
20	>	CONTAINS	CODE	EV (113757, DCM, "X-Ray Filter Material")	1	U		Use values in DCID 10006 “X-Ray filter Materials” (C-120F9, SRT, “Aluminum or Aluminum compound”) used in XA if not provided by modality (C-150F9, SRT, “Molybdenum or Molybdenum compound”) used in Mammography if not provided by modality.

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
21	>	CONTAINS	NUM	EV (113758, DCM, "X-Ray Filter Thickness Minimum")	1	U		Filled with what device sent. Display two decimals
22	>	CONTAINS	NUM	EV (113773, DCM, "X-Ray Filter Thickness Maximum")	1	U		Filled with what device sent. Display two decimals
23			NUM	EV (113790, DCM, “Collimated Field Area”)	1	U		UNITS = EV (m2, UCUM, “m2”). Display two decimals
24			NUM	EV (113788, DCM, “Collimated Field Height”)	1	U		UNITS = EV (mm, UCUM, “mm”). Display two decimals
25			NUM	EV (113789, DCM, “Collimated Field Width”)	1	U		UNITS = EV (mm, UCUM, “mm”). Display two decimals
26			CODE	EV (111635, DCM, “X-Ray Grid”)	1-n	U		(111642, DCM, “Focused Grid”) used in XA if not provided by modality (111643, DCM, “Reciprocating grid”) (111644, DCM, “Parallel Grid”) (111645, DCM, “Crossed Grid”) (111646, DCM, “No grid”) (111641, DCM, “Fixed Grid”) used in Mammography if not provided by modality.

TABLE 14-18 TID 10003C.
IRRADIATION EVENT X-RAY MECHANICAL DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
2			NUM	EV (112011, DCM, "Positioner Primary Angle")	1	UC	XOR Row 6	UNITS = EV (deg, UCUM, "deg"). Display two decimals.
3			NUM	EV (112012, DCM, "Positioner Secondary Angle")	1	UC	XOR Row 6	UNITS = EV (deg, UCUM, "deg"). Display two decimals.
4			NUM	EV(113739, DCM,”Positionner Primary End Angle”)	1	UC	IFF TID (10003) Row 7 value = (113613, DCM, “Rotational Acquisition”)	UNITS = EV (deg, UCUM, "deg")
5			NUM	EV(113740, DCM,”Positionner Secondary End Angle”)	1	UC	IFF TID (10003) Row 7 value = (113613, DCM,	UNITS = EV (deg, UCUM, "deg")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
							"Rotational Acquisition")	
6			NUM	EV (113770, DCM, "Column Angulation")	1	UC	XOR Rows 2, 3	UNITS = EV (deg, UCUM, "deg")
7			NUM	EV(113754, DCM, "Table Head Tilt Angle")	1	U		UNITS = EV (deg, UCUM, "deg")
8			NUM	EV(113755, DCM, "Table Horizontal Rotation Angle")	1	U		UNITS = EV (deg, UCUM, "deg")
9			NUM	EV(113756, DCM, "Table Cradle Tilt Angle")	1	U		UNITS = EV (deg, UCUM, "deg")
10			NUM	EV (111633, DCM, "Compression Thickness)	1	U		UNITS = EV (mm, UCUM, "mm")
10a			NUM	EV (111647, DCM, "Compression Force")	1	U		UNITS = EV (N, UCUL, "Newton")
10b			NUM	EV (111648, DCM, "Compression Pressure")	1	U		UNITS = EV (kPa, UCUM, "kilopascal")
10c			NUM	EV (111649, DCM, "Compression Contact Area")	1	U		UNITS = EV (mm, UCUM, "mm")
11			NUM	DCID 10008 "Dose Related Distance Measurements"	1-n	U		UNITS = EV (mm, UCUM, "mm") See CID 10008.

Table 14-19 TID 10004.
ACCUMULATED FLUOROSCOPY AND ACQUISITION PROJECTION X-RAY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113726, DCM, "Fluoro Dose Area Product Total")	1	MC	IFF TID 10003 Row 7 value = (44491008, SCT, "Fluoroscopy") for at least one irradiation event.	UNITS = EV (Gy.m2, UCUM, "Gy.m2") Re-use the data the modality sent
2			NUM	EV (113728, DCM, "Fluoro Dose (RP) Total")	1	MC	IF TID (10003) Row 7 value = (44491008, SRT, "Fluoroscopy") for at least one irradiation event AND any of the values of TID (10001) Row 18 are not (113858, DCM, "MPPS Content").	UNITS = EV (Gy, UCUM, "Gy") Re-use the data the modality sent
3			NUM	EV (113730, DCM, "Total Fluoro Time")	1	MC	IF TID (10003) Row 7 value = (44491008, SRT, "Fluoroscopy") for at least one irradiation event.	UNITS = EV (s, UCUM, "s") Re-use the data the modality sent

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
4			NUM	EV (113727, DCM, "Acquisition Dose Area Product Total")	1	MC	IF any of the values of TID (10001) Row 18 are not (113858, DCM, “MPPS Content”)	UNITS = EV (Gy.m2, UCUM, "Gy.m2") Re-use the data the modality sent
5			NUM	EV (113729, DCM, "Acquisition Dose (RP) Total")	1	MC	IF any of the values of TID (10001) Row 18 are not (113858, DCM, “MPPS Content”)	UNITS = EV (Gy, UCUM, "Gy") Re-use the data the modality sent
6			NUM	EV (113855, DCM, "Total Acquisition Time")	1	MC	IF any of the values of TID (10001) Row 18 are not (113858, DCM, “MPPS Content”)	UNITS = EV (s, UCUM, "s") Re-use the data the modality sent

TABLE 14-20 TID 10005.
ACCUMULATED MAMMOGRAPHY X-RAY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (111637, DCM, “Accumulated Average Glandular Dose”)	1-2	M		UNITS = EV (mGy, UCUM, "mGy")
2	>	HAS CONCEPT MOD	CODE	EV (272741003, SCT, "Laterality")	1	M		(80248007, SCT, “Left breast”) (73056007, SCT, “Right breast”) (63762007, SCT, “Both breasts”)

TABLE 14-21 TID 10007.
ACCUMULATED TOTAL PROJECTION RADIOGRAPHY DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	EV (113722, DCM, "Dose Area Product Total")	1	M		UNITS = EV (Gy.m2, UCUM, "Gy.m2")
2			NUM	EV (113725, DCM, "Dose (RP) Total")	1	MC	IF TID (10001) Row 4 = (113958, DCM, "Integrated Projection Radiography System") or any of the values of TID (10001) Row 18 are not (113858, DCM, "MPPS Content").	UNITS = EV (Gy, UCUM, "Gy")
3			NUM	EV (113737, DCM, “Distance Source to Reference Point”)	1	U		UNITS = EV (mm, UCUL, “mm”)
4			NUM	EV (113731, DCM, “Total Number of Radiographic Frames”)	1	U		UNITS = EV (1, UCUM, “no units”)
5			CODE	EV (113780, DCM, "Reference Point Definition")	1	MC	IF any of (113725, DCM, "Dose (RP) Total"), (113728, DCM, "Fluoro Dose (RP) Total") or (113729, DCM, "Acquisition Dose (RP) Total") are present, and Row 6 is not present.	DCID 10025 “Radiation Dose Reference Points” (113860, DCM, “15cm from Isocenter toward Source”) used for XA if not provided by modality

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
6			TEXT	EV (113780, DCM, "Reference Point Definition")	1	MC	IF any of (113725, DCM, "Dose (RP) Total"), (113728, DCM, "Fluoro Dose (RP) Total") or (113729, DCM, "Acquisition Dose (RP) Total") are present, and Row 5 is not present.	

TABLE 14-22 CID 10008.
DOSE RELATED DISTANCE MEASUREMENTS

Code Scheme Designator	Code Value	Code Meaning	Comment
DCM	113748	Distance Source to Isocenter	Display two decimals
DCM	113737	Distance Source to Reference Point	Display two decimals
DCM	113750	Distance Source to Detector	Display two decimals
DCM	113751	Table Longitudinal Position	Display two decimals
DCM	113752	Table Lateral Position	Display two decimals
DCM	113753	Table Height Position	Display two decimals
DCM	113792	Distance Source to Table Plane	Display two decimals
DCM	113759	Table Longitudinal End Position	Display two decimals
DCM	113760	Table Lateral End Position	Display two decimals
DCM	113761	Table Height End Position	Display two decimals

14.5.1.2 Template ID 10011 CT Radiation Dose

This Template defines the CT Radiation Dose Report **produced** by DoseWatch. This template is easily editable in the software if needed.

Table 14-23 TID 10011.
CT Radiation Dose

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	1	M		Root node
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	1	M		EV (77477000, SCT, "Computed Tomography X-Ray")
3	>>	HAS CONCEPT MOD	CODE	EV (363703001, SCT, "Has Intent")	1	M		DCID 3629 “Procedure Intent”
4	>		INCLUDE	DTID 1002 “Observer Context”	2	M		See Table 14-11 **TID 1002.** Observer context for device and TID 1002. Observer context for person
5	>	HAS OBS CONTEXT	DATETIME	EV (113809, DCM, "Start of X-Ray Irradiation")	1	M		Based on the study start of X-Ray Irradiation if provided. If not the the study date is used

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
6	>	HAS OBS CONTEXT	DATETIME	EV (113810, DCM, "End of X-Ray Irradiation")	1	M		Based on the study end of X-Ray Irradiation if provided. If not the the study date is used
7	>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	1	M		DCID 10000 “Scope of Accumulation” Use (113014, DCM, ”Study”)
8	>>	HAS PROPERTIES	UIDREF	DCID 10001 “UID Types”				Use (110180, DCM, “Study Instance UID”)
9	>	CONTAINS	INCLUDE	DTID 10012 “CT Accumulated Dose Data”	1	M		See Table 14-24 **TID 10012.** CT Accumulated Dose Data
14	>	CONTAINS	INCLUDE	DTID 10013 “CT Irradiation Event Data”	1-n	M		Iterate of all series received to display: protocol, target region, Irradiation event UID, exposure time, scanning length, nominal single collimation width, number of X-Ray- Sources ... See Table 14-25 **TID 10013.** CT Irradiation Event Data
15	>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	1	M		Use (113856, DCM, “Automated Data Collection”)

The table below lists the fields used for CT Accumulated Dose Data. They are all based on information given by the modality.

Table 14-24 TID 10012.
CT ACCUMULATED DOSE DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113811, DCM, "CT Accumulated Dose Data")	1	M		
2	>	CONTAINS	NUM	EV (113812, DCM, "Total Number of Irradiation Events")	1	M		UNITS = EV ({events}, UCUM, "events")
3	>	CONTAINS	NUM	EV (113813, DCM, "CT Dose Length Product Total")	1	M		UNITS = EV (mGy.cm, UCUM, "mGy.cm")

The table below lists the fields used for each irradiation events. They are all based on information given by the modality.

Table 14-25 TID 10013.
CT IRRADIATION EVENT DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113819, DCM, "CT Acquisition")	1	M		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
2	>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	1	U		Use the series protocol name
3	>	CONTAINS	CODE	EV (123014, DCM, "Target Region")	1	M		DCID 4030 “CT, MR and PET Anatomy Imaged” Use (38266002, SCT, “Entire body”) if not provided by modality.
4	>	CONTAINS	CODE	EV (113820, DCM, "CT Acquisition Type")	1	M		Value can be : Constant Angle Acquisition Spiral Acquisition Stationary Acquisition Sequenced Acquisition. Use (113804, DCM, “Sequenced Acquisition”) if not provided by modality.
6	>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	1	M		Use a UID generated by DoseWatch
6f	>	CONTAINS	DATETIME	EV (111526, DCM, “DateTime Started”)	1	U		Use Series Date and Time or Acquisition Date Time depending of the device.
7	>	CONTAINS	CONTAINER	EV (113822, DCM, "CT Acquisition Parameters")	1	M		
8	>>	CONTAINS	NUM	EV (113824, DCM, "Exposure Time")	1	M		UNITS = EV (s, UCUM, "s")
9	>>	CONTAINS	INCLUDE	DTID 10014 “Scanning Length”	1	M		
10	>>	CONTAINS	NUM	EV (113826, DCM, "Nominal Single Collimation Width")	1	M		UNITS = EV (mm, UCUM, "mm")
11	>>	CONTAINS	NUM	EV (113827, DCM, "Nominal Total Collimation Width")	1	M		UNITS = EV (mm, UCUM, "mm")
12	>>	CONTAINS	NUM	EV (113828, DCM, "Pitch Factor")	1	MC	IF row 4 equals (P5-08001, SRT, "Spiral Acquisition") or equals (113804, DCM, "Sequenced Acquisition")	UNITS = EV ({ratio}, UCUM, "ratio")
13	>>	CONTAINS	NUM	EV (113823, DCM, "Number of X-Ray Sources")	1	M		UNITS = EV ({X-Ray sources}, UCUM, "X-Ray sources")
14	>>	CONTAINS	CONTAINER	EV (113831, DCM, "CT X-Ray Source Parameters")	1-n	M		
15	>>>	CONTAINS	TEXT	EV (113832, DCM, "Identification of the X-Ray Source")	1	M		Use 1 if not provided by modality.
16	>>>	CONTAINS	NUM	EV (113733, DCM, "KVP")	1	M		UNITS = EV (kV, UCUM, "kV")

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
17	>>>	CONTAINS	NUM	EV (113833, DCM, "Maximum X-Ray Tube Current")	1	M		UNITS = EV (mA, UCUM, "mA")
18	>>>	CONTAINS	NUM	EV (113734, DCM, "X-Ray Tube Current")	1	M		UNITS = EV (mA, UCUM, "mA")
19	>>>	CONTAINS	NUM	EV (113834, DCM, "Exposure Time per Rotation")	1	MC	IF row 4 does not equal (113805, DCM, "Constant Angle Acquisition")	UNITS = EV (s, UCUM, "s")
21	>	CONTAINS	CONTAINER	EV (113829, DCM, "CT Dose")	1	MC	IF row 4 does not equal (113805, DCM, "Constant Angle Acquisition")	
22	>>	CONTAINS	NUM	EV (113830, DCM, "Mean CTDIvol")	1	M		UNITS = EV (mGy, UCUM, "mGy")
23	>>	CONTAINS	CODE	EV (113835, DCM, "CTDIw Phantom Type")	1	M		DCID 4052 “Phantom Devices” Use (113691, DCM, “IEC Body Dosimetry Phantom”) if not provided by modality.
26	>>	CONTAINS	NUM	EV (113838, DCM, "DLP")	1	M		UNITS = EV (mGy.cm, UCUM, "mGy.cm")
30	>>	CONTAINS	NUM	EV (113930, DCM, "Size Specific Dose Estimation")	1-n	U		UNITS = EV (mGy, UCUM, "mGy")
31	>>>	HAS CONCEPT MOD	CODE	EV (370129005, SCT, "Measurement Method")	1	M		Use (113936, DCM, “AAPM 204 Sum of Lateral and AP Dimension) or (113981, DCM, “Water Equivalent Diameter Representative Value)
32	>>>>	INFERRED FROM	NUM	EV (113931, DCM, "Measured Lateral Dimension")	1	MC	IF row 31 equals (113934, DCM, "AAPM 204 Lateral Dimension") or (113936, DCM, "AAPM 204 Sum of Lateral and AP Dimension")	UNITS = EV (mm, UCUM, "mm")
33	>>>>	INFERRED FROM	NUM	EV (113932, DCM, "Measured AP Dimension")	1	MC	IF row 31 equals (113935, DCM, "AAPM 204 AP Dimension") or (113936, DCM, "AAPM 204 Sum of Lateral and AP Dimension")	UNITS = EV (mm, UCUM, "mm")
34	>>>>	INFERRED FROM	NUM	EV (113933, DCM, "Derived Effective Diameter")	1	MC	IF row 31 equals (113934, DCM, "AAPM 204 Lateral Dimension") or (113935, DCM, "AAPM 204 AP Dimension") or (113936, DCM,	UNITS = EV (mm, UCUM, "mm") Calculated with (Measured Lateral Dimension* Measured AP Dimension)^1/2

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
							"AAPM 204 Sum of Lateral and AP Dimension") or (113937, DCM, "AAPM 204 Effective Diameter Estimated From Patient Age")	
34b	>>>>	INFERRED FROM	NUM	EV (113980, DCM, “Water Equivalent Diameter”	1	MC	IF row 31 equals (113981, DCM, "Water Equivalent Diameter Representative Value")	UNITS = EV (mm, UCUM, "mm")
34c	>>>>	HAS CONCEPT MOD	CODE	EV (370129005, SCT, "Measurement Method")	1	M		Use (113987, DCM, “AAPM 220”)
34e	>>>>	INFERRED FROM	NUM	EV (113986, DCM, “Z value of location of Water Equivalent Diameter estimation”)	1	MC	IF row 31 equals (113981, DCM, "Water Equivalent Diameter Representative Value")	UNITS = EV (mm, UCUM, "mm")
35	>>	CONTAINS	INCLUDE	DTID 10015 “CT Dose Check Details”	1	M		Remains emtpy as data not stored in DoseWatch
39	>	CONTAINS	INCLUDE	DTID 1021 “Device Participant”	1	MC	Required if the irradiating device is not the recording device	$DeviceProcedureRole = EV (113859, DCM, "Irradiating Device") See TID 1021.

The table below lists the fields used for Device Participant. They are all based on information given by the modality.

Table 14-26 TID 1021.
DEVICE PARTICIPANT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CODE	EV (113876, DCM, "Device Role in Procedure")	1	M		$PersonProcedureRole = EV (113851, DCM, "Irradiation Administering")
2	>	HAS PROPERTIES	TEXT	EV (113877, DCM, "Device Name")	1	U		Use the irradiating device AET
3	>	HAS PROPERTIES	TEXT	EV (113878, DCM, "Device Manufacturer")	1	M		
4	>	HAS PROPERTIES	TEXT	EV (113879, DCM, "Device Model Name")	1	M		
5	>	HAS PROPERTIES	TEXT	EV (113880, DCM, "Device Serial Number")	1	M		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
6	>	HAS PROPERTIES	UIDREF	EV (121012, DCM, "Device Observer UID")	1	M		Remains empty as not storred in DoseWatch

15. RADIOPHARMACEUTICAL RADIATION DOSE STRUCTURED REPORT INFORMATION OBJECT IMPLEMENTATION

15.1 INTRODUCTION

This section specifies the use of the DICOM CT/X-Ray Radiation Dose SR IOD to represent results **produced and received** by this implementation. Corresponding attributes are conveyed using the module construct.

15.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 15-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	NMStudy
Series	NMSeries
Document	DicomMessage

15.3 IOD MODULE TABLE

The Radiopharmaceutical Radiation Dose Structured Report Information Object Definitions comprise the modules of the following tables.

The contents of the SR Document Content are constrained by the supported template, as identified in Section 14.4.3.4.1. Standard, Standard Extended and Private templates are further described in Section 14.5.

TABLE 15-2
RADIOPHARMACEUTICAL RADIATION DOSE SR IOD MODULES

Entity Name	Module Name	Usage	Reference
Patient	Patient	Used	3.4.1.1
	Clinical Trial Subject	Not Used	
Study	General Study	Used	3.4.2.1
	Patient Study	Used	3.4.2.2
	Clinical Trial Study	Not Used	
Series	SR Document Series	Used	14.4.2.1
	Clinical Trial Series	Not Used	
Frame of Reference	Synchronization	Not Used	
Equipment	General Equipment	Used	3.4.4.1(for SR Reading) 14.4.1.1 (for SR production)

	Enhanced General Equipment	Used	14.4.1.2
Document	SR Document General	Used	14.4.3.1
	SR Document Content	Used	14.4.3.2
	SOP Common	Used	14.4.3.3

15.4 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the entities, modules, and attributes contained within the SR Information Objects.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported and expected. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from when generating the instance as well as what are the expected values when loading such instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

15.5 STANDARD, STANDARD EXTENDED AND PRIVATE TEMPLATES

The Product supports the Standard Extended and Private Templates defined in the following sections.

15.5.1 Standard Templates

The Product supports the following standard templates for SOP Instances created by this product.

15.5.1.1 Template ID 10021 Radiopharmaceutical Radiation Dose

This Template defines the structure of the Radiopharmaceutical Radiation Dose SR **produced** by DoseWatch. The template declared in DoseWatch can be easily changed if needed.

Table 15-3 TID 10021.
RADIOPHARMACEUTICAL RADIATION DOSE

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113500, DCM, "Radiopharmaceutical Radiation Dose Report")	1	M		Root node
2	>	HAS CONCEPT MODE	CODE	EV (363589002, SCT, "Associated Procedure")	1	M		DCID 3108 “NM/PET Procedures”. Uses (45316007, SCT, “Radionuclide localization of tumor”)
3	>>	HAS CONCEPT MODE	CODE	EV (363703001, SCT, "Has Intent")	1	M		DCID 3629 “Procedure Intent”. Uses (261004008, SCT, “Diagnostic Intent”)
4	>	CONTAINS	INCLUDE	DTID 10022 “Radiopharmaceutical Administration Event Data”	1	M		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
5	>	CONTAINS	INCLUDE	DTID 10024 “Imaging Agent Administration Patient Characteristics”	1	U		

The table below lists the fields used for Radiopharmaceutical Administration Event Data. They are all based on information given by the modality.

Table 15-4 TID 10022.
RADIOPHARMACEUTICAL ADMINISTRATION EVENT DATA

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (113502, DCM, "Radiopharmaceutical Administration")	1	M		
2	>	CONTAINS	CODE	EV (349358000, SCT, "Radiopharmaceutical agent")	1	M		DCID 25 “Radiopharmaceuticals” DCID 4021 “PET Radiopharmaceutical”
3	>>	HAS PROPERTIES	CODE	EV (89457008, SCT, "Radionuclide")	1	M		DCID 18 “Isotopes in Radiopharmaceuticals” DCID 4020 “PET Radionuclide”
4	>>	HAS PROPERTIES	NUM	EV (304283002, SCT, "Radionuclide Half Life")	1	M		UNITS = EV (s, UCUM, "seconds")
6	>	CONTAINS	UIDREF	EV (113503, DCM, "Radiopharmaceutical Administration Event UID")	1	M		
9	>	CONTAINS	DATETIME	EV (123003, DCM, "Radiopharmaceutical Start DateTime")	1	M		
11	>	CONTAINS	NUM	EV (113507, DCM, "Administered activity")	1	M		UNITS = EV (MBq, UCUM, "MBq")
12	>	CONTAINS	NUM	EV (123005, DCM, "Radiopharmaceutical Volume")	1	U		UNITS = EV (cm3, UCUM, "cm3") Can be filled if connection to Injector through HL7.
20	>	CONTAINS	CODE	EV (410675002, SCT, "Route of administration")	1	M		BCID 11 “Route of Administration”
21	>>	HAS PROPERTIES	CODE	EV (272737002, SCT, "Site of")	1	MC	IF Row 20 equals (47625008, SCT, "Intravenous route") or (78421000, SCT, "Intramuscular route")	DCID 3746 “Percutaneous Entry Site”
22	>>>	HAS CONCEPT MOD	CODE	EV (272741003, SCT, "Laterality")	1	MC	IF Row 21 has laterality	DCID 244 “Laterality”

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
23	>	CONTAINS	INCLUDE	DTID 1020 “Person Participant”	1-n	M		$PersonProcedureRole = EV (113851, DCM, "Irradiation Administering"). See TID 1020.
26	>	CONTAINS	TEXT	EV (111529, DCM, "Brand Name")	1	U		Can be filled if connection to Injector through HL7.
27	>	CONTAINS	TEXT	EV (113511, DCM, "Radiopharmaceutical Dispense Unit Identifier")	1	U		Can be filled if connection to Injector through HL7.
28	>>	CONTAINS	TEXT	EV (113512, DCM, "Radiopharmaceutical Lot Identifier")	1-n	U		Can be filled if connection to Injector through HL7.
29	>>	CONTAINS	TEXT	EV (113513, DCM, "Reagent Vial Identifier")	1-n	U		Can be filled if connection to Injector through HL7.
30	>>	CONTAINS	TEXT	EV (113514, DCM, "Radionuclide Identifier")	1-n	U		Can be filled if connection to Injector through HL7.
31	>	CONTAINS	TEXT	EV (113516, DCM, "Prescription Identifier")	1	U		Can be filled if connection to Injector through HL7.
32	>	CONTAINS	TEXT	EV (121106, DCM, "Comment")	1	U		Can be filled if connection to Injector through HL7.

The table below lists the fields used for Person Participant. They are all based on information given by the modality.

Table 15-5 TID 1020.
PERSON PARTICIPANT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			PNAME	EV (113870, DCM, "Person Name")	1	M		
2	>	HAS PROPERTIES	CODE	EV (113875, DCM, "Person Role in Procedure")	1	M		$PersonProcedureRole

The table below lists the fields used for Radiopharmaceutical Administration Event Data. They are all based on information given by the modality.

Table 15-6 TID 10024.
IMAGING AGENT ADMINISTRATION PATIENT CHARACTERISTICS

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (121118, DCM, "Patient Characteristics")				
3	>	CONTAINS	NUM	EV (121033, DCM, "Subject Age")	1	U		UNITS = DCID 7456 “Units of Measure for Age”
4	>	CONTAINS	CODE	EV (121032, DCM, "Subject Sex")	1	U		DCID 7455 “Sex”

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
5	>	CONTAINS	NUM	EV (8302-2, LN, "Patient Height")	1	U		UNITS = EV (cm, UCUM, "cm")
6	>	CONTAINS	NUM	EV (29463-7, LN, "Patient Weight")	1	U		UNITS = EV (kg, UCUM, "kg")
9	>	CONTAINS	NUM	EV (60621009, SCT, "Body Mass Index")	1	U		UNITS = EV (kg/m2, UCUM, "kg/m^2")
10	>>	INFERRED FROM	CODE	EV (121420, DCM, "Equation")	1	U		DT (122265, DCM, "BMI = Wt/Ht^2")

16. MODALITY WORKLIST QUERY IMPLEMENTATION

16.1 INTRODUCTION

This section specifies the use of the DICOM Modality Worklist Information Model used to organize data and against which a Modality Worklist Query will be performed.

16.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 16-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM	DoseWatch Entity
Scheduled Procedure Step	ScheduledProcedureStep
Requested Procedure	RequestedProcedure
Imaging Service Request	ImagingServiceRequest
Visit	N/A
Patient	Patient

16.3 WORKLIST QUERY MODULE TABLE

See DICOM PS 3.3 and PS 3.4 for a complete definition of the entities, modules, and attributes.

TABLE 16-2
MODALITY WORKLIST INFORMATION MODEL MODULES

Entity Name	Module Name	Reference
Scheduled Procedure Step	SOP Common	16.4.1.1
	Scheduled Procedure Step	16.4.1.2
Requested Procedure	Requested Procedure	16.4.2.1
Imaging Service Request	Imaging Service Request	16.4.3.1
Visit	Visit Identification	16.4.4.1
	Visit Status	16.4.4.2
Patient	Patient Identification	16.4.5.1
	Patient Demographic	16.4.5.2
	Patient Medical	16.4.5.3

16.4 WORKLIST QUERY MODULE DEFINITIONS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) for a description of each of the query key attributes contained within the Modality Worklist Information Model.

16.4.1 Common Scheduled Procedure Step Entity Modules

16.4.1.1 SOP Common Module

TABLE 16-3
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Specific Character Set	(0008,0005)	O	1C	

16.4.1.1.1 Specific Character Set

The attribute Specific Character Set (0008,0005) will not be sent, unless Patient Name is sent with a matching key that includes a non-ASCII character; in that case, the configured extended character set identifier will be sent. Only non-ASCII characters that may be entered from the console keyboard, as described in Section 2.7, may be included in the matching key value.

The AE will use any Specific Character Set value returned in a Scheduled Procedure Step Identifier in the images created pursuant to that Scheduled Procedure Step. Text attributes, including Patient and Physician names, that include non-ASCII characters will be displayed as described in Section 2.7.

16.4.1.2 Scheduled Procedure Step Module

TABLE 16-4
SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Scheduled Procedure Step Sequence	(0040,0100)	R	1	
>Scheduled Station AE Title	(0040,0001)	R	1	Used.
>Scheduled Procedure Step Start Date	(0040,0002)	R	1 *	Used.
>Scheduled Procedure Step Start Time	(0040,0003)	R	1 *	Used.
>Scheduled Procedure Step End Date	(0040,0004)	O	3	Used.
>Scheduled Procedure Step End Time	(0040,0005)	O	3	Used.
>Modality	(0008,0060)	R	1 *	Used.
>Scheduled Performing Physician's Name	(0040,0006)	R	2	Used.

>Scheduled Procedure Step Description	(0040,0007)	O	1C *	Used.
>Scheduled Station Name	(0040,0010)	O	2	Used.
>Scheduled Procedure Step Location	(0040,0011)	O	2	Used.
>Scheduled Protocol Code Sequence	(0040,0008)	O	1C	Used.
>>Code Value	(0008,0100)	O	1	Used.
>>Coding Scheme Designator	(0008,0102)	O	1	Used.
>>Coding Scheme Version	(0008,0103)	O	3	Used.
>>Code Meaning	(0008,0104)	O	3	Used.
>Pre-Medication	(0040,0012)	O	2C	Used.
>Scheduled Procedure Step ID	(0040,0009)	O	1	Used.
>Requested Contrast Agent	(0032,1070)	O	2C	Used.
>Scheduled Procedure Step Status	(0040,0020)	O	3	Used.
>Comments on the Scheduled Procedure Step	(0040,0400)	O	3	Used.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

16.4.1.2.1 Scheduled Station AE Title

The AE title used to query the worklist on the RIS is either the AET of the device as it is configured in DoseWatch or a DoseWach AET specified in the configuration. The first case allows no further configuration on the RIS to perform the query.

16.4.2 Common Requested Procedure Entity Modules

16.4.2.1 Requested Procedure Module

TABLE 16-5
REQUESTED PROCEDURE MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Requested Procedure ID	(0040,1001)	O	1	Used.
Requested Procedure Description	(0032,1060)	O	1C	Used.

Requested Procedure Code Sequence	(0032,1064)	O	1C	Used.
>Code Value	(0008,0100)	O	1	Used.
>Coding Scheme Designator	(0008,0102)	O	1	Used.
>Coding Scheme Version	(0008,0103)	O	3	Used.
>Code Meaning	(0008,0104)	O	3	Used.
Study Instance UID	(0020,000D)	O	1	Used.
Study Date	(0008,0020)	O	3	Used.
Study Time	(0008,0030)	O	3	Used.
Requested Procedure Priority	(0040,1003)	O	2	Used.
Requested Procedure Location	(0040,1005)	O	3	Used.
Reporting Priority	(0040,1009)	O	3	Used.
Reason for the Requested Procedure	(0040,1002)	O	3	Used.
Requested Procedure Comments	(0040,1400)	O	3	Used.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

16.4.3 Common Imaging Service Request Entity Modules

16.4.3.1 Imaging Service Request Module

TABLE 16-6
IMAGING SERVICE REQUEST MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Accession Number	(0008,0050)	O	2 *	Used.
Requesting Physician	(0032,1032)	O	2	Used.
Referring Physician's Name	(0008,0090)	O	2	Used.
Requesting Service	(0032,1033)	O	2	Used.
Imaging Service Request Comments	(0040,2400)	O	3	Used.
Placer Order Number / Imaging Service Request	(0040,2016)	O	3	Used.

Filler Order Number / Imaging Service Request	(0040,2017)	O	3	Used.
Order entered by...	(0040,2008)	O	3	Used.
Order Entere's Location	(0040,2009)	O	3	Used.
Order Callback Phone Number	(0040,2010)	O	3	Used.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

16.4.4 Common visit Entity Modules

16.4.4.1 Visit Identification

TABLE 16-7
VISIT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Admission ID	(0038,0010)	O	2	Requested.

16.4.4.2 Visit Status

TABLE 16-8
VISIT STATUS MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Current Patient Location	(0038,0300)	O	2	Requested.

16.4.5 Common Patient Entity Modules

16.4.5.1 Patient Identification

TABLE 16-9
PATIENT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patient's Name	(0010,0010)	R	1 *	Requested.
Patient ID	(0010,0020)	R	1 *	DoseWatch search into database for existing patient to display the dose records and dose alerts prior examination.
Issuer of Patient ID	(0010,0021)	O	3*	DoseWatch search into database for existing patient to display the dose records and dose alerts prior examination.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

16.4.5.2 Patient Demographic

TABLE 16-10
PATIENT DEMOGRAPHIC MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patients Birth Date	(0010,0030)	O	2 *	Requested.
Patient's Sex	(0010,0040)	O	2 *	Requested.
Confidentiality constraint on patient data	(0040,3001)	O	2	Requested.
Patient's Size	(0010,1020)	O	3	Requested.

Note: * in the *Expected Return Key Type* column indicates that this information is displayed on screen, if available.

16.4.5.3 Patient Medical

TABLE 16-11
PATIENT MEDICAL MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Note
Patient State	(0038,0500)	O	2	Requested.
Pregnancy Status	(0010,21C0)	O	2	Requested.
Medical Alerts	(0010,2000)	O	2	Requested.
Contrast Allergies	(0010,2110)	O	2	Requested.
Special Needs	(0038,0050)	O	2	Requested.

17. MODALITY PERFORMED PROCEDURE STEP IMPLEMENTATION

17.1 INTRODUCTION

This section specifies the use of the DICOM Modality Performed Procedure Step information included in the MPPS **received and produced** by this implementation.

This feature works in conjunction with DICOM Modality Worklist, if installed. However the conformance of this feature is independent of Modality Worklist feature. For information on conformance of Modality Worklist feature to DICOM standard please refer to the appropriate section in this document.

17.2 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 17-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM IE	DoseWatch Entity
Patient	Patient
Study	Study/CTStudy Study/MGStudy Study/RFStudy Study/XAStudy Study/MRStudy Study/USStudy
Series	Series/CTSeries Series/MGSeries Series/RFSeries Series/XASeries Series/MRSeries Series/USSeries

17.3 RELATIONSHIP BETWEEN SCHEDULED AND PERFORMED PROCEDURE STEPS

As of now, DoseWatch does not have a strong correlation between Scheduled Procedure Steps and Performed Procedure Steps. It means that there can be one-to-one, multiple-to-one, one/multiple-to-multiple or zero-to-one relationships between these two entities.

17.4 MODALITY PERFORMED PROCEDURE STEP MODULE TABLE

See DICOM PS 3.3 and PS 3.4 for a complete definition of the entities, modules, and attributes.

TABLE 17-2
MODALITY PERFORMED PROCEDURE STEP MODULES

Module Name	Reference
SOP Common	17.5.1
Performed Procedure Step Relationship	17.5.2
Performed Procedure Step Information	17.5.3
Image Acquisition Results	17.5.4
Radiation Dose	17.5.5
Billing and Material Management Codes	17.5.6

17.5 MODALITY PERFORMED PROCEDURE STEP MODULE DEFINITIONS

Please refer to DICOM Standard PS 3.3 (Information Object Definitions) for a description of each of the attributes contained within the Modality Performed Procedure Step Information Object Definition.

The modules defined below concern only information created by DoseWatch when an MPPS message is sent to a peer.

17.5.1 SOP Common Module

TABLE 17-3
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type for SCU N-CREATE	Type for SCU N-SET	Use
Specific Character Set	(0008,0005)	1C	1C	Not Used. Default one (ISO_IR 192) is used if not defined.

17.5.2 Performed Procedure Step Relationship Module

TABLE 17-4
PERFORMED PROCEDURE STEP RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	Type for SCU - N-CREATE
		Post-Processing
Patient's Name	(0010,0010)	2, filled from DICOM data received (Images, RDSR, MPPS, ...).
Patient ID	(0010,0020)	2, filled from DICOM data received (Images, RDSR, MPPS, ...).
Issuer of Patient ID	(0010,0021)	3, not sent.
Patient's Birth Date	(0010,0030)	2, filled from DICOM data received (Images, RDSR, MPPS, ...).
Patient's Sex	(0010,0040)	2, filled from DICOM data received (Images, RDSR, MPPS, ...).
Admission ID	(0038,0010)	3, not sent.
Issuer of Admission ID	(0038,0011)	3, not sent.

Service Episode ID	(0038,0060)	3, not sent.
Issuer of Service Episode ID	(0038,0061)	3, not sent.
Service Episode Description	(0038,0062)	3, not sent.
Scheduled Step Attributes Sequence	(0040,0270)	1, Sequence with 1 item produced.
>Study Instance UID	(0020,000D)	1, filled from DICOM data received (Images, RDSR, MPPS, ...).
>Referenced Study Sequence	(0008,1110)	2, always empty.
>>Referenced SOP Class UID	(0008,1150)	1, not sent.
>>Referenced SOP Instance UID	(0008,1155)	1, not sent.
>Accession Number	(0008,0050)	2, filled from DICOM data received (Images, RDSR, MPPS, ...).
>Placer Order Number/Imaging Service Request	(0040,2016)	3, not sent.
>Filler Order Number/Imaging Service Request	(0040,2017)	3, not sent.
>Requested Procedure ID	(0040,1001)	2, always empty.
>Requested Procedure Code Sequence	(0032,1064)	3, not sent.
>>Code Value	(0008,0100)	1, not sent.
>>Coding Scheme Designator	(0008,0102)	1, not sent.
>>Code Meaning	(0008,0104)	1, not sent.
>Requested Procedure Description	(0032,1060)	2, always empty.
>Scheduled Procedure Step ID	(0040,0009)	2, always empty.
>Scheduled Procedure Step Description	(0040,0007)	2, always empty.
>Scheduled Protocol Code Sequence	(0040,0008)	2, always empty.
>>Code Value	(0008,0100)	1, not sent.
>>Coding Scheme Designator	(0008,0102)	1, not sent.
>>Coding Scheme Version	(0008,0103)	3, not sent.
>>Code Meaning	(0008,0104)	3, not sent.
Referenced Patient Sequence	(0008,1120)	2, always empty.
>Referenced SOP Class UID	(0008,1150)	1, not sent.

>Referenced SOP Instance UID	(0008,1155)	1, not sent.

17.5.3 Performed Procedure Step Information Module

TABLE 17-5
PERFORMED PROCEDURE STEP INFORMATION MODULE ATTRIBUTES

Attribute Name	Tag	Type for SCU N-CREATE	Type for SCU N-SET	Use
Performed Procedure Step ID	(0040,0253)	1	-	Generated.
Performed Station AE Title	(0040,0241)	1	-	Use the AET of the device producing the DICOM data (MPPS, Images, RDSR, ...).
Performed Station Name	(0040,0242)	2	-	Use the Station Name of the device producing the DICOM data (MPPS, Images, RDSR, ...).
Performed Location	(0040,0243)	2	-	Always empty.
Performed Procedure Step Start Date	(0040,0244)	1	-	Use the Study Date of the device producing the DICOM data (MPPS, Images, RDSR, ...).
Performed Procedure Step Start Time	(0040,0245)	1	-	Use the Study Time of the device producing the DICOM data (MPPS, Images, RDSR, ...).
Performed Procedure Step Status	(0040,0252)	1	3	IN PROGRESS for N-CREATE, COMPLETED for N-SET.
Performed Procedure Step Description	(0040,0254)	2	3	Use the Study Description of the device producing the DICOM data (MPPS, images, RDSR, ...)
Performed Procedure Type Description	(0040,0255)	2	3	Always empty.
Procedure Code Sequence	(0008,1032)	2	3	Always empty.
>Code Value	(0008,0100)	1	1	Not sent.
>Coding Scheme Designator	(0008,0102)	1	1	Not sent.
>Coding Scheme Version	(0008,0103)	3	3	Not sent.
>Code Meaning	(0008,0104)	3	3	Not sent.
Performed Procedure Step End Date	(0040,0250)	2	3	Always empty.
Performed Procedure Step End Time	(0040,0251)	2	3	Always empty.
Comments on the Performed Procedure Step	(0040,0280)	3	3	Not sent.
Performed Procedure Step Discontinuation Reason Code Sequence	(0040,0281)	3	3	Not sent.
>Code Value	(0008,0100)	1	1	Not sent.
>Coding Scheme Designator	(0008,0102)	1	1	Not sent.
>Coding Scheme Version	(0008,0103)	3	3	Not sent.
>Code Meaning	(0008,0104)	3	3	Not sent.

17.5.4 Image Acquisition Results Module

TABLE 17-6
IMAGE ACQUISITION RESULTS MODULE ATTRIBUTES

Attribute Name	Tag	Type for SCU N-CREATE	Type for SCU N-SET	Use
Modality	(0008,0060)	1	-	Use the Modality of the device producing the DICOM data (MPPS, images, RDSR, ...).
Study ID	(0020,0010)	2	-	Use the Study ID of the device producing the DICOM data (MPPS, images, RDSR, ...).
Performed Protocol Code Sequence	(0040,0260)	2	3	Always empty.
>Code Value	(0008,0100)	1	1	Not sent.
>Coding Scheme Designator	(0008,0102)	1	1	Not sent.
>Coding Scheme Version	(0008,0103)	3	3	Not sent.
>Code Meaning	(0008,0104)	3	3	Not sent.
Performed Series Sequence	(0040,0340)	2	3	Always empty for N-CREATE, used in N-SET.
>Performing Physician's Name	(0008,1050)	2	2	Always empty.
>Protocol Name	(0018,1030)	1	1	Filled with “Irrelevant information produced by DoseWatch”
>Operator’s Name	(0008,1070)	2	2	Always empty.
>Series Instance UID	(0020,000E)	1	1	Filled with a generated UID.
>Series Description	(0008,103E)	2	2	Filled with “Irrelevant information produced by DoseWatch”
>Retrieve AE Title	(0008,0054)	2	2	Filled with the AET of the device producing the DICOM data (MPPS, images, RDSR, ...).
> Archive Requested	(0040,A494)	3	3	Not sent.
>Referenced Image Sequence	(0008,1140)	2	2	Always empty.
>>Referenced SOP Class UID	(0008,1150)	1	1	Not sent.
>>Referenced SOP Instance UID	(0008,1155)	1	1	Not sent.
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	2	2	Always empty.
>>Referenced SOP Class UID	(0008,1150)	1	1	Not sent.
>>Referenced SOP Instance UID	(0008,1155)	1	1	Not sent.

17.5.5 Radiation Dose Module

This Module has been retired. See PS3.3 2017c. But it may be used in MPPS generated by DoseWatch software or on old devices still using this module in their implementation.

TABLE 17-7
RADIATION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type for SCU N-CREATE	Type for SCU N-SET	Use
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	3	Not sent.
> *'Code Sequence Macro'*	(0020,0010)	3	3	Not sent.
Total Time of Fluoroscopy	(0040,0300)	3	3	Use the Total Time of Fluoroscopy sent by the device producing the DICOM data (MPPS, images, RDSR, ...).
Total Number of Exposures	(0040,0301)	3	3	Use the Total Number of Exposures sent by the device producing the DICOM data (MPPS, images, RDSR, ...).
Distance Source to Detector (SID)	(0018,1110)	3	3	Not sent.
Distance Source to Entrance	(0040,0306)	3	3	Not sent.
Entrance Dose	(0040,0302)	3	3	Not sent.
Entrance Dose in mGy	(0040,8302)	3	3	Not sent.
Exposed Area	(0040,0303)	3	3	Not sent.
Image Area Dose Product	(0018,115E)	3	3	Not sent.
Comments on Radiation Dose	(0040,0310)	3	3	Filled with different content depending on the information to provide in the MPPS. Usually dose information.
Exposure Dose Sequence	(0040,030E)	3	3	May be sent in some cases.
>Radiation Mode	(0018,115A)	3	3	Not sent.
>KVp	(0018,0060)	3	3	Use the kVp sent by the device producing the DICOM data (MPPS, images, RDSR, ...).
>X-ray Tube Current in µA	(0018,8151)	3	3	Not sent.
>Exposure Time	(0018,1150)	3	3	Use the Exposure Time sent by the device producing the DICOM data (MPPS, images, RDSR, ...).
>Filter Type	(0018,1160)	3	3	Not sent.
>Filter Material	(0018,7050)	3	3	Not sent.

17.5.6 Billing and Material Management Codes Module

TABLE 17-8
BILLING AND MATERIAL MANAGEMENT CODES MODULE ATTRIBUTES

Attribute Name	Tag	Type for SCU N-CREATE	Type for SCU N-SET	Use
Billing Procedure Step Sequence	(0040,0320)	3	3	Not sent.
> *'Code Sequence Macro'*	(0020,0010)	3	3	Not sent.
Film Consumption Sequence	(0040,0321)	3	3	Not sent.
>Number of Films	(2100,0170)	3	3	Not sent.
>Medium Type	(2000,0030)	3	3	Not sent.
>Film Size ID	(2010,0050)	3	3	Not sent.
Billing Supplies and Devices Sequence	(0040,0324)	3	3	Not sent.
>Billing Item Sequence	(0040,0296)	3	3	Not sent.
>> *'Code Sequence Macro'*	(0040,0303)	3	3	Not sent.
>Quantity Sequence	(0040,0293)	3	3	Not sent.
>>Quantity	(0040,0294)	3	3	Not sent.
>>Measuring Units Sequence	(0040,0295)	3	3	Not sent.
>>> *'Code Sequence Macro'*	(0018,115A)	3	3	Not sent.

18. QUERY IMPLEMENTATION

18.1 DOSEWATCH MAPPING OF DICOM ENTITIES

The DoseWatch maps DICOM Information Entities to local Information Entities in the product's database and user interface.

TABLE 18-1
MAPPING OF DICOM ENTITIES TO DOSEWATCH ENTITIES

DICOM	DoseWatch Entity
Patient	Patient
Study	Study
Series	Serie
Image	DicomRawImage/ DicomMessage

18.2 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Query/Retrieve Information Model.

18.2.1 Common Query Keys

The query key attributes specified in this section are used at all levels and in all classes of query.

TABLE 18-2
Q/R PATIENT LEVEL COMMON RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	SCU Use
Specific Character Set	(0008,0005)	-	See 2.7
Query Retrieve Level	(0008,0052)	-	Set to level of query: Patient Study Series Composite Object Instance
Retrieve AE Title	(0008,0054)	-	Used

18.2.2 Patient Root – Patient Level

This section defines the keys at the Patient Level of the Patient Root Query/Retrieve Information Models that are supported by this implementation. Patient Root can only be used in punctual queries, not routine ones.

TABLE 18-3
PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Patient's Name	(0010,0010)	R	Matching key and/or Return key.
Patient ID	(0010,0020)	U	Matching key and/or Return key.
Issuer of Patient Id	(0010,0021)	O	Matching key and/or Return key.

Referenced Patient Sequence	(0008,1120)	O	
>Referenced SOP Class UID	(0008,1150)	O	Matching key and/or Return key.
>Referenced SOP Instance UID	(0008,1155)	O	Matching key and/or Return key.
Patient's Birth Date	(0010,0030)	O	Matching key and/or Return key.
Patient's Birth Time	(0010,0032)	O	Matching key and/or Return key.
Patient's Sex	(0010,0040)	O	Matching key and/or Return key.
Other Patient IDs Sequence	(0010,1002)	O	Only Return key.
Other Patient Names	(0010,1001)	O	Matching key and/or Return key.
Ethnic Group	(0010,2160)	O	Matching key and/or Return key.
Patient Comments	(0010,4000)	O	Matching key and/or Return key.
Number of Patient Related Studies	(0020,1200)	O	Matching key and/or Return key.
Number of Patient Related Series	(0020,1202)	O	Matching key and/or Return key.
Number of Patient Related Instances	(0020,1204)	O	Matching key and/or Return key.

18.2.3 Patient Root – Study Level

This section defines the keys at the Study Level of the Patient Root Query/Retrieve Information Models that are supported by this implementation. Patient Root can only be used in punctual queries, not routine ones.

TABLE 18-4
STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Study Date	(0008,0020)	R	Matching key and/or Return key.
Study Time	(0008,0030)	R	Matching key and/or Return key.
Accession Number	(0010,0021)	R	Matching key and/or Return key.
Study ID	(0020,0010)	R	Matching key and/or Return key.
Study Instance UID	(0020,000D)	U	Matching key and/or Return key.
Modalities in Study	(0008,0061)	O	Matching key and/or Return key.
SOP Classes in Study	(0008,0062)	O	Matching key and/or Return key.
Anatomic Regions in Study Code Sequence	(0008,0063)	O	Only Return key.
Referring Physician's Name	(0008,0090)	O	Matching key and/or Return key.
Study Description	(0008,1030)	O	Matching key and/or Return key.
Station Name	(0008,1010)	O	Matching key and/or Return key.
Procedure Code Sequence	(0008,1032)	O	Matching key and/or Return key.
>Code Value	(0008,0100)	O	Matching key and/or Return key.

>Coding Scheme Designator	(0008,0102)	O	Matching key and/or Return key.
>Coding Scheme Version	(0008,0103)	O	Matching key and/or Return key.
>Code Meaning	(0008,0104)	O	Matching key and/or Return key.
Name of Physician(s) Reading Study	(0008,1060)	O	Matching key and/or Return key.
Admitting Diagnoses Description	(0008,1080)	O	Matching key and/or Return key.
Referenced Study Sequence	(0008,1110)	O	Matching key and/or Return key.
>Referenced SOP Class UID	(0008,1150)	O	Matching key and/or Return key.
>Referenced SOP Instance UID	(0008,1155)	O	Matching key and/or Return key.
Patient's Age	(0010,1010)	O	Matching key and/or Return key.
Patient's Size	(0010,1020)	O	Matching key and/or Return key.
Patient's Weight	(0010,1030)	O	Matching key and/or Return key.
Occupation	(0010,2180)	O	Matching key and/or Return key.
Additional Patient History	(0010,21B0)	O	Matching key and/or Return key.
Other Study Numbers	(0020,1070)	O	Matching key and/or Return key.
Number of Study Related Series	(0020,1206)	O	Matching key and/or Return key.
Number of Study Related Instances	(0020,1208)	O	Matching key and/or Return key.

18.2.4 Study Root – Study Level

This section defines the keys at the Study Level of the Study Root Query/Retrieve Information Models that are supported by this implementation.

TABLE 18-5
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	SCU Use
Study Date	(0008,0020)	R	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Study Time	(0008,0030)	R	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Accession Number	(0010,0021)	R	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.

Patient's Name	(0010,0010)	R	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Patient ID	(0010,0020)	R	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Study ID	(0020,0010)	R	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Study Instance UID	(0020,000D)	U	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Modalities in Study	(0008,0061)	O	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
SOP Classes in Study	(0008,0062)	O	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Anatomic Regions in Study Code Sequence	(0008,0063)	O	Return key only.
Referring Physician's Name	(0008,0090)	O	Matching key and/or Return key.
Study Description	(0008,1030)	O	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Station Name	(0008,1010)	O	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Procedure Code Sequence	(0008,1032)	O	Matching key and/or Return key.
>Code Value	(0008,0100)	O	Matching key and/or Return key.
>Coding Scheme Designator	(0008,0102)	O	Matching key and/or Return key.
>Coding Scheme Version	(0008,0103)	O	Matching key and/or Return key.
>Code Meaning	(0008,0104)	O	Matching key and/or Return key.

Name of Physician(s) Reading Study	(0008,1060)	O	Matching key and/or Return key.
Admitting Diagnoses Description	(0008,1080)	O	Matching key and/or Return key.
Referenced Study Sequence	(0008,1110)	O	Matching key and/or Return key.
>Referenced SOP Class UID	(0008,1150)	O	Matching key and/or Return key.
>Referenced SOP Instance UID	(0008,1155)	O	Matching key and/or Return key.
Referenced Patient Sequence	(0008,1120)	O	Matching key and/or Return key.
>Referenced SOP Class UID	(0008,1150)	O	Matching key and/or Return key.
>Referenced SOP Instance UID	(0008,1155)	O	Matching key and/or Return key.
Issuer of Patient ID	(0010,0021)	O	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Patient's Birth Date	(0010,0030)	O	Matching key and/or Return key. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Patient's Birth Time	(0010,0032)	O	Matching key and/or Return key.
Patient's Sex	(0010,0040)	O	Matching key and/or Return key.
Patient's Address	(0010,1040)	O	Matching key only. Can be used in routine queries. In this case it can come from an existing Study using a template and triggered by an event or from a fixed value.
Other Patient IDs Sequence	(0010,1002)	O	Matching key and/or Return key.
Other Patient Names	(0010,1001)	O	Matching key and/or Return key.
Patient's Age	(0010,1010)	O	Matching key and/or Return key.
Patient's Size	(0010,1020)	O	Matching key and/or Return key.
Patient's Weight	(0010,1030)	O	Matching key and/or Return key.
Ethnic Group	(0010,2160)	O	Matching key and/or Return key.
Occupation	(0010,2180)	O	Matching key and/or Return key.
Additional Patient History	(0010,21B0)	O	Matching key and/or Return key.
Patient Comments	(0010,4000)	O	Matching key and/or Return key.
Administration Route Code Sequence	(0054,0302)	O	Return key only.
Other Study Numbers	(0020,1070)	O	Matching key and/or Return key.

Number of Study Related Series	(0020,1206)	O	Matching key and/or Return key.
Number of Study Related Instances	(0020,1208)	O	Matching key and/or Return key.

Note: * in the *Type* column indicates that this information is displayed on screen, if available.

18.2.5 Patient and Study Root – Series Level

This section defines the keys at the Series Level of the Patient Root and Study Root Query/Retrieve Information Models that are supported by this implementation. Patient Root can only be used in punctual queries, not routine ones.

TABLE 18-6
SERIES LEVEL ATTRIBUTES FOR THE PATIENT ROOT AND STUDY ROOT QUERY/RETRIEVE INFORMATION MODELS

Attribute Name	Tag	Type	SCU Use
Modality	(0008,0060)	R	Matching key only. Can be used in routine queries. In this case it can come from an existing Series using a template and triggered by an event or from a fixed value.
Series Number	(0020,0011)	R	Matching key only. Can be used in routine queries. In this case it can come from an existing Series using a template and triggered by an event or from a fixed value.
Series Instance UID	(0020,000E)	U	Matching key only. Can be used in routine queries. In this case it can come from an existing Series using a template and triggered by an event or from a fixed value.
Station Name	(0008,1010)	O	Matching key only. Can be used in routine queries. In this case it can come from an existing Series using a template and triggered by an event or from a fixed value.
Laterality	(0020,0060)	O	Matching key and/or Return key.
Series Date	(0008,0021)	O	Matching key and/or Return key.
Series Time	(0008,0031)	O	Matching key and/or Return key.
Performing Physician Name	(0008,1050)	O	Matching key and/or Return key.
Performing Physician Identification Sequence	(0008,1052)	O	Return key only.
Protocol Name	(0018,1030)	O	Matching key and/or Return key.
Referenced Defined Protocol Sequence	(0018,990C)	O	Matching key and/or Return key.
>Referenced SOP Class UID	(0008,1150)	O	Matching key and/or Return key.

>Referenced SOP Instance UID	(0008,1155)	O	Matching key and/or Return key.
Referenced Performed Protocol Sequence	(0018,990D)	O	Matching key and/or Return key.
>Referenced SOP Class UID	(0008,1150)	O	Matching key and/or Return key.
>Referenced SOP Instance UID	(0008,1155)	O	Matching key and/or Return key.
Series Description	(0008,1060)	O	Matching key and/or Return key.
Series Description Code Sequence	(0008,103F)	O	Return key only.
Patient Position	(0018,5100)	O	Matching key and/or Return key.
Request Attributes Sequence	(0040,0275)	O	Matching key and/or Return key.
>Requested Procedure ID	(0040,1001)	O	Matching key and/or Return key.
>Scheduled Procedure Step ID	(0040,0009)	O	Matching key and/or Return key.
Performed Procedure Step Start Date	(0040,0244)	O	Matching key and/or Return key.
Performed Procedure Step Start Time	(0040,0245)	O	Matching key and/or Return key.
Number of Series Related Instances	(0020,1209)	O	Matching key and/or Return key.
Presentation Intent Type	(0008,0068)	O	Matching key and/or Return key.
Manufacturer	(0008,0070)	O	Matching key and/or Return key.
Manufacturers Model Name	(0008,1090)	O	Matching key and/or Return key.
Software Versions	(0018,1020)	O	Matching key and/or Return key.
Institution Name	(0008,0080)	O	Matching key and/or Return key.
Institutional Department Name	(0008,1040)	O	Matching key and/or Return key.
Institution Address	(0008,0081)	O	Matching key and/or Return key.
Device Serial Number	(0018,1000)	O	Matching key and/or Return key.

18.2.7 Patient and Study Root – Composite Object Instance Level

This section defines the keys at the Composite Object Instance Level of the Patient Root and Study Root Query/Retrieve Information Models that are supported by this implementation. Patient Root can only be used in punctual queries, not routine ones.

TABLE 18-7
COMPOSITE OBJECT INSTANCE LEVEL ATTRIBUTES FOR THE PATIENT ROOT AND STUDY ROOT QUERY/RETRIEVE INFORMATION MODELS

Attribute Name	Tag	Type	SCU Use
Instance Number	(0020,0013)	R	Matching key only. Can be used in routine queries. In this case it can come from an existing Instance using a template and triggered by an event or from a fixed value.
SOP Instance UID	(0008,0018)	U	Matching key only. Can be used in routine queries. In this case it can come from an existing Instance using a template and triggered by an event or from a fixed value.
SOP Class UID	(0008,0016)	O	Matching key only. Can be used in routine queries. In this case it can come from an existing Instance using a template and triggered by an event or from a fixed value.
Alternate Representation Sequence	(0008,3001)	O	Matching key and/or Return key.
>Series Instance UID	(0020,000E)	O	Matching key and/or Return key.
>SOP Class UID	(0008,0016)	O	Matching key and/or Return key.
>SOP Instance UID	(0008,0018)	O	Matching key and/or Return key.
>Purpose of Reference Code Sequence	(0040,A170)	O	Matching key and/or Return key.
>>Code Value	(0008,0100)	O	Matching key and/or Return key.
>>Coding Scheme Designator	(0008,0102)	O	Matching key and/or Return key.
>>Coding Scheme Version	(0008,0103)	O	Matching key and/or Return key.
>>Code Meaning	(0008,0104)	O	Matching key and/or Return key.
Related General SOP Class UID	(0008,001A)	O	Matching key and/or Return key.
Concept Name Code Sequence	(0040,A043)	O	Matching key and/or Return key.
>Code Value	(0008,0100)	O	Matching key and/or Return key.
>Coding Scheme Designator	(0008,0102)	O	Matching key and/or Return key.
>Coding Scheme Version	(0008,0103)	O	Matching key and/or Return key.
>Code Meaning	(0008,0104)	O	Matching key and/or Return key.
Content Template Sequence	(0040,A504)	O	Matching key and/or Return key.

>Template Identifier	(0040,DB00)	O	Matching key and/or Return key.
>Mapping Resource	(0008,0105)	O	Matching key and/or Return key.
Container Identifier	(0040,0512)	O	Matching key and/or Return key.
Specimen Description Sequence	(0040,0560)	O	Matching key and/or Return key.
>Specimen Identifier	(0040,0551)	O	Matching key and/or Return key.
>Specimen UID	(0040,0554)	O	Matching key and/or Return key.
Image Type	(0008,0008)	O	Matching key and/or Return key.

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