DICOM Conformance Statement

MAMMOMAT Revelation

VC20

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1 Conformance Statement Overview

The MAMMOMAT Revelation conforms to the DICOM Standard and supports the network services as described in Table 1: Network Services and the media services as described in Table 2 - Media Services.

Table 1 - Network Services

SOP Classes	SOP Class UID	User of Service (SCU)		Provider of Service (SCP)	
Verification					
Verification	1.2.840.10008.1.1	Yes		Yes	
SOP Classes created by MAMMOMAT Revelation					
		Create	**Send**	**Store**	**Display**
Digital Mammography X-Ray Image Storage – For Processing	1.2.840.10008. 5.1.4.1.1.1.2.1	Yes	Yes	Yes	Yes
Digital Mammography X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.2	Yes	Yes	Yes	Yes
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Yes	Yes	Yes	Yes
Breast Tomosynthesis Image Storage	1.2.840.10008.5.1.4.1.1.13.1.3	Yes	Yes	Yes	Yes
SOP Classes managed by MAMMOMAT Revelation					
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	No	Yes	Yes	Yes
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	No	Yes	Yes	Yes
Digital X-Ray Image Storage – For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	No	Yes	Yes	Yes
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	No	Yes	Yes	Yes
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	No	Yes	Yes	Yes
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	No	Yes	Yes	Yes
Enhanced MR Image Storage	1.2.840.10008.5.1.4.1.1.4.1	No	Yes	Yes	Yes
MR Spectroscopy Storage	1.2.840.10008.5.1.4.1.1.4.2	No	Yes	Yes	Yes
Enhanced MR Color Image Storage	1.2.840.10008.5.1.4.1.1.4.3	No	Yes	Yes	Yes
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	No	Yes	Yes	Yes
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	No	Yes	Yes	Yes
Mammography CAD SR Storage	1.2.840.10008.5.1.4.1.1.88.50	Yes	Yes	Yes	Yes
Key Object Selection Document Storage	1.2.840.10008.5.1.4.1.1.88.59	Yes	Yes	Yes	Yes
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	Yes	Yes	Yes
Storage Commitment					
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Yes		Yes	

SOP Classes	SOP Class UID	User of Service (SCU)		Provider of Service (SCP)	
		Create	Send	Store	Display
Worklist Management					
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes		No	
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Yes		No	
Query/Retrieve					
Patient Root Q/R Information Model - FIND	1.2.840.10008.3.1.2.3.3	Yes		Yes	
Patient Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes		Yes	
Study Root Q/R - Information Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes		Yes	
Study Root Q/R - Information Model - MOVE	1.2.840.10008.5.1.4.1.2.2.1	Yes		Yes	
Patient/Study Only Q/R - Information Model FIND	1.2.840.10008.5.1.4.1.2.2.1	No		No	
Patient/Study Only Q/R - Information Model MOVE	1.2.840.10008.5.1.4.1.2.3.2	No		No	
Print Management					
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Yes		No	
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Yes		No	
Basic Film Sesssion SOP Class	1.2.840.10008.5.1.1.1	Yes		No	
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Yes		No	
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Yes		No	
Basic Color Image Box SOP SOP Class	1.2.840.10008.5.1.1.4.1	Yes		No	
Printer SOP Class	1.2.840.10008.5.1.1.16	Yes		No	
Print Job SOP Class	1.2.840.10008.5.1.1.14	Yes		No	
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Yes		No	

Table 2 - Media Services

Media Storage Application Profile	Write Files (FSC / FSU)	Read Files (FSR)
Compact Disk - Recordable		
STD-GEN-CD	Yes	Yes
AUG-GEN-CD	Yes	Yes
DVD		
AUG-GEN-DVD	Yes	Yes
AUG- GEN-DVD-J2K	Yes	Yes
STD-GEN-DVD	Yes	Yes
STD-GEN-DVD-J2K	Yes	Yes
USB		
AUG- GEN-USB-J2K	Yes	Yes
STD-GEN-USB-J2K	Yes	Yes

Table 3 - Implementation Identifying Information

Name	Value
Application Context Name	1.2.840.100008.3.1.1.1
Implementation Class UID	1.3.12.2.1107.5.12.7
Implementation Version Name	" SIEMENSAWSVE10"

3 Introduction

3.1 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between MAMMOMAT Revelation and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [1].

The Conformance Statement facilitates a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement does not replace validation with other DICOM equipment to ensure proper exchange of intended information. The user should be aware of the following important topics:

- The comparison of conformance statements is the first step towards assessing interconnectivity and interoperability between MAMMOMAT Revelation and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.
- DIN 6862-2:2019 complies to the DICOM Standard

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3.3 Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ASCII	American Standard Code for Information Interchange
DCS	DICOM Conformance Statement
DICOM	Digital Imaging and Communications in Medicine
FSC	File Set Creator
FSR	File Set Reader
FSU	File Set Updater
GSDF	Grayscale Standard Display Function
IOD	DICOM Information Object Definition
ISO	International Standard Organization
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
O	Optional Key Attribute
PDU	DICOM Protocol Data Unit
R	Required Key Attribute
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM Server)
SOP	DICOM Service-Object Pair

SR Structured Report
TFT Thin Film Transistor (Display)
TID Template ID
U Unique Key Attribute
UID Unique Identifier
UTF-8 Unicode Transformation Format-8
VR Value Representation

3.4 References

[1] NEMA PS3 / ISO 12052, Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at http://medical.nema.org/)

[2] Integrating the Healthcare Enterprise – IHE Radiology Technical Framework – http://www.ihe.net

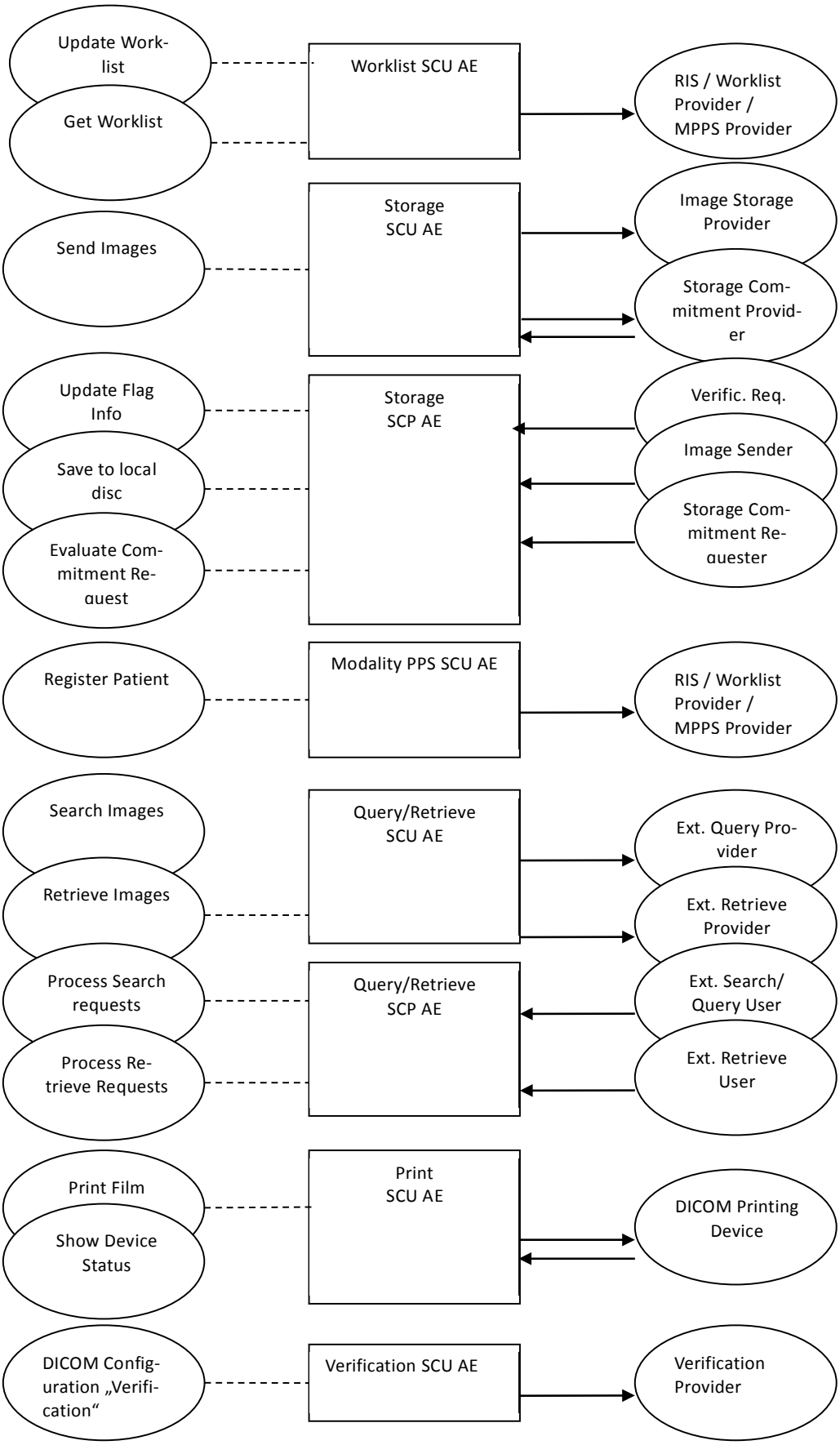
4 Networking

4.1 Implementation Model

- **Verification**
  The MAMMOMAT Revelation DICOM Service Tool application requests Verification to prove the ability of a remote DICOM application to respond to DICOM messages. Responding to Verification requests from remote nodes is handled by the Storage SCP.
- **Workflow**
  The MAMMOMAT Revelation will issue automated “broad” worklist queries and inter-active “narrow” worklist queries as DICOM Modality Worklist SCU. The status of the procedure started and performed is communicated via MPPS, which is also supported in SCU role only. Radiation Dose information is also sent via MPPS.
- **Storage**
  The MAMMOMAT Revelation DICOM implementation can initiate associations for Storage of DICOM Composite Information Objects to Remote AEs and to receive and respond to associations for Storage from Remote AEs.
- **Storage Commitment**
  The MAMMOMAT Revelation DICOM implementation can initiate Storage Commitment requests to Remote AEs and is able to receive and respond to Storage Commitment requests from Remote AEs.
- **Query/Retrieve**
  The MAMMOMAT Revelation DICOM application supports the Query/Retrieve services in a SCP role. Via the user interface, MAMMOMAT Revelation supports Query/Retrieve as SCU to retrieve IODs to the local database.
- **Print**
  The MAMMOMAT Revelation DICOM implementation can initiate associations as Print Management SCU for printing of composed film-sheets with one or more DICOM Print AE.

4.1.1 Application Data Flow

The following figure provides a functional overview of the MAMMOMAT Revelation Application Entities (AE). Relationships are shown between user-invoked activities (to the left of the AEs) and the associated real-world activities provided by DICOM service providers (to the right of the AEs)


Update Work-list
Get Worklist
Worklist SCU AE
RIS / Worklist Provider / MPPS Provider
Send Images
Storage SCU AE
Image Storage Provider
Storage Com-mitment Provid-er
Update Flag Info
Save to local disc
Evaluate Com-mitment Re-quest
Storage SCP AE
Verific. Req.
Image Sender
Storage Com-mitment Re-quester
Register Patient
Modality PPS SCU AE
RIS / Worklist Provider / MPPS Provider
Search Images
Retrieve Images
Query/Retrieve SCU AE
Ext. Query Pro-vider
Ext. Retrieve Provider
Process Search requests
Process Re-trieve Requests
Query/Retrieve SCP AE
Ext. Search/ Query User
Ext. Retrieve User
Print Film
Show Device Status
Print SCU AE
DICOM Printing Device
DICOM Config-uration „Verifi-cation“
Verification SCU AE
Verification Provider

- The Worklist SCU AE runs autonomously for cyclic “broad” query and issues C-FIND Worklist model requests. It can be manually triggered for most recent data. A “broad” query with user input can be triggered separately.
- The MPPS AE uses N-CREATE when registering an Acquisition patient and updates via N-SET with each run. The user can close MPPS interactively (triggers “final N-SET”).
- The MAMMOMAT Revelation DICOM Service Tool application opens an association when a “verification” of a remote application is requested during a configuration session. This can be done when entering new data to configure a remote application or to verify existing configuration data.
- The Storage SCU AE can send Composite SOP Instances and automatically request Storage Commitment for sent SOP Instances, if configured and handles incoming commitment status N-EVENT messages.
- The Storage SCP AE can receive incoming DICOM images and add them to the local database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. The Storage SCP AE autonomously handles incoming Storage Commitment requests in SCP role and checks commitment status based on the local database and sends back the related commitment status in N-EVENT-REPORT messages. The Storage SCP AE supports Composite SOP In-stances as indicated in chapter “DICOM Conformance Statement Overview”
- The Query part of the Query/Retrieve SCU AE uses C-FIND to search a DICOM Database for Patient Study and Series information. The Retrieve part of the Query/Retrieve SCU AE uses C-MOVE to initiate a DICOM transfer of composite objects to the local database.
- The Query/Retrieve SCP AE runs autonomously in the background and responds to incoming C-FIND requests based on the matches in the local database and supports retrieve of supported SOP Instances from the local database to a known retrieve destination.
- The Print SCU AE sends previously compiled, complete (virtual) film-sheets in 1:1 image mode (page mode) to the printer. The printer status is cyclically monitored by sending Status requests and/or awaiting asynchronous events.

4.1.2 Functional Definitions of Application Entities

4.1.2.1 Functional Definition of Worklist SCU AE

The Worklist SCU AE (“broad query”) is invoked from the patient browser user interface or by timer to request the worklist from a remote Information System (Modality Worklist Class SCP). The worklist SCP responses to the C-FIND query and scheduled imaging service requests (scheduled procedure steps) and patient demographic information will be “pulled” from the information system to the MAMMOMAT Revelation modality. All information retrieved will be held in the scheduling database for usage during Patient Registration procedure.

Furthermore, the patient-based Query dialog from the patient browser allows entering specific matching criteria (“narrow query”) for the worklist query. With the response data the Patient Registration dialog can be populated according to the availability within the worklist response identifier.

4.1.2.2 Functional Definition of Modality PPS SCU AE

When registering a Patient (i.e. selecting a Scheduled Procedure Step from Worklist), the MAMMOMAT Revelation DICOM application will create an MPPS Instance and communicate it to the MPPS Manager (SCP). It is configurable to set the states of all related MPPS to “Completed” when a patient is closed. Furthermore, a manual update can be performed with the MPPS user interface. From the user interface it is possible to set the state of the MPPS to “Completed” or “Discontinued”, after which the DICOM application will no longer allow updates on the related MPPS Instance. The MAMMOMAT Revelation will support creation of “unscheduled cases” by allowing MPPS Instances to be created for locally registered Patients.

4.1.2.3 Functional Definition of Storage-SCU AE

The MAMMOMAT Revelation Storage SCU AE is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

With each successfully completed send job, the MAMMOMAT Revelation DICOM application will populate the Storage Commitment Push Model Action Information from the SOP Instances sent, which triggers a Storage Commit Request, if configured. Depending on configuration, the MAMMOMAT Revelation DICOM application will keep the association open for responses with a configurable time-out, or closes the association and expects responses on a different association that has to be established by the remote Storage Commitment SCP.

The commitment status derived from the related trigger response will be indicated in the related Status Flags of the related entity. It is possible to create triggers (“auto rules”) from this event.

The Transaction UIDs of the pending commitment request are kept “open” (Job-status is “waiting”) for a configurable time (default: 1h). If the “open time” for a pending commitment request has elapsed w/o a related response from the provider, the Transaction UID is removed and the related entities are indicated as “commit failed”.

Open Transaction UIDs of pending commitment requests are discarded after a reboot of the system. The related entities are indicated as “commit failed”.

4.1.2.4 Functional Definition of Storage-SCP AE

The Storage SCP component of the MAMMOMAT Revelation DICOM application is operating as background server process. The process starts when the machine is powered on and waits for Storage association requests. Upon accepting an association with a negotiated Presentation Context, it starts to receive the Composite Image Objects and imports them to local database.

The Verification SCP is included in the Storage SCP.

The Storage Commitment SCP is running in background and is ready to receive requests when the system is started. Storage Commitment will be checked and returned against the SOP Classes received and kept in the local Storage of the MAMMOMAT Revelation. The response will either be sent “on same” (association not closed by requester) or “on separate” association (requester closed association consecutive to posi-tive request status).

4.1.2.5 Functional Definition of Query/Retrieve-SCU AE

The MAMMOMAT Revelation DICOM Query/Retrieve SCU requests the remote Query/Retrieve SCP to perform a search and match to the keys specified in the request in order to display the results in the system’s user interface. Depending on user action (Import) the MAMMOMAT Revelation Query/ Retrieve DI-COM SCU sends a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the system’s Storage SCP.

4.1.2.6 Functional Definition of Query/Retrieve-SCP AE

The MAMMOMAT Revelation DICOM Query/Retrieve SCP responds to C-FIND DIMSE services from remote SCU applications. Depending on further remote request, a C-GET or a C-MOVE involves the system’s DICOM Query/Retrieve SCP application to initiate a C-STORE association to send image objects to a remote Storage SCP.

All components of the DICOM Query/Retrieve SCP application are operating as background server processes. The processes start when the machine is powered on and then respond to queries based on the records stored in its database.

4.1.2.7 Functional Definition of Print SCU AE

The Print SCU is invoked by the user interface to setup film-sheet layout and whenever an image is ready to be printed on film. The Print SCU will hold and maintain all data needed to compile a complete film-sheet from the data (images, layout, configuration) received. Whenever a film-sheet is ready to print the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained, in order to intermediately store several film-sheets in case of resource problems on printer. The SCU will only supply and require the mandatory SOP Classes of the Print Management Ser-vice Class.

4.1.2.1 Functional Definition of Verification-SCU AE

The MAMMOMAT Revelation DICOM Service Tool application opens an association when a “verification” of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

4.1.3 Sequencing of Activities

4.1.3.1 Workflow

The “narrow” (interactive) Worklist Query requires that sufficient matching of keys or a unique matching key are/is entered before the query is issued. Only then a single response can be expected to complete the registration dialog.

An MPPS N-CREATE message is sent when a patient is registered.

Closing a patient’s examination triggers sending the MPPS N-SET message and auto transfer of images, if configured. If the IHE profile Mammography Acquisition Workflow is activated, information about rejected or corrected images will be stored and transferred in KOS objects.

4.1.3.2 Verification

Newly entered data must be saved first, before a “verification” of these data is possible.

4.1.3.3 Storage

Prior to sending of SOP Instances the MAMMOMAT Revelation Storage application is capable of invoking postprocessing features.

The Storage Commitment trigger is automatically derived from the successful completion of a Send Job.

4.1.3.4 Query/Retrieve

Retrieve of images is only possible if a result from a previous “Search...” operation exists, and those entities can be selected for “Import”.

The Query application won‘t request information on IMAGE level without user interaction. The user can select a series and request image level information with the “Image List” function.

4.2 Application Entity Specification

This section outlines the specifications for each of the Application Entities that are part of the <product>.

4.2.1 Verification SCU AE Specification

4.2.1.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services” section “Verification”.

4.2.1.2 Association Policy

The MAMMOMAT Revelation DICOM Service Tool application attempts to open an association for verification request whenever the “verification” function is activated during network configuration of a remote DICOM application.

The MAMMOMAT Revelation DICOM Service Tool application initiates one association at a time to request verification

4.2.1.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.1.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – “Verification”

4.2.1.3.1.1 Description and Sequencing of Activities

The Verification SCU C-ECHO request is initiated by Service and Configuration software whenever “Verification” is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO Response from the re-mote application contains a status other than “Success” this will be indicated in the service environment and the association is closed.

4.2.1.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Presentation Contexts as shown in the following table:

Table 4 - Presentation Context Table “Verification”

Presentation Context Table – “Verification”

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

4.2.1.3.1.3 SOP specific Conformance for SOP classes

n.a

4.2.1.4 Association Acceptance Policy

The Verification SCP is part of the Storage SCP.

4.2.2 Storage SCU AE Specification

4.2.2.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services”.

4.2.2.2 Association Policy

The DICOM Storage application will be triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE and, upon successful negotiation of a Presentation Context, the transfer is started.

With a Send Job successfully completed, the DICOM application will generate the Storage Commitment Action Information which references to all Instances of the processed job, if configured. The Commit Re-quest is sent over a single opened association. The MAMMOMAT Revelation will wait for Status responses of the Storage Commitment Request. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a timestamp, is kept. De-pending on configuration, the association is closed or kept open for a configured time range. If the associ-ation is closed immediately, the response is expected on a different association which is the default set-ting. Multiple Storage Commitment Requests can be pending.

The default PDU size used will be 516KB.

The MAMMOMAT Revelation DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in “Configuration / DICOM / General”.

4.2.2.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.2.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.2.3 Association Initiation Policy

If a job with network destination gets active in the job list or a retrieve sub-operation is processed, the MAMMOMAT Revelation DICOM application attempts to initiate a new association for

- DIMSE C-STORE to send images and with successful status and
- N-ACTION DIMSE for the Storage Commitment Push Model Service Class to request commitment.

4.2.2.3.1 Activity – “Send to”

4.2.2.3.1.1 Description and Sequencing of Activities

The C-STORE request is triggered by a job with network destination or the processing of an external C-MOVE retrieve request. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. If the C-STORE Response from the remote application contains a status other than “Success” or “Warning”, the association is aborted.

With success status for the previous transfer, the MAMMOMAT Revelation Storage Application sends the commit request (N-ACTION-RQ) message and waits for acceptance of this request (N-ACTION-RSP). After receiving this, the transaction is marked as “waiting”.

Depending on a configuration value, the association will then be closed or kept open. In the first case, there is another configurable timeout giving the number of hours (h) and minutes (m) (by default 1h:0m) to wait for the corresponding commit response (N-EVENT-REPORT). In the second case, this time is the (also configurable) time-out for the association being kept open. In both cases, if the commit response (N-EVENT-REPORT) does not arrive within the configured time-out, the transaction will be marked as failed.

If the received commit response (N-EVENT-REPORT) has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”. In both cases, a status message is shown to the user.

4.2.2.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Storage SCU Presentation Contexts as shown in the following table:

Table 5 - Presentation Context Table “Send to ...”

Presentation Context Table – “Send to ...”

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role	Ext Neg.
Any image SOP Class detailed in “Table 1: Network Services” section „Transfer Image SOP Class) “.	JPEG Lossy Extended*1 JPEG Lossless, Process 14 (selection value 1) JPEG Lossy Baseline (Process 1) *1 Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endia	1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Any Non-image SOP Class detailed in “Table 1: Network Services” section „Transfer (Non-image SOP Class) “.	Explicit VR Little Endian Explicit VR Big Endian 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
Storage Commitment SOP Class as detailed in “Table 1: Network Services” section “Workflow Management”.	Explicit VR Little Endian Explicit VR Big Endian 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

**1: The Transfer Syntax used is strongly influenced by the fact of “how was the accepted Transfer Syntax at the time when the Instance was received”. E.g. the Instances received with JPEG Lossy Transfer Syntaxes will not be converted and can only be sent out with the same Transfer Syntax. The compression is only supported for images with pixel representation (0028, 0103) equal to 0 (=unsigned).*

Not all the listed transfer syntaxes will be proposed all the time. For some abstract syntax only a list of uncompressed (UC) transfer syntaxes (one or more) will be proposed, for other abstract syntaxes also JPEG Lossless (LL) syntax will be proposed and/or a list of JPEG Lossy (LY) transfer syntaxes. The contents of this lists are configurable.

The compression types JPEG lossy and JPEG lossless are parameters, which are part of the Application Entity Properties configuration (storage checked). It can be reached via the Service-UI: Configuration / DICOM / Network nodes.

Due to local regulatory requirements lossy compression may not be allowed for FFDM images.

4.2.2.3.1.3 SOP specific Conformance for SOP classes

The MAMMOMAT Revelation allows configuration for which images (e.g. MG For Presentation only) should be transferred when (e.g. completed after End Examination) automatically to one or more destinations (e.g. reviewing workstation and archive). Reconstructed Tomosynthesis slices as well as Insight 3Dimages can be either sent in CT or Breast Tomosynthesis format. For association and DIMSE level time-outs, please refer to section Configuration.

4.2.2.3.1.3.1 Optional Attributes

Please refer to the related Image Object definition tables in the Annex (section “Created SOP Instances”) for a list of all DICOM IOD attributes of type 2 and 3, which are encoded by the MAMMOMAT Revelation applications.

4.2.2.3.1.3.2 Specialized Information Object Definitions

The DICOM images sent by the MAMMOMAT Revelation DICOM application are conform to the DICOM IOD definitions (Standard extended IODs). They will contain additional private elements, which must be discarded by a DICOM system when modifying the image. The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes must be removed upon modification.

4.2.2.3.1.3.3 Data Dictionary of applied private IOD Attributes

Please refer to “Standard Extended/Specialized/Private SOP Classes” in the Annex for a list of possible private IOD attributes.

4.2.2.3.1.4 SOP specific Conformance - Request Commitment

Storage Commitment is supported for all the SOP Classes detailed in “Table 1: Network Services”. The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the commitment request (N-ACTION primitive) invoked by the Storage Commitment SCU.

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity – “Update Flag Information”

4.2.2.4.1.1 Description and Sequencing of Activity

After sending a Storage Commitment Request the MAMMOMAT Revelation either waits on the same association or, being configured to receive response on a separate association, closes the association and waits for an association request from the Storage Commitment SCP that wants to send the results.

Any incoming Notification will be checked for validity, that is, if the related Transaction UID is still part of the Pending Request Queue.

If the Notification is valid the related Instances are marked with the reported status. The over-all Commit Status of the higher Information Entities in the MAMMOMAT Revelation database is derived from propagation of the States of all sub-ordinate Image entities included in a study.

The Status Flags directly affected by Storage Commitment results and indicated in the different entities of the Patient Browser list can be one of

- “AC” or “SC” - Successful Commitment, “A” means archived to configured Archive destination, whereas “S” means sent to any other destination.
- “Af” of “Sf” - Commitment failed.
- “A?” or “S?” - Commitment request is sent, response is pending.

In case of failure the user must repeat the transfer of images to the Archive destination. Another Storage Commitment will be performed after sending is completed successfully.

4.2.2.4.1.2 Accepted Presentation Context

The MAMMOMAT Revelation DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 6 - Presentation Context Table “Update Flag Information”

Presentation Context Table – “Update Flag Information”

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role	Ext Neg.
1.2.840.10008.1.20.1 Storage Commitment Push Model	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.2.4.1.3 SOP specific Conformance

If the Commitment response (N-EVENT-REPORT) received has the status of “complete - failure exists”, the transaction is marked as failed, else the transaction is marked as “completed”. In both cases, a message is shown to the user.

The related status flags are set for the committed images in the local database.

The MAMMOMAT Revelation DICOM application will not support the Storage Media File Set ID attributes.

4.2.3 Storage SCP AE Specification

4.2.3.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services”.

4.2.3.2 Association Policy

The MAMMOMAT Revelation DICOM application will accept any number of verification or storage SOP classes that are referred to above. There is no limit on the number of presentation contexts accepted except for the DICOM limit. If the Siemens Healthineers DICOM application runs out of resources, it will reject the association request.

If “trusted host functionality” is enabled, MAMMOMAT Revelation will only accept

Associations from known hosts with a known AET. Hosts and AETs must be entered in “Local Service” by a Siemens Healthineers CSE.

The default PDU size used will be 516KB.

The Siemens Healthineers MAMMOMAT Revelation DICOM application accepts one association at a time.

4.2.3.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.3.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.3.3 Association Initiation Policy

If the result from a previously accepted Storage Commitment request is evaluated, the MAMMOMAT Revelation DICOM application attempts to initiate a new association for

- DIMSE N-EVENT-REPORT for sending commitment result from a previous request.

4.2.3.3.1 Activity – “Return Commitment Result”

4.2.3.3.1.1 Description and Sequencing of Activity

When MAMMOMAT Revelation Storage SCP AE received a Storage Commitment request it tries to send the response back on the same association. When the association is not open anymore it will initiate an-other association to send the Storage Commitment response (N-EVENT-REPORT) to the SCU.

4.2.3.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Storage SCP Presentation Contexts for returning Storage Commitment results as shown in the following table:

Table 7 - Presentation Context Table "Return Commitment Result"

Presentation Context Table – "Return Commitment Result"

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role	Ext Neg.
Storage Commitment Push Model SOP Class as detailed in "Table 1: Network Services" section "Workflow Management".	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.2.3.3.1.3 SOP specific Conformance for SOP classes

Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage SCP.

4.2.3.4 Association Acceptance Policy

The MAMMOMAT Revelation DICOM application attempts to accept a new association for

- DIMSE C-ECHO for incoming Verification requests
- DIMSE C-STORE for external image senders request storage of instances
- DIMSE N-ACTION for external systems requesting Storage Commitment
- DIMSE N-EVENT-REPORT for receiving commitment result from a previous request

4.2.3.4.1 Activity – "Save to local disk"

4.2.3.4.1.1 Description and Sequencing of Activities

The MAMMOMAT Revelation DICOM application will accept an association and will receive

SOP Instances according to the listed presentation contexts on that association and will store the images to the local hard disk if the conformance check is performed successfully.

Upon successfully receiving a C-STORE-RQ, the MAMMOMAT Revelation DICOM receiver performs a plausibility test on the received image and available system resources. If this test succeeds, it returns the Status SUCCESS, otherwise one of the following status codes is returned and the association is aborted:

Table 8 - Status codes "Save to local disk"

Code	Meaning
A700	Refused: This error status indicates a lack of Resources (e.g. not enough disk space) on the MAMMOMAT Revelation modality.
A900	Invalid Dataset: An error occurred while processing the image, which makes it impossible to proceed. The image will not be stored, and the association is aborted.
0110	Processing Error: An error occurred while processing the image, which makes it impossible to proceed. Association is aborted.

Note: The image will be saved after sending the response. If during this operation an error occurs, the association will be aborted. This implies that a C-STORE-RSP with status SUCCESS does not mean that the image was successfully stored into the database.

4.2.3.4.1.2 Accepted Presentation Contexts

The MAMMOMAT Revelation DICOM application will accept Presentation Contexts as shown in the following table:

Table 9 - Presentation Context Table “Save to local disk”

Presentation Context Table – “Save to local disk”

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role	Ext Neg.
Any image SOP Class detailed in “Table 1: Network Services” section „Transfer (Image SOP Class) “.	JPEG Lossy Extended	1.2.840.10008.1.2.4.51		
	JPEG Lossless, Process 14 (selection value 1)	1.2.840.10008.1.2.4.70		
	JPEG Lossy Baseline (Process 1)	1.2.840.10008.1.2.4.50		
	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None
Any non-image SOP Class detailed in “Table 1: Network Services” section „Transfer (Non-image SOP Class) “.	Explicit VR Little Endian	1.2.840.10008.1.2.1		
	Explicit VR Big Endian	1.2.840.10008.1.2.2		
	Implicit VR Little Endian	1.2.840.10008.1.2	SCP	None

4.2.3.4.1.3 SOP specific Conformance for SOP classes

The MAMMOMAT Revelation application conforms to the Full Storage Service Class at Level 2.

Any Explicit VR Transfer Syntax is preferred to be used by the Storage SCU when sending Composite Image Instances to the MAMMOMAT Revelation DICOM application.

If an image instance is received that is identified by a SOP Instance UID which is already used by an Instance stored in database, then the actual received image will be discarded. The existing Instance is not superseded.

The order of preference in accepting Transfer Syntaxes within Presentation Contexts or Presentation Contexts with single Transfer Syntaxes is:

Table 10 - Order of Preference Transfer Syntax

Order	DICOM Transfer Syntax
1	JPEG Lossy Extended
2	JPEG Lossless Non-hierarchical
3	JPEG Lossy Baseline
4	RLE Lossless
5	Explicit VR Little Endian
6	Implicit VR Little Endian

MAMMOMAT Revelation DICOM application will decompress the image before storing it into the database, if configured and images are not received with JPEG Lossy Transfer Syntaxes.

The following sections will differentiate the attribute contents required for Image Viewing. The MAMMOMAT Revelation DICOM application supports more formats for Storage of Images than for Viewing.

4.2.3.4.1.3.1 Image Pixel Attribute Acceptance Criterion for Grayscale Images - Viewing

The MAMMOMAT Revelation Multi-Modality Viewing application accepts the MONOCHROME1 and MONOCHROME2 photometric interpretation pixel format and graphic overlay with unsigned integer and 8 or 16 bits allocated. Accepted values:

Pixel plane

- (0028, 0002) Samples Per Pixel 1
- (0028,0004) Photometric Interpretation "MONOCHROME1"
- (0028,0004) Photometric Interpretation "MONOCHROME2"
- (0028, 0103) Pixel Representation 0
- (0028, 0100) Bits Allocated 8, 16
- (0028,0101) Bits Stored 8, 10, 12, 14, 15, 16
- (0028,0102) High Bit 7, 9, 11

Only aspect ratio 1:1 is supported

Overlay plane "embedded"

- (60xx, 0040) Overlay Type "G"
- (60xx, 0100) Bits Allocated 16
- (60xx, 0102) Bit Position 12, 13, 14, 15

Graphic Overlay will be shifted to fill Overlay Planes from Bit 12 and consecutive.

Overlay plane "explicit"

- (60xx, 0040) Overlay Type "G"
- (60xx, 0100) Bits Allocated 1
- (60xx, 0102) Bit Position 0
- (60xx, 3000) Overlay Data supported

The MAMMOMAT Revelation Multi-Modality Viewing application accepts also the MONOCHROME1 and MONOCHROME2 photometric interpretation pixel format with binary 2's complement integer and 16 bits allocated. Accepted values:

Pixel plane

- (0028, 0002) Samples Per Pixel 1
- (0028,0004) Photometric Interpretation "MONOCHROME1"
- (0028,0004) Photometric Interpretation "MONOCHROME2"
- (0028, 0103) Pixel Representation 1 (signed)
- (0028, 0100) Bits Allocated 16
- (0028,0101) Bits Stored 16
- (0028,0102) High Bit 15

Only aspect ratio 1:1 is supported

Overlay plane

- (60xx, 0040) Overlay Type "G"
- (60xx, 0100) Bits Allocated 1
- (60xx, 0102) Bit Position 0
- (60xx, 3000) Overlay Data supported

For Modality LUT, both the linear LUT (Rescale Slope/Intercept) and the MOD LUT SQ are supported and considered when pixel data is displayed. However, there are two limitations. The Modality LUT Sequence will be ignored in the following cases:

- 8-Bit signed pixels
- the pixel format is changed by the MOD LUT (e.g. 8bit -> 16bit)

If the MOD LUT SQ contains multiple LUTs, then only the first one is used.

For VOI LUT, both the linear LUT (Window Center/Width) and the VOI LUT SQ are supported (VOI LUT SQ with 8 or 16-bit LUT data)

But if both, a VOI LUT SQ and a linear MOD LUT, are specified within one image, then the value for Rescale Slope is restricted to 1.

If the VOI LUT SQ contains multiple LUTs, then only the first one is used by default. The other VOI LUTs are selectable.

Only Rectangular and Circular Shutter Shape is supported in this version. Images containing other Shutter Shapes will be displayed w/o shutter.

4.2.3.4.1.3.2 Image Pixel Attribute Acceptance Criterion for Color Images - Viewing

The MAMMOMAT Revelation Multi-Modality Viewing application supports the RGB color image description with the unsigned integer 24-bit color image plane pixel format. Accepted values:

- (0028, 0002) Samples Per Pixel 3
- (0028,0004) Photometric Interpretation "RGB"
- (0028, 0103) Pixel Representation 0
- (0028, 0100) Bits Allocated 8
- (0028,0101) Bits Stored 8
- (0028,0102) High Bit 7
- (0028,0006) Planar Configuration 0 (pixel interleave)
  1 (plane interleave).

The MAMMOMAT Revelation Multi-modality Viewing application supports the "Palette Color" color image description with the unsigned integer and 2's complement pixel format. Accepted values:

- (0028, 0002) Samples Per Pixel 1
- (0028,0004) Photometric Interpretation "PALETTE COLOR"
- (0028, 0103) Pixel Representation 0
- (0028, 0100) Bits Allocated 8, 16
- (0028,0101) Bits Stored 8, 16
- (0028,0102) High Bit 7, 15

Both 8-bit and 16-bit palettes are supported, but NO Segmented Palette Color LUTs.

The MAMMOMAT Revelation Multi-modality Viewing application supports the YBR color image description with the unsigned integer pixel format. Accepted values:

- (0028, 0002) Samples Per Pixel 3
- (0028,0004) Photometric Interpretation "YBR_FULL" or
  "YBR_FULL_422"
- (0028, 0103) Pixel Representation 0
- (0028, 0100) Bits Allocated 8
- (0028,0101) Bits Stored 8
- (0028,0102) High Bit 7

If MAMMOMAT Revelation software is making any persistent changes on an YBR image, the resulting new image will be saved with Photometric Interpretation = "RGB".

4.2.3.4.2 Activity – Evaluate Commit Request

4.2.3.4.2.1 Description and Sequencing of Activity

When receiving a Storage Commitment request the MAMMOMAT Revelation DICOM application will perform the necessary steps to check the received list Instances against the local database.

4.2.3.4.2.2 Accepted Presentation Context

The MAMMOMAT Revelation DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 11 - Presentation Context Table “Evaluate Commit Request”

Presentation Context Table – “Evaluate Commit Request”

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role	Ext Neg.
Storage Commitment Push SOP Class detailed in “Table 1: Network Services” section “Workflow Management”.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCP	None

4.2.3.4.2.3 SOP specific Conformance

The MAMMOMAT Revelation Storage SCP AE will return success for images that are stored in the local database and failure for images that are not. However, the committed images can later be deleted by the user at the MAMMOMAT Revelation without notice.

Note: Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage Commitment SCP.

4.2.4 Query/Retrieve SCU AE Specification

4.2.4.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services”.

4.2.4.2 Association Policy

With the “Search...” function the query keys can be entered and the DICOM Query/Retrieve application is initiated. An initial query request will be sent out to one remote node that can be selected from a list of configured Query Providers. Depending on the replies to the initial request, sub-sequent query requests are issued to gather further data for lower information level entities. The results compiled from the re-sponse data will be displayed to the user. Upon request (Import), the retrieval of selected items is initiat-ed.

The default PDU size used will be 516KB.

The MAMMOMAT Revelation DICOM application initiates several associations at a time.

For Query it initiates a new association to the remote node and issues the C-FIND request to retrieve all the requested patient and study information matching the search criteria. The MAMMOMAT Revelation initiates in parallel a second association to the destination node to query for all the series information for each study’s information returned on the first association.

For the Retrieve request (C-MOVE) only one association is initiated per destination.

4.2.4.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.4.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.4.3 Association Initiation Policy

The MAMMOMAT Revelation DICOM application will request associations for the following DIMSE-C operations as SCU:

Table 12 - Supported DIMSE-C Operations - Query/Retrieve SCU

Supported DIMSE operations	Cancel Request supported
C-FIND	yes
C-MOVE	n. a.

Extended negotiation (relational query) is not supported for the above listed services.

4.2.4.3.1 Activity – “Search for images (Search...)”

4.2.4.3.1.1 Description and Sequencing of Activities

The associated activity is to fill out a query form with search data and pass it as query to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. If needed, further associations are opened for querying data from sub-sequent entities. When data transfer is finished, each association is closed.

If the C-FIND Response from the remote application contains an error status, the association is aborted.

4.2.4.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Presentation Contexts as shown in the following table:

Table 13 - Presentation Context Table “Search...”

Presentation Context Table - “Search...”

Abstract Syntax Name	UID	Transfer Syntax Name List	UID List	Role	Ext. Neg.
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endia	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Patient/Study Only Query/ Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Within the DICOM network configuration it is configurable which of the query models are to be used by the MAMMOMAT Revelation DICOM Query SCU application for each node.

4.2.4.3.1.3 SOP Specific Conformance

The MAMMOMAT Revelation DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The interactive querying of attributes on IMAGE level is not supported by the Query SCU; hence retrieval of individual Objects is possible. The following table describes the search keys for the different query models that the SCU supports. Matching is either wildcard, which means that the user can supply a string containing wildcards, or universal, which means that the attribute is requested as return value.

Table 14 - C-FIND RQ Search Keys

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Patient Level [a]					
Patient Name	(0010,0010)	R	Wildcard [b]	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard [b]	Enter value	yes
Patient's Birth Date	(0010,0030)	O	Single value	Enter value	yes
Patient's Sex	(0010,0040)	O	Single value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal (Null)	--	yes
Number of Patient related Series	(0020,1202)	O	Universal (Null)	--	no
Number of Patient related Instances	(0020,1204)	O	Universal (Null)	--	no
Study Level					
Patient Name [d]	(0010,0010)	R	Wildcard [b]	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard [b]	Enter value	yes
Patient's Birth Date	(0010,0030)	O	Single value	Enter value	yes
Patient's Sex [d]	(0010,0040)	O	Single value	Enter value	yes
Study Instance UID	(0020,000D)	U	Single value	Enter value	yes
Study ID	(0020,0010)	R	Wildcard [b]	Enter value	yes
Study Date	(0008,0020)	R	Range	Enter value	yes
Study Time	(0008,0030)	R	Range	Enter value	yes
Accession Number	(0008,0050)	R	Wildcard	Enter value	yes
Study Description	(0008,1030)	O	Wildcard [b]	Enter value	yes
Referring Physician's Name	(0008,0090)	O	Wildcard [b]	Enter value	yes
Name of Physician Reading Study	(0008,1060)	O	Wildcard [b]	Enter value	yes
Modalities in Study	(0008,0061)	O	Single Value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal (Null)	--	no
Number of Patient related Series	(0020,1202)	O	Universal (Null)	--	no
Number of Patient related Instances	(0020,1204)	O	Universal (Null)	--	no

[a] *Patient Root Information Model only*
[b] *Always a "*" is appended to the user-supplied string*
[c] *Implicitly visualized in the UI if no study and series search attributes have been entered*
[d] *Study Root Information Model only*
[e] *Implicitly if no series search attributes have been entered*

Attribute Name	Tag	Type	Matching	User Input	Return Value Display	
Number of Study related Series	(0020,1206)	O	Universal (Null)	--	yes	
Number of Study related Instances	(0020,1208)	O	Universal (Null)	--	no	
Series Level						
Series Instance UID	(0020,000E)	U	Single Value	Enter value	yes	
Series Number	(0020,0011)	R	Single Value	Enter value	yes	
Modality	(0008,0060)	R	Single Value	Enter value	yes	
Series Date	(0008,0021)	O	Universal (Null)	--	yes	
Series Time	(0008,0031)	O	Universal (Null)	--	yes	
Series Description	(0008,103E)	O	Wildcard [b]	Enter value	yes	
Body Part Examined	(0018,0015)	O	Single Value	Enter value	yes	
Performing Physician's Name	(0008,1050)	O	Wildcard [b]	Enter value	yes	
Request Attributes Sequence	(0040,0275)	O	--	--	yes	
>Requested Procedure ID	(0040,1001)	O	Wildcard [b]	Enter value	yes	
>Scheduled Procedure Step ID	(0040,0009)	O	Wildcard [b]	Enter value	yes	
Performed Procedure Step Start Date	(0040,0244)	O	Range	Enter value	yes	
Performed Procedure Step Start Time	(0040,0245)	O	Range	Enter value	yes	
Number of Series related Instances	(0020,1209)	O	Universal (Null)	--	yes	
Instance Availability	(0008,0056)	O	Universal (Null)			
Image Level						
SOP Instance UID	(0008,0018)	U	Single Value	--	no	
Instance Number	(0020,0013)	R	Universal (Null)	--	yes	
SOP Class UID	(0008,0016)	O	Universal (Null)	--	no	
Image Comments	(0020,4000)	O	Universal (Null)	--	yes	
Number of Frames	(0028,0008)	O	Universal (Null)	--	yes	
Content Date	(0008,0023)	O	Universal (Null)	--	yes	
Content Time	(0008,0033)	O	Universal (Null)	--	yes	

U = Unique Key, **R** = Required Key, **O** = Optional Key, **-** = not supported or applicable

[a] *Patient Root Information Model only*
[b] *Always a "*" is appended to the user-supplied string*
[c] *Implicitly visualized in the UI if no study and series search attributes have been entered*
[d] *Study Root Information Model only*
[e] *Implicitly if no series search attributes have been entered*

The MAMMOMAT Revelation Search application supports a
- DIMSE C-FIND-CANCEL

If the user wishes to cancel a running Query request via the MAMMOMAT Revelation user interface (“Cancel” button while a “Search...” is active).

The Find SCU interprets following status codes:

Table 15 - Status Codes “Search...”

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.4.3.2 Activity – Retrieve Images (Import...)

4.2.4.3.2.1 Description and Sequencing of Activity

When selecting a data entry in the Query UI and activating the "Import" function, a retrieval request is passed to the MAMMOMAT Revelation DICOM application which issues a C-MOVE service according to the Patient Root or Study Root query model. (The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by processing the C-MOVE service.)

The received image data is processed as described in the Storage class SCP descriptions.

The MAMMOMAT Revelation DICOM application will always insert the own Storage SCP AE as "Move Destination".

4.2.4.3.2.2 Proposed Presentation Contexts

The MAMMOMAT Revelation Server DICOM application will propose Presentation Contexts as shown in the following table:

Table 16 - Presentation Context Table "Import..."

Presentation Context Table

Abstract Syntax Name	UID	Transfer Syntax Name List	UID List	Role	Ext. Neg.
Query/Retrieve Model Patient Root – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Study Root – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Patient/ Study Only – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Note: C-MOVE Extended Negotiation will not be supported by the SCU.

4.2.4.3.2.3 SOP Specific Conformance

All required keys will be provided in the retrieve request identifier, as defined in DICOM Standard. The Move SCU interprets following status codes:

Table 17 - C-MOVE RSP Status Codes

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	Move destination unknown	A801	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.5 Query/Retrieve SCP AE Specification

4.2.5.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services” .

4.2.5.2 Association Policy

When “trusted host” functionality is enabled MAMMOMAT Revelation will only accept Associations from known hosts with a known AET. Hosts and AETs must be entered in “Local Service” by a Siemens Healthineers CSE.

The default PDU size used will be 516KB.

The Siemens Healthineers MAMMOMAT Revelation DICOM application can accept and handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in “Configuration / DICOM / General”.

4.2.5.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.5.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.5.3 Association Initiation Policy

See previous section “Query/Retrieve SCU AE Specification”.

The MAMMOMAT Revelation DICOM application will accept associations for the following DIMSE-C operations as SCP:

- C-FIND
- C-GET
- C-MOVE
- C-FIND-CANCEL
- C-GET-CANCEL
- C-MOVE-CANCEL

Extended negotiation - which is relational query or retrieve - is not supported for the above listed services. The MAMMOMAT Revelation DICOM application does support multiple C-FIND requests over the same association, while multiple C-MOVE or C-GET operations are not supported over the same association.

4.2.5.4 Association Acceptance Policy

4.2.5.4.1 Activity – "Process Search Requests"

4.2.5.4.1.1 Description and Sequencing of Activities

The Query SCP AE will respond to incoming query requests from a SCU with the query model Patient Root, Study Root and Patient/Study Only. Relational retrieve operation is not supported. The content records of the local database are used to match the incoming query keys and fill the related return keys. With a C-FIND-CANCEL request the running query can be canceled at any time.

Multiple C-FIND requests over the same association are supported.

4.2.5.4.1.2 Accepted Presentation Contexts

The MAMMOMAT Revelation DICOM application will accept Presentation Contexts as shown in the following table:

Table 18 - Presentation Context Table "Process Search Requests"

Presentation Context Table

Abstract Syntax Name	UID	Transfer Syntax Name List	UID List	Role	Ext. Neg.
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endia	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient/Study Only Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Note: C-FIND Extended Negotiation will not be supported.

The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

4.2.5.4.1.3 SOP specific Conformance for SOP classes

The MAMMOMAT Revelation DICOM Query/Retrieve SCP supports hierarchical queries for all mandatory and optional search keys.

The syntactical component structure of the attribute (0010,0010) Patients Name is defined as follows (see [DICOM], Part 5, Definition of PN, Person Name):

<single byte group> =<ideographic group>=<phonetic group>

The Query/Retrieve SCP replies to queries for "Patient Name" as follows:

1. Matching of Patients Name attribute (0010, 0010) is done case insensitive.
2. If a search string matches the complete value of a Patient's Name in the database, a match will be returned.
3. If a search string matches an individual group (single byte, ideographic or phonetic) of a Patient's Name in the database, a match will be returned.
4. If a search string matches two consecutive groups of a data base object's Patients Name, a match will be returned.

5. Redundant group separators “=” or component separators “^” are treated as insignificant for matching.
6. Leading and trailing blanks within a component or a group of Patient’s Name are treated as insignificant for matching.

Except for attribute Patient’s Name (0010,0010) any queries for text string attributes will be treated case sensitive.

The Find SCP will not differentiate “?” and “*”, thus “?abc*” will be treated as “*abc*”.

If the value for the patient-level unique key “Patient ID” is not known, it will be returned with zero length. The attribute “Image Comments” will not be included in the C-FIND-RSP, if it is not set in the DB, even if it was requested as return key in the related C-FIND-RQ.

Usage of Storage Media File-Set ID, Retrieve AE Title with C-FIND-RSP message:

- The Storage Media File-Set ID - if available - can be returned at Study/Series/Image Level. Only on Image Level, the values of ONLINE, NEARLINE or OFFLINE are returned to indicate the Storage Location of the related Instance.
- The Retrieve AE Title - if available - can only be returned at Image Level (for Patient Root and Study Root models) or Study Level (for Patient/Study Only model).

Relational Queries are not supported.

A remote DICOM AE can cancel the running query by sending a C-FIND-CANCEL. Matches are possibly continuing (more C-FIND response with status PENDING) until the cancel operation takes effect and query matching has completed.

The supported attributes on the various query levels of the three supported information models are listed in the following table.

Table 19 - Query/Retrieve SCP supported attributes

Attribute Name	Tag	PR	SR	PSo	Matching
Patient Level (PR or PSo) or Study Level (SR)					
Patient Name	(0010,0010)	R	R	R	Single value, Wildcard, universal
Patient ID	(0010,0020)	U	R	U	Single Value, Wildcard, universal
Patient’s Birth Date	(0010,0030)	O	O	O	Single Value, Range, universal
Patient’s Birth Time	(0010,0032)	O	O	O	Single Value, Range, universal
Patient’s Sex	(0010,0040)	O	O	O	Single Value, Wildcard, universal
Ethnic Group	(0010,2160)	O	-	O	Single Value, Wildcard, universal
Patient Comments	(0010,4000)	O	O	O	Wildcard, universal
Number of Patient related Studies	(0020,1200)	O	O	O	universal
Number of Patient related Series	(0020,1202)	O	O	O	universal
Number of Patient related Instances	(0020,1204)	O	O	O	universal
Study Level					
Study Instance UID	(0020,000D)	U	U	U	Single Value, List of UIDs
Study ID	(0020,0010)	R	R	R	Single Value, Wildcard, universal
Study Date	(0008,0020)	R	R	R	Single Value, Range, universal
Study Time	(0008,0030)	R	R	R	Single Value, Range, universal
Accession Number	(0008,0050)	R	R	R	Single Value, Wildcard, universal

Attribute Name	Tag	PR	SR	PSo	Matching
Referring Physician's Name	(0008,0090)	O	O	O	Single Value, Wildcard, universal
Study Description	(0008,1030)	O	O	O	Single Value, Wildcard, universal
Admitting Diagnosis Descrip-ion	(0008,1080)	O	O	O	Single Value, Wildcard, universal
Patient's Age	(0010,1010)	O	O	O	Single Value, Wildcard, universal
Patient's Size	(0010,1020)	O	O	O	Single Value, universal
Patient's Weight	(0010,1030)	O	O	O	Single Value, universal
Occupation	(0010,2180)	O	O	O	Single Value, Wildcard, universal
Additional Patient History	(0010,21B0)	O	O	O	Wildcard, universal
Name of Physician reading the Study	(0008,1060)	O	O	O	Single Value, Wildcard, universal
Modalities in Study	(0008,0061)	O	O	O	Multiple values, universal
Number of Study Related Series	(0020,1206)	O	O	O	universal
Number of Study Related Instances	(0020,1208)	O	O	O	universal
Series Level					
Series Instance UID	(0020,000E)	U	U	-	Single Value, List of UIDs
Series Number	(0020,0011)	R	R	-	Single Value, universal
Modality	(0008,0060)	R	R	-	Single Value, Wildcard, universal
Body Part Examined	(0018,0015)	O	O	-	Single Value, Wildcard, universal
Patient Position	(0018,5100)	O	O	-	Single Value, Wildcard, universal
Smallest Pixel Value in Series	(0028,0108)	O	O	-	Single Value, universal
Largest Pixel Value in Series	(0028,0109)	O	O	-	Single Value, universal
Protocol Name	(0018,1030)	O	O	-	Single Value, Wildcard, universal
Series Date	(0008,0021)	O	O	-	Single Value, Range, universal
Series Time	(0008,0031)	O	O	-	Single Value, Range, universal
Series Description	(0008,103E)	O	O	-	Single Value, Wildcard, universal
Operator's Name	(0008,1070)	O	O	-	Single Value, Wildcard, universal
Performing Physician's name	(0008,1050)	O	O	-	Single Value, Wildcard, universal
Performed Procedure Step Start Date	(0040,0244)	O	O	-	universal
Performed Procedure Step Start Time	(0040,0245)	O	O	-	universal
Number of Series related Instances	(0020,1209)	O	O	-	universal
Image or SR Document Level					
SOP Instance UID	(0008,0018)	U	U	-	Single Value, List of UIDs
Image Number	(0020,0013)	R	R	-	Single Value, universal
Content Date	(0008,0023)	O	O	-	Single Value, Range, universal

Attribute Name	Tag	PR	SR	PSo	Matching
Content Time	(0008,0033)	O	O	-	Single Value, Range, universal
Modality	(0008,0060)	O	O	-	Single Value, Wildcard, universal
Image Comments	(0020,4000)	O	O	-	universal
Referenced Request Sequence	(0040,A370)	O	O	-	Sequence matching
>Accession Number	((0008,0050)	O	O	-	Single value, universal
>Requested Procedure ID	(0040,1000)	O	O	-	Single value, universal
Concept Name Code Sequence	(0040,A043)	O	O	-	Sequence matching
>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, universal
>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, universal
>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, universal
>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, universal
Template Identifier	(0040,DB00)	O	O	-	Single Value, Wildcard, universal
Completion Flag	(0040,A491)	O	O	-	Single Value, Wildcard, universal
Verification Flag	(0040,A493)	O	O	-	Single Value, Wildcard, universal
Verifying Observer Sequence	(0040,A073)	O	O	-	Sequence matching
>Verifying Organization	(0040,A027)	O	O	-	Single Value, Wildcard, universal
>Verifying Date Time	(0040,A030)	O	O	-	Single Value, Range,
universal					
>Verifying Observer Name	(0040,A075)	O	O	-	Single Value, Wildcard, universal
>Verifying Observer Identification Code Sequence	(0040,A088)	O	O	-	Sequence matching
>>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, universal
>>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, universal
>>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, universal
>>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, universal

PR = Patient Root Model, SR = Study Root Model, PSo = Patient/Study Only Model
U = Unique Key, R = Required Key, O = Optional Key, - = not supported or applicable

The “Process Search Requests” activity can return the following status codes:

Table 20 - Status Codes Process Search Request

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)

Service Status	Meaning	Error Codes	Related Fields
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.5.4.2 Activity – "Process Retrieve Requests"

4.2.5.4.2.1 Description and Sequencing of Activity

The associated activity is to respond to retrieve requests initiated from a foreign SCU. Relational retrieve operation is not supported.

Multiple C-GET or C-MOVE requests over the same association are not supported.

4.2.5.4.2.2 Accepted Presentation Contexts

The MAMMOMAT Revelation DICOM application will accept Presentation Contexts as shown in the following table:

Table 21 - Presentation Context Table "Process Retrieve Requests"

Presentation Context Table

Abstract Syntax Name	UID	Transfer Syntax Name List	UID List	Role	Ext. Neg.
Patient Root Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient/Study Only Query/ Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.3.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient/Study Only Query/ Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Note: C-FIND Extended Negotiation will not be supported.

The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

4.2.5.4.2.3 SOP Specific Conformance

Relational retrieve operation is not supported.

All unique keys must be supplied according to the selected Query/Retrieve Level. The related tables in the C-FIND SCP section will give information about key attributes marked “U”.

The C-STORE can only be performed to AEs that are configured in the system.

The “Process Retrieve Requests” activity can return the following status codes:

Table 22 - Status Codes “Process Retrieve Requests”

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.6 Print SCU AE Specification

4.2.6.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services”.

4.2.6.2 Association Policy

Whenever a film-sheet is completely set up and printed by command or automated rule, the job is prepared for processing. As soon as the queue is ready to process the job, it is activated and executed according to the processing data. The Print application will initiate an association to the print destination and process the printing.

The default PDU size used will be 516KB.

The MAMMOMAT Revelation DICOM application initiates one association at a time for each different print device configured.

4.2.6.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM print application does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.6.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.6.3 Association Initiation Policy

Triggered by the Print job queue the Print Management SCU establishes an association by using the DICOM association services. An N-GET request determines the printer status prior to printing. If the printer status is “normal”, the print job is started.

After the last film sheet from the queue has been printed, the Print application will leave the association for open for another 60 seconds. If a new film job is ready for printing within this time limit, the job will be immediately processed. If there is no new job, the association is closed.

If there is no new job, the association is closed.

During the “idle-time” (no open association to printer) the Print application will issue a cyclic camera status request (using N-GET of the Printer SOP Class) every 5 minutes.

4.2.6.3.1 Activity – “Print Film”

4.2.6.3.1.1 Description and Sequencing of Activities

The film sheet is internally processed, converted to a Standard/1-1 page and then the page image is sent. Status is controlled by awaiting any N-EVENT message through the transfer until the last image or film-sheet is sent.

If the response from the remote application contains a status other than Success or Warning the association is aborted.

4.2.6.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Presentation Contexts as shown in the following table:

Table 23 - Presentation Context Table "Print Film"

Presentation Context Table

Abstract Syntax Name	UID	Transfer Syntax Name List	UID List	Role	Ext. Neg.
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	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	SCU	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	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	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	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	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	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	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	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	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	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	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	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	SCU	None

4.2.6.3.1.3 SOP specific Conformance for SOP classes

The MAMMOMAT Revelation DICOM print management SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class.

The application uses a setting platform to define the properties of the connected DICOM SCP, e.g.:

- maximum number of print jobs in the queue
- maximum number of print copies
- supported film sizes of the connected DICOM SCP
- supported film formats of the DICOM SCP
- lookup table definition.

The printing is only suspended in the case of a failure return status of the SCP.

4.2.6.3.1.4 Basic Film Session SOP Class

The Basic Film Session information object definition describes all the user-defined parameters, which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes that are printed on one hardcopy printer.

The MAMMOMAT Revelation DICOM print management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE
- N-DELETE

The Basic Film Session SOP Class N-CREATE-RQ (SCU) uses the following attributes:

Table 24 - Basic Film Session N-CREATE attributes

Attribute Name	Tag	Usage SCU	Supported Values
Number of Copies	(2000,0010)	U	"1"
Medium Type	(2000,0030)	U	BLUE FILM CLEAR FILM PAPER
Film Destination	(2000,0040)	U	MAGAZINE PROCESSOR

U = User Option

The number of copies sent to the DICOM Printer is always 1, the job is sent n times for n copies.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Session – see below:

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) ➔ (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Session

The N-DELETE-RQ on the Basic Film Session SOP Class is used to remove the complete Basic Film Session SOP Instance hierarchy.

The Basic Film Session SOP Class interprets the following status codes (from N-CREATE-RSP, N-DELETE-RSP messages):

Table 25 - Basic Film Session Status Codes

Service Status	Meaning	Error Codes
Failure	Film session SOP instances hierarchy does not contain film box SOP instances	C600
	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Memory allocation not supported	B600
	Film session printing is not supported	B601
	Film box does not contain image box (empty page)	B602
Success	Film belonging to the film session are accepted for printing	0000

4.2.6.3.1.5 Basic Film Box SOP Class

The Basic Film Box information object definition describes all the user-defined parameter of one film of the film session. The Basic Film Box information description defines the presentation parameters, which are common for all images on a given sheet of film.

The Basic Film Box refers to one or more Image Boxes.

Supported Service Elements as SCU are:

- N-CREATE
- N-ACTION
- N-DELETE

The Basic Film Box SOP Class N-CREATE-RQ message uses the following attributes (the actual values for each attribute depend on DICOM printer configuration within the MAMMOMAT Revelation DICOM Print management SCU):

Table 26 - Basic Film Box N-CREATE attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	M	n. a.
> Referenced SOP Class UID	(0008,1150)	M	1.2.840.10008.5.1.1.1
> Referenced SOP Instance UID	(0008,1155)	M	UID
Film Orientation	(2010,0040)	M	PORTRAIT
Film Size ID	(2010,0050)	M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM
Magnification Type	(2010,0060)	M	BILINEAR, CUBIC, NONE, REPLICATE
Max Density	(2010,0130)	U	> 0
Min Density	(2010,0120)	U	50 > value > 0
Illumination	(2010,015E)	U	> 0 Required if Presentation LUT is present.
Reflective Ambient Light	(2010,0160)	U	> 0 Required if Presentation LUT is present.
Referenced Presentation LUT Sequence	(2050,0500)	U	

M = Mandatory, **U** = User Option

The N-CREATE-RSP message from the Print SCP includes the Referenced Image Box Sequence with SOP Class/Instance UID pairs which will be kept internally and used for the subsequent Basic Image Box SOP Class N-SET-RQ messages.

When all Image Boxes (including parameters) for the film-sheet have been set, the DICOM print manager will issue an N-ACTION-RQ message with the SOP Instance UID of the Basic Film Box and the Action Type ID of 1.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Box - see below:

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) ➔ (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Box

The Basic Film Box SOP Class interprets the following status codes:

Table 27 - Basic Film Box Status Codes

Service Status	Meaning	Error Codes
Failure	Unable to create print job, print queue is full Image size is larger than images box size	C601 C603
Warning	Film box does not contain image box (empty page) Requested MinDensity or MaxDensity outside of Printer's operating range	B603 B605
Success	Film accepted for printing	0000

4.2.6.3.1.6 Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Grayscale Image Box information describes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Grayscale Image Box SOP Class uses only the N-SET-RQ with the following attributes:

Table 28 - Basic Grayscale Image Box N-SET attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
BASIC Grayscale Image Sequence	(2020,0110)	M	n.a.
> Samples per Pixel	(0028,0002)	M	1
> Photometric Interpretation	(0028,0004)	M	MONOCHROME2
> Rows	(0028,0010)	M	<Printer/Film config>
> Columns	(0028,0011)	M	<Printer/Film config>
> Pixel Aspect Ratio	(0028,0034)	M	(1:1)
> Bits Allocated	(0028,0100)	M	8, 16
> Bits Stored	(0028,0101)	M	8, 12
> High Bit	(0028,0102)	M	7, 11
> Pixel Representation	(0028,0103)	M	0
> Pixel Data	(7FE0,0010)	M	

M = Mandatory

The Grayscale Image Box SOP Class interprets the following status codes:

Table 29 - Basic Grayscale Image Box Status Codes

Service Status	Meaning	Error Codes
Failure	Image contains more pixel than printer can print in Image Box Insufficient memory in printer to store the image	C603 C605
Warning	Requested MinDensity or MaxDensity outside of Printer's operating range	B605
Success	Image Box Accepted for printing	0000

4.2.6.3.1.7 Presentation LUT SOP Class

The Presentation LUT tailors image hardcopy printing for specific modalities, applications and user preferences.

The output of the Presentation LUT is Presentation Values (P-Values). P-Values are approximately related to human perceptual response. They are intended to facilitate common input for hardcopy. P-Values are intended to be independent of the specific class or characteristics of the hardcopy device. The Presentation LUT SOP Class uses only the N-CREATE-RQ with the following attributes:

Table 30 - Presentation LUT N-CREATE attribute

Attribute Name	Tag	Usage SCU	Supported Values
Presentation LUT Shape	(2050,0020)	U	IDENTITY

U = User Option

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and is used for later requests on the Basic Film Box (N-CREATE-RQ) and on the Presentation LUT (N-DELETE-RQ) - see below:

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) ➔ (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Presentation LUT

The Presentation LUT SOP Class interprets the following status codes:

Table 31 - Presentation LUT Status Codes

Service Status	Meaning	Codes
Success	Presentation LUT successfully created	0000
Warning	Requested MinDensity or MaxDensity outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	B605

4.2.6.3.1.8 Printer SOP Class

The Printer SOP Class allows monitoring the status of the hardcopy printer in a synchronous and an asynchronous way.

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronous way.

The following returned information is supported:

Table 32 - Used Printer N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

U = User Option

Table 33 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

4.2.6.3.1.9 Printer Job SOP Class

The Print Job SOP Class allows monitoring the execution of the print process.

The MAMMOMAT Revelation DICOM Print Management application supports the optional N-EVENT-REPORT DIMSE Service to receive the changes of the Print Job Status in an asynchronous way.

It can receive Events from the Print SCP asynchronously:

- N-EVENT-REPORT

Note: The underlying *syngo* DICOM Print AE does not support receiving of N-EVENT-REPORT messages from camera during open print sessions. This is typically configurable in the camera setup.

The following information is supported:

Table 34 - Used Print Job N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	--
				(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Printing	2	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	--
				(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	--
				(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Failure	4	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	--
				(Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

U = User Option

4.2.6.3.2 Activity - Show Device Status

4.2.6.3.2.1 Description and Sequencing of Activity

With no printing activity ongoing (“idle time”), the MAMMOMAT Revelation DICOM Print SCU application will cyclically request the printer status to update the related printer state in the Printing UI.

4.2.6.3.2.2 Proposed Presentation Context

The MAMMOMAT Revelation DICOM application will propose Presentation Contexts as shown in the following table:

Table 35 - Presentation Context Table “Show Device Status”

Presentation Context Table

Abstract Syntax Name	UID	Transfer Syntax Name List	UID List	Role	Ext. Neg.
Printer SOP Class	1.2.840.10008.5.1.1.16	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	1.2.840.10008.1.2.2	SCU	None

4.2.6.3.2.3 SOP Specific Conformance

The Printer SOP Class allows monitoring the status of the hardcopy printer in a synchronous and an asynchronous way.

The Print SCU AE application will cyclically “ask” the Printer (SCP) for its status synchronously:

- N-GET as SCU

The following information is supported:

Table 36 - Used Printer N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

U = User Option

Table 37 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

4.2.6.4 Association Acceptance Policy

n.a

4.2.7 Worklist SCU AE Specification

4.2.7.1 SOP Classes

For SOP Classes supported, please refer to “Table 1: Network Services”.

4.2.7.2 Association Policy

It is possible to configure a cyclic update of the modality worklist through a background worklist request with date/time and modality information.

In addition, the user can request worklist update with “Update Worklist”. No duplicate entries will be added in the Worklist. Entries are uniquely identified by the Study Instance UID (0020,000D) for the Requested Procedure.

An interactive worklist query can be issued with search criteria entered in the patient-based Query dialog from the patient browser.

The default PDU size used will be 516KB.

The MAMMOMAT Revelation DICOM application initiates one association at a time to query worklist entry data.

4.2.7.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.7.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.7.3 Association Initiation Policy

The MAMMOMAT Revelation DICOM application will cyclically query the worklist provider and by request from the patient registration interface. It establishes an association by using the

- C-FIND with Worklist information model

It is possible to configure multiple worklist providers but only one can be active at a time. The active worklist provider can be selected in the service.

4.2.7.3.1 Activity – “(cyclic) Update Worklist”

4.2.7.3.1.1 Description and Sequencing of Activities

A network application will perform worklist queries with the C-FIND request at regular intervals. In addition, it can be triggered by an immediate request. All worklist data from previous queries will be deleted when new data is received.

No automatic clean-up of the Worklist is performed after a Patient-based Query has been completed since the worklist received - due to restricted search criteria - does not correspond to the list of all currently scheduled procedures for the modality.

4.2.7.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Presentation Contexts as shown in the following table:

Table 38 - Presentation Context “Update Worklist”

Presentation Context Table – “Update Flag Information”

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role Neg.	Ext.
1.2.840.10008.5.1.4.31 Modality Worklist Information Model - FIND	Explicit VR Little Endian Explicit VR Big Endian 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

4.2.7.3.1.3 SOP specific Conformance for SOP classes

The MAMMOMAT Revelation DICOM worklist SCU supports “broad worklist queries” with all required search keys. The following table describes the “broad query” search keys that the SCU supports.

Table 39 - Supported Broad Worklist Query Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Station AE Title (It depends on user configuration (Options-> Configuration-> Patient Registration) if the “own AET” is provided or not. Use the “HIS/RIS” tab card for configuration.)	(0040,0001)	R	<own AET> or <zero length>
>Schedule Procedure Step Start Date (It depends on user configuration (Options-> Configuration-> Patient Registration) if the actual Date with a full-time range or an interactive input dialog for date/time specification is used.)	(0040,0002)	R	<act. Date>-<act. Date> or range from UI
>Schedule Procedure Step Start Time (It depends on user configuration (Options-> Configuration-> Patient Registration) if the actual Date with a full-time range or an interactive input dialog for date/time specification is used.)	(0040,0003)	R	00.00-235959.00 or range from UI
>Modality (It depends on user configuration (Options-> Configuration-> Patient Registration) if the “own Modality” is provided or not. Use the “HIS/RIS” tab card for configuration.)	(0008,0060)	R	<zero length> or <own Modality>

R = Required

- Return Key Attributes of the Worklist C-FIND

The MAMMOMAT Revelation DICOM Worklist SCU supports worklist queries with return key attributes of all types. The following table describes the return keys that the SCU supports.

The return key type describes the expected behavior of the worklist SCP to return a value.

An “x” in the UI column will indicate the attribute is displayed in the user interface. The display is influenced by the related configuration.

A tag in the IOD column will indicate that the related attribute is included into the SOP Instances of the IODs created during processing of this worklist request.

A tag in the MPPS column will indicate that the related attribute is included into the SOP Instances of the MPPS objects created during processing of this worklist request. (See also the tables “Attributes used for the Performed Procedure Step N-CREATE” and “Attributes used for the Performed Procedure Step N-SET”.)

Table 40 - Basic Worklist C-FIND-RSP Return Key Attributes

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
SOP Common					
Specific Character Set	(0008,0005)	1C	-	(0008,0005)	(0008,0005)
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	1			
>Modality	(0008,0060)	1	x	(0008,0060)	(0008,0060)
>Requested Contrast Agent	(0032,1070)	2C	x		
>Scheduled Station AE Title (“Scheduled Station AE Title” is taken as default for “Performed Station AE Title”)	(0040,0001)	1	x		(0040,0241)
>Scheduled Procedure Step Start Date	(0040,0002)	1	x		
>Scheduled Procedure Step Start Time	(0040,0003)	1	x		
>Scheduled Procedure Step End Date	(0040,0004)	3	-		
>Scheduled Procedure Step End Time	(0040,0005)	3	-		
>Scheduled Performing Physician’s Name (“Scheduled Performing Physician’s Name” is taken as default for “Performing Physician’s Name”)	(0040,0006)	1	x	(0008,1050)	(0008,1050)
>Scheduled Procedure Step Description (“Scheduled Procedure Step Description” is taken as default for “Performed Procedure Step Description”)	(0040,0007)	1C	x	(0040,0007) (0040,0007)	(0040,0254) (0040,0254)
>Scheduled Protocol Code Sequence (universal Sequence Match) (“Scheduled Protocol Code Sequence” is taken as default for “Performed Protocol Code Sequence”)	(0040,0008)	1C	-	(0040,0008) (0040,0008)	(0040,0260) (0040,0260)
>>Code Value	(0008,0100)	1C	x		
>>Coding Scheme Designator	(0008,0102)	1C	x		
>>Coding Scheme Version	(0008,0103)	3	x		
>>Code Meaning	(0008,0104)	3	x		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
>Scheduled Procedure Step ID ("Scheduled Procedure Step ID" is taken as default for "Performed Procedure Step ID")	(0040,0009)	1	x	(0040,0009) (0040,0009)	(0040,0253) (0040,0253)
>Scheduled Station Name	(0040,0010)	2	x		
>Scheduled Procedure Step Location ("Scheduled Procedure Step Location" is taken as default for "Performed Location")	(0040,0011)	2	x		(0040,0243)
>Pre-Medication	(0040,0012)	2C	x		
>Scheduled Procedure Step Status	(0040,0020)	3	x		
>Comments on the Scheduled Procedure Step	(0040,0400)	3	-		
Requested Procedure					
Referenced Study Sequence (universal Sequence Match)	(0008,1110)	2	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Study Instance UID	(0020,000D)	1	-	(0020,000D)	(0020,000D)
Requested Procedure Description	(0032,1060)	1C	x	(0032,1060)	(0032,1060)
Requested Procedure Code Sequence (universal Sequence Match)					
("Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence")	(0032,1064)	1C	-	(0008,1032) (0032,1064)	(0008,1032)
>Code Value	(0008,0100)	1C	x		
>Coding Scheme Designator	(0008,0102)	1C	x		
>Coding Scheme Version	(0008,0103)	3	x		
>Code Meaning	(0008,0104)	3	x		
Requested Procedure ID ("Requested Procedure ID" is taken as default for "Study ID")	(0040,1001)	1	x	(0040,1001) (0040,1001)	(0020,0010) (0020,0010)
Reason for the Requested Procedure	(0040,1002)	3	-	(0040,1002)	
Requested Procedure Priority	(0040,1003)	2	x		
Patient Transport Arrangements	(0040,1004)	2	-		
Requested Procedure Location	(0040,1005)	3	-		
Confidentiality Code	(0040,1008)	3	-		
Reporting Priority	(0040,1009)	3	-		
Names of intended Recipients of Results	(0040,1010)	3	-		
Requested Procedure Comments	(0040,1400)	3	x		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Imaging Service Request					
Accession Number	(0008,0050)	2	x	(0008,0050)	(0008,0050)
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Requesting Physician	(0032,1032)	2	x	(0032,1032)	
Requesting Service	(0032,1033)	3	x	(0032,1033)	
Issuing Date of Imaging Service Request	(0040,2004)	3	-		
Issuing Time of Imaging Service Request	(0040,2005)	3	-		
Placer Order Number / Imaging Service Request (Old tag (0040,2006) is retired and not used.)	(0040,2016)	3	-		(0040,2016)
Filler Order Number / Imaging Service Request (Old tag (0040,2007) is retired and not used.)	(0040,2017)	3	-		(0040,2017)
Order entered by ...	(0040,2008)	3	-		
Order Enterer's location	(0040,2009)	3	-		
Order Callback Phone Number	(0040,2010)	3	-		
Imaging Service Request Comments	(0040,2400)	3	x		
Visit Identification					
Institution Name	(0008,0080)	3	x	(0008,0080)	
Institution Address	(0008,0081)	3	-		
Institution Code Sequence (universal Sequence Match)	(0008,0082)	3	-		
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Admission ID	(0038,0010)	2	x		
Issuer of Admission ID	(0038,0011)	3	-		
Visit Status					
Visit Status ID	(0038,0008)	3	-		
Current Patient Location	(0038,0300)	2	x		
Patient's Institution Residence	(0038,0400)	3	-		
Visit Comments	(0038,4000)	3	-		
Visit Relationship					
Referenced Study Sequence (universal Sequence Match)	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Visit Admission					
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Admitting Diagnosis Description	(0008,1080)	3	x	(0008,1080)	
Patient Identification					
Patient's Name	(0010,0010)	1	x	(0010,0010)	(0010,0010)
Patient ID	(0010,0020)	1	x	(0010,0020)	(0010,0020)
Issuer of Patient ID	(0010,0021)	3	-	(0010,0021)	
Other Patient IDs	(0010,1000)	3	x	(0010,1000)	
Other Patient Names	(0010,1001)	3	x	(0010,1001)	
Patient's Birth Name	(0010,1005)	3	-	(0010,1005)	
Patient's Mother's Birth Name	(0010,1060)	3	-	(0010,1060)	
Medical Record Locator	(0010,1090)	3	-	(0010,1090)	
Patient Demographic					
Patient's Birth Date	(0010,0030)	2	x	(0010,0030)	(0010,0030)
Patient's Birth Time	(0010,0032)	3	-	(0010,0032)	
Patient's Sex	(0010,0040)	2	x	(0010,0040)	(0010,0040)
Patient's Insurance Plan Code Sequence (universal Sequence Match)	(0010,0050)	3	-	(0010,0050)	
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Patient's Age	(0010,1010)	3	x	(0010,1010)	
Patient's Size	(0010,1020)	3	x	(0010,1020)	
Patient's Weight	(0010,1030)	2	x	(0010,1030)	
Patient's Address	(0010,1040)	3	x	(0010,1040)	
Military Rank	(0010,1080)	3	x	(0010,1080)	
Branch of Service	(0010,1081)	3	-	(0010,1081)	
Country of Residence	(0010,2150)	3	-	(0010,2150)	
Region of Residence	(0010,2152)	3	-	(0010,2152)	
Patient's Telephone Numbers	(0010,2154)	3	-	(0010,2154)	
Ethnic Group	(0010,2160)	3	x	(0010,2160)	
Occupation	(0010,2180)	3	-	(0010,2180)	
Patient's Religious Preference	(0010,21F0)	3	-	(0010,21F0)	
Patient Comments	(0010,4000)	3	x	(0010,4000)	
Patient Data Confidentiality Constraint Descrip-tion	(0040,3001)	2	x	(0040,3001)	
Patient Medical					
Medical Alerts	(0010,2000)	2	x	(0010,2000)	
Contrast Allergies	(0010,2110)	2	x	(0010,2110)	
Smoking Status	(0010,21A0)	3	x	(0010,21A0)	
Last Menstrual Date	(0010,21D0)	3	x	(0010,21D0)	

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Additional Patient History	(0010,21B0)	3	x	(0010,21B0)	
Special Needs	(0038,0050)	2	x	(0038,0050)	
Patient Relationship					
Referenced Study Sequence (universal Sequence Match)	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Visit Sequence (universal Sequence Match)	(0008,1125)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Alias Sequence (universal Sequence Match)	(0038,0004)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		

- The Worklist SCU interprets the following status codes:

Table 41 - Status Codes “Update Worklist”

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier issupplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.7.3.2 Activity – “Get Worklist”

4.2.7.3.2.1 Description and Sequencing of Activities

With “Get Worklist” in the patient-based Worklist Query dialog, the entered attributes are used to form a worklist request identifier. The response data is used to fill the Patient Registration dialog. The response data and only the response data is placed in the Worklist.

4.2.7.3.2.2 Proposed Presentation Contexts

This Activity will propose the same Presentation Context as with “Update Worklist”. Please see related table in section 4.2.7.3.1.2.

4.2.7.3.2.3 SOP specific Conformance for SOP classes

The MAMMOMAT Revelation DICOM worklist SCU supports “narrow worklist queries” with all required search keys. The following tables describe the “narrow query” search keys that the SCU supports.

Table 42 - Patient based “narrow query” Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Modality	(0008,0060)	R	Input from UI or <zero length>
>Scheduled Start Date	(0008,0002)	R	Input from UI or <zero length>
>Scheduled Performing Physician’s Name	(0040,0006)	R	Input from UI or <zero length>
Requested Procedure			
Requested Procedure ID	(0040,1001)	R	Input from UI or <zero length>
Imaging Service Request			
Accession Number	(0008,0050)	R	Input from UI or <zero length>
Referring Physician’s Name	(0008,0090)	R	Input from UI or <zero length>
Patient Identification			
Patient’s Name	(0010,0010)	R	Input from UI or <zero length>
Patient ID	(0010,0020)	R	Input from UI or <zero length>

R = Required Key, **O** = Optional Key

The Return Key Attribute handling and supported Status Codes are identical to the “Update Worklist” activity. Please see Fehler! Verweisquelle konnte nicht gefunden werden. for details.

4.2.7.4 Association Acceptance Policy

na

4.2.8 Modality PPS SCU AE Specification

4.2.8.1 SOP Classes

For SOP Classes supported, please refer to Table 1: Network Services

4.2.8.2 Association Policy

The creation of MPPS Instance is done automatically by MAMMOMAT Revelation whenever a patient is registered for image acquisition through the Patient Registration dialog.

Further updates on the MPPS data can be done interactively from the related MPPS user interface. The MPPS "Complete" or "Discontinued" states can be set from user interface.

The default PDU size used will be 516KB.

The MAMMOMAT Revelation DICOM application initiates one association at a time to create or set the MPPS instance.

4.2.8.2.1 Asynchronous Nature

The MAMMOMAT Revelation DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.8.2.2 Implementation Identifying Information

For Implementation Identifying Information please refer to "Table 3 - Implementation Identifying Information".

4.2.8.3 Association Initiation Policy

The MAMMOMAT Revelation DICOM application will notify a RIS (MPPS Manager) about the status of a procedure while it is performed. It establishes an association by using the

- N-CREATE DIMSE according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET DIMSE to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

It is possible to configure multiple MPPS providers but only one can be active at a time. The active MPPS provider can be configured via Service-UI.

4.2.8.3.1 Activity – "Patient registered"

4.2.8.3.1.1 Description and Sequencing of Activities

A patient is registered by the Patient Registration "Exam" action. From this event the trigger to create a MPPS Instance is derived. The related Instance is then immediately communicated to the configured RIS system. An association is established and the MPPS Instance is sent.

4.2.8.3.1.2 Proposed Presentation Contexts

The MAMMOMAT Revelation DICOM application will propose Presentation Contexts as shown in the following table:

Table 43 - Presentation Context "Patient Registered"

Presentation Context Table – "Update Flag Information"

Abstract Syntax Description	Transfer Syntax Name List	UID List	Role	Ext. Neg.
1.2.840.10008.3.1.2.3.3 Modality Performed Procedure Step	Explicit VR Little Endian Explicit VR Big Endian 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

4.2.8.3.1.3 SOP specific Conformance for SOP classes

Attributes for the Performed procedure Step N-CREATE:

The Siemens Healthineers MAMMOMAT Revelation DICOM Modality Performed Procedure Step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed (i.e. the patient is registered). The N-CREATE message is sent when the examination is started with successful registration of the patient data. The following table describes the supported attributes of an N-CREATE message.

Table 44 - Performed Procedure Step N-CREATE Attributes

Attribute Name	Tag	Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	from MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	from MWL or created
>Referenced Study Sequence	(0008,1110)	2	from MWL or <zero length>
>>Referenced SOP Class UID	(0008,1150)	1C	"
>>Referenced SOP Instance UID	(0008,1155)	1C	"
>Accession Number	(0008,0050)	2	from MWL or user input
>Placer Order Number/Imaging Service Request	(0040,2016)	3	from MWL or <zero length>
>Filler Order Number/Imaging Service Request	(0040,2017)	3	from MWL or <zero length>
>Requested Procedure ID	(0040,0001)	2	from MWL or user input
>Requested Procedure Description	(0032,1060)	2	from MWL or <zero length>
>Scheduled Procedure Step ID	(0040,0009)	2	from MWL or <zero length>
>Scheduled Procedure Step Description	(0040,0007)	2	from MWL or <zero length>
>Scheduled Protocol Code Sequence	(0040,0008)	2	from MWL or <zero length>
>>Code Value	(0008,0100)	1C	"
>>Coding Scheme Designator	(0008,0102)	1C	"
>>Coding Scheme Version	(0008,0103)	3	"or omitted
>>Code Meaning	(0008,0104)	3	"
Patient's Name	(0010,0010)	2	from MWL or user input
Patient ID	(0010,0020)	2	from MWL or user input
Patient's Birth Date	(0010,0030)	2	from MWL or user input
Patient's Sex	(0010,0040)	2	from MWL or user input

Attribute Name	Tag	Type	Value
>Referenced SOP Class UID	(0008,1150)	1C	“
>Referenced SOP Instance UID	(0008,1155)	1C	“
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	From SPS ID or created
Performed Station AE Title	(0040,0241)	1	own AE Title
Performed Station Name	(0040,0242)	2	own hostname
Performed Location	(0040,0243)	2	from SPS location or <zero length>
Performed Procedure Step Start Date	(0040,0244)	1	created
Performed Procedure Step Start Time	(0040,0245)	1	created
Performed Procedure Step End Date	(0040,0250)	3	<zero length>
Performed Procedure Step End Time	(0040,0251)	3	<zero length>
Performed Procedure Step Status	(0040,0252)	1	“IN PROGRESS”
Performed Procedure Step Description	(0040,0254)	2	from SPS Description or <zero length>
Performed Procedure Type Description	(0040,0255)	2	<zero length>
Performed Protocol Code Sequence	(0040,0260)	3	From MWL or configuration
Procedure Code Sequence	(0008,1032)	2	from Requested Procedure Code or <zero length>
>Code Value	(0008,0100)	1C	“
>Coding Scheme Designator	(0008,0102)	1C	“
>Coding Scheme Version	(0008,0103)	3	“or UNKNOWN
>Code Meaning	(0008,0104)	3	“
Comments on the Performed Procedure Steps	(0040,0280)	3	<zero length>
Image Acquisition Results			
Modality	(0008,0060)	1	MG
Study ID	(0020,0010)	2	from Requested Procedure ID or created
Performed Series Sequence	(0040,0340)	2	“
>Performing Physician’s Name	(0008,1050)	2C	from MWL or user input
>Operator’s Name	(0008,1070)	2C	User input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	<zero length>
>Retrieve AE Title	(0008,0054)	2C	<zero length>
>Protocol Name	(0018,1030)	1C	from organ program
>Referenced Image Sequence	(0008,1140)	2C	<zero length>
>Referenced Non-Image Composite SOP I nstance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	<zero length>
Total Time of Fluoroscopy	(0040,0300)	3	<zero length>
Total Number of Exposures	(0040,0301)	3	<zero length>
Distance Source to Detector	(0018,1110)	3	<zero length>
Distance Source to Entrance	(0040,0306)	3	<zero length>

Attribute Name	Tag	Type	Value
Entrance Dose	(0040,0302)	3	<zero length>
Entrance Dose in mGy	(0040,8302)	3	<zero length>
Exposed Area	(0040,0303)	3	<zero length>
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	<zero length>
Comments on Radiation Dose	(0040,0310)	3	<zero length>
Exposure Dose Sequence	(0040,030E)	3	<zero length>
Billing and Material Management Code			
Billing Procedure Step Sequence	(0040,0320)	3	<zero length>
Film Consumption Sequence	(0040,0321)	3	Sequence with
>Number of Films	(2100,0170)	3	<zero length>
>Medium Type	(2000,0030)	3	<zero length>
>Film Size ID	(2010,0050)	3	<zero length>
Billing Supplies and Devices Sequence	(0040,0324)	3	Sequence with
>Billing Item Sequence	(0040,0296)	3	<zero length>
>Quantity Sequence	(0040,0293)	3	Sequence with
>>Quantity	(0040,0294)	3	<zero length>
>>Measuring Units Sequence	(0040,0295)	3	<zero length>

The Performed Procedure Step SCU interprets the following N-CREATE status codes:

Table 45 - Status Codes “Patient Registered”

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure	0110
	No such attribute	0105
	Invalid attribute value	0106
	Duplicate SOP Instance	0111
	No such SOP Instance	0112
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute	0120
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance created	0000

4.2.8.3.2 Activity - MPPS Update

4.2.8.3.2.1 Description and Sequencing of Activity

With the MPPS UI the status of the MPPS Instance can be set to “COMPLETED” or “DISCONTINUED”. During performance of the procedure the status will remain “IN PROGRESS”.

4.2.8.3.2.2 Proposed Presentation Context

For “MPPS Update” the same Presentation Contexts as with “Patient registered” are proposed. Please see related table in section Fehler! Verweisquelle konnte nicht gefunden werden..

4.2.8.3.2.3 SOP Specific Conformance

Attributes for the Performed procedure Step N-SET

The Siemens Healthineers MAMMOMAT Revelation DICOM Modality Performed Procedure Step SCU informs the remote SCP about the performed examination and its status. The N-SET message is sent after each acquisition (status "IN PROGRESS") and per finished examination (finished status "COMPLETED", or incomplete status "DISCONTINUED"). The following table describes the supported attributes of an N-SET message.

Table 46 - Performed Procedure Step N-SET Attributes

Attribute Name	Tag	Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	"IN PROGRESS" during procedure, "COMPLETED" or "DISCONTINUED" for final N-SET
Performed Procedure Step Description	(0040,0254)	3	from SPS Description or user input
Procedure Code Sequence	(0008,1032)	3	from Requested Procedure
>Code Value	(0008,0100)	1C	"
>Coding Scheme Designator	(0008,0102)	1C	"
>Coding Scheme Version	(0008,0103)	3	"
>Code Meaning	(0008,0104)	3	"
Performed Procedure Step End Date	(0040,0250)	1	created
Performed Procedure Step End Time	(0040,0251)	1	created
Comments on the Performed Proce-dure Steps	(0040,0280)	3	user input
Image Acquisition Results			
Performed Protocol Code Sequence	(0040,0260)	3	from Scheduled Protocol Code Sequence
>Code Value	(0008,0100)	1C	"
>Coding Scheme Designator	(0008,0102)	1C	"
>Coding Scheme Version	(0008,0103)	3	"UNKOWN, if not provided
>Code Meaning	(0008,0104)	3	"
Performed Series Sequence	(0040,0340)	1	"
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	from related SOP Instance
>Operator's Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	from related SOP Instance
>Series Description	(0008,103E)	2C	from related SOP Instance
>Retrieve AE Title	(0008,0054)	2C	<zero length>
>Referenced Image Sequence	(0008,1140)	2C	Series related SOP Instances as items
>>Referenced SOP Class UID	(0008,1150)	1C	From related SOP Instance
>>Referenced SOP Instance UID	(0008,1155)	1C	"
>Referenced Non-image Composite SOP Instance Sequence	(0040,0220)	2C	<zero length>

Attribute Name	Tag	Type	Value
Radiation Dose			
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	T-0400, SNM3, Breast
Total Time of Fluoroscopy	(0040,0300)	3	Accumulated Exposure Time (0018,1150) divided by 1000 (msecs -> secs)
Total Number of Exposures	(0040,0301)	3	Number of exposures in this Performed Procedure Step
Entrance Dose in mGy	(0040,8302)	3	accumulated over complete procedure step
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	Zero length
Exposure Dose Sequence	(0040,030E)	3	on item for each irradiation event (acquisition or fluoro)
>KVP	(0018,0060)	3	peak KV used for this event (KV)
>Exposure Time	(0018,1150)	3	time of x-ray in ms for this event
>Radiation Mode	(0018,115A)	3	“CONTINUOUS”
>Filter Type	(0018,1160)	3	Used value
>Filter Material	(0018,7050)	3	Used value
>X-ray Tube Current in µA	(0018,8151)	3	tube current used for this event
>Comments on Radiation Dose	(0040,0310)	3	additional acquisition specific information (Organ dose) as text: <laterality>-<View> mGy
>Organ dose	(0040,0316)	3	Organ dose for this view
Comments on Radiation Dose	(0040,0310)	3	additional acquisition specific information (accumulated organ dose) as text: R: <> mGy, L: <> mGy, B: <> mGy
Billing and Material Management Code			
Film Consumption Sequence	(0040,0321)	3	In case film was used
>Number of Films	(2100,0170)	3	User Input
>Medium Type	(2000,0030)	3	User Input
>Film Size ID	(2010,0050)	3	User Input

The Performed Procedure Step SCU interprets the following N-SET status codes:

Table 47 - Status Codes “MPPS Update”

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure: Performed Procedure Step Object may no longer be updated.	0110
	No such attribute	0105
	Invalid attribute value	0106
	No such SOP Instance	0112
	Invalid Object instance	0117
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance set	0000

Performed Procedure Step ID without MPPS option - Handling of Performed Procedure Step ID in case MPPS is not configured or Unscheduled case.

The attribute “Performed Procedure Step ID” (0040,0235) will be encoded based on “YYYYMMDDHHMMSS”. This date and time are based on the time when the first image was acquired. The “Performed Procedure Step ID” stays the same for all acquired or derived images if the patient is reregistered. A re-registered patient with a new study or new series within the existing study will get a new-lyassigned “Performed Procedure Step ID”.

4.2.8.4 Association Acceptance Policy

na

4.3 Network Interfaces

4.3.1 Physical Network Interface

The DICOM Interface of the MAMMOMAT Revelation provides DICOM TCP/IP Network Communication Support and uses the TCP/IP protocol stack from the operating system. It uses the MergeCOM subroutine library. All available Ethernet interfaces are supported.

4.3.2 Additional Protocols

n.a.

4.3.3 IPv4 and IPv6 Support

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

4.4.1.1 Local AE Titles

According to the DICOM Standard, the AET string can be up to 16 characters long and must not contain any extended characters, only 7-bit ASCII characters (excluding Control Characters).

Note: Spaces and special characters (like &<> ") are not supported in the AE title string.

Change of the default AE Titles chosen by the system can be performed in the Service UI under "Configuration / DICOM / General" item - first page.

Table 48 - Default AET Characteristics

Application Entity	Default AE Title	TCP/IP Port
Verification SCU	STU_<hostname>	-
Verification SCP	STU_<hostname>	104 (fixed)
Storage SCU	STU_<hostname>	-
Storage SCP	STU_<hostname>	104 (fixed)
Query/Retrieve SCU	STU_<hostname>	-
Query/Retrieve SCP	STU_<hostname>	104 (fixed)
Print SCU	PRI_<hostname>	-
Worklist SCU	HRI_<hostname>	-
MPPS SCU	HRI_<hostname>	-

4.4.1.2 Remote AE Titles

When “trusted host functionality” is enabled all external AE Titles have to be configured to be able to communicate with MAMMOMAT Revelation.

For each remote AE the following data and capabilities can be configured:

Table 49 - Remote AE Configuration Items

Remote AE configuration item	Comment
Host Name	As defined in the network domain. This must be configured also for any DICOM AE that wishes to connect to SCP services of MAMMOMAT Revelation.
TCP/IP address	As defined in the network domain. This must be configured also for any DICOM AE that wishes to connect to SCP services of MAMMOMAT Revelation.
Logical Name	Name for the AE used in the user interfaces of the MAMMOMAT Revelation applications.
AE Title	AET, as provided by network administration
Port Number	Port Number, as provided by network administration
If Storage Service support is checked	
Transfer Syntax	Selection of uncompressed transfer Syntaxes supported by remote AE
Compression	Selection of additional compression Syntaxes supported for remote AE
Default Node	“first default”/”second default”/[“no default”] - activating this feature will show “Send to <logical name>” in the Transfer tool menu for quick access.
Preference Node	When checked, the remote AE will be assigned to a keyboard shortcut key.
Archive Node	When checked, sending to remote AET will set status of a(rchived), else s(ent) is indicated.
Default Archive	When checked, the remote AE will be listed as default archive in User interfaces.
Graphics in Pixel Data	When checked, the DICOM overlay will not be encoded in attribute (60xx,3000) Overlay Data, but masked in the “unused bits” of the pixel data (only for uncompressed transfer syntaxes). For backwards compatibility with legacy AE.
Select SC node	Select a previously configured node as target for Storage Commitment when sending DICOM objects to the configured AE. Default is the same node as to which the Objects are sent.
Select SC AET	Select AET that corresponds to the above selected node that receives the Storage Commitment request. Default is the above specified “AE Title”.
SC Result in same association	When checked the MAMMOMAT Revelation DICOM application will await the Storage Commitment N-EVENT-REPORT on the same association. Default is “not checked” (= different association).
SC result timeout	Timeout in hours and minutes to wait at the open association. Default: 01:00 (hour:minutes).
If Storage Commitment Service support is checked	
n. a.	The related Storage Commitment configuration is either in the Storage section of the same AET or different AET (in case the current AET is only Storage Commitment Provider).

If Query Service support is checked	
provides DICOM Query model	The Query models supported by this AET can be selected. When possible, the STUDY ROOT model should preferably be configured
If Retrieve Service support is checked	
n. a.	Checking Retrieve support for an AET is the only needed configuration item. This will allow access to the “Import” feature in the Query result browser.
If Modality Worklist Service support is checked	
Query Waiting time	The time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec.)
Max Query Match	
Number	The maximum number of entries accepted in one worklist (default is 200)
Query Interval	The time between two C-FIND-RQ to the Hospital Information system (default is 60 min, minimum is 3 min, maximum is 1440 min i.e. 24 hours)
Automatic removal of canceled/rescheduled Requests	Checking this item will remove all unused entries from the scheduler list prior to inserting the worklist responses with each query.

4.4.2 Parameters

System parameters can be changed in the Service UI under “Configuration / DICOM / General” item - second page.

Table 50 - General parameter settings and timeouts

Time-out Values

Parameter	Default Value [sec]	Min [sec]	Max [sec]	Comment
Accepting/Rejecting an Asso ciation Request	60 Association	15	600	Wait for an Asso ciation Request or wait for a Peer to shut down the
Association Open Request	60	15	600	Wait for a reply to an Association Accept Request
Association Close Request	60	15	600	Wait for a reply to an Association Release Request
Accepting a Message over Network	60	15	600	Wait for a Network Write to be accepted
Waiting for Data between TCP/IP Packets	60	15	600	Wait for Data between TCP/IP packets
Accept network connect	15	15	600	Wait for a Network Connect to be accepted
General Transfer Setting				
Simultaneous DICOM associa-tions	10	1	10	Number of simultaneous associations running.
Maximum PDU Size	516KByte	4KByte	1MByte	Proposed PDU size, each selectable value is doubled from previous, starting with 4kB. Additionally, for optimization for some networks 28kByte are provided.

5 Media Interchange

For "Offline Media Application Profiles" please refer to Table 2 - Media Services " in chapter 1.

Table 51 – Supported Application Profiles

Media Storage Application Profile
General Purpose on CD-R
General Purpose on DVD with JPEG
General Purpose USB Media Interchange with JPEG

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

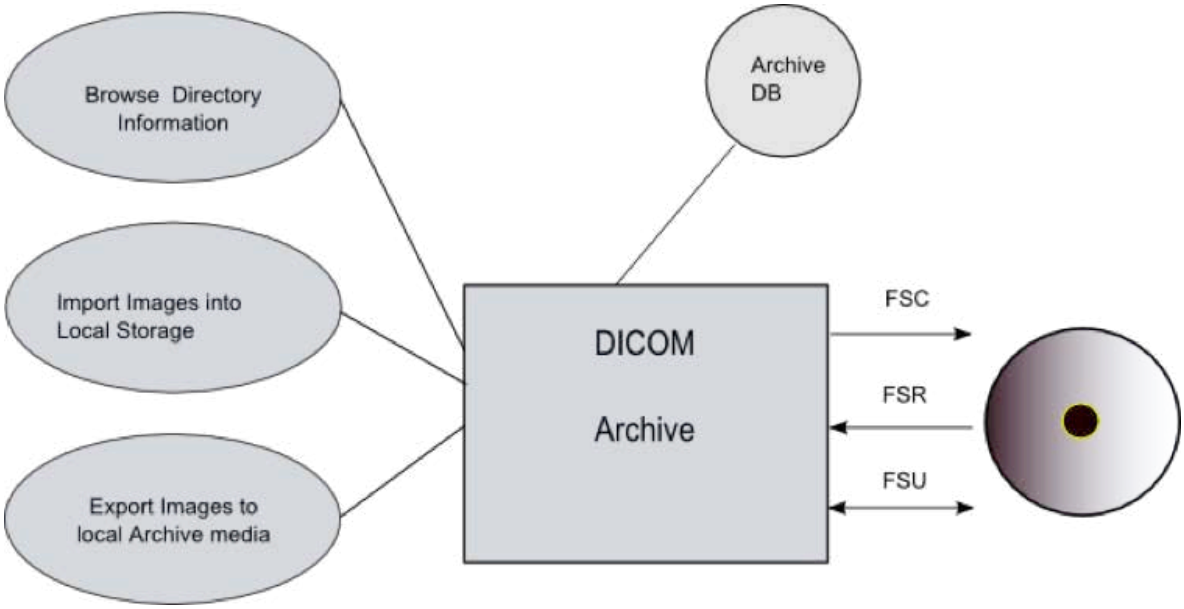


Figure 2 Application Data Flow DICOM Archive

The DICOM Archive application will serve as an interface to the CD-R/DVD offline media device. The DICOM Archive application will support the 120mm CD-R and DVD media.The FSU role will update new SOP Instances only to media with pre-existing File-sets conforming to the Application Profiles supported.

The contents of the DICOMDIR will temporarily be stored in Archive-Database.

5.1.2 Functional definitions of AEs

The MAMMOMAT Revelation DICOM Offline Media Storage application consists of the DICOM Archive application entity serving all interfaces to access offline media. The DICOM Archive application is capable of

- creating a new File-set onto an unwritten media (Export to...).
- updating an existing File-set by writing new SOP Instances onto the media (Export to...).
- importing SOP Instances from the media onto local storage
- reading the File-sets DICOMDIR information into temporary database and pass it to display applications.

5.1.3 Sequencing of Real-World Activities

5.1.4 File Meta Information for Implementation Class and Version

The Source Application Entity Title is set by configuration and is same as used for Storage provider.

5.2 AE SPECIFICATIONS

5.2.1 Media Storage AE – Specification

The DICOM Archive provides Standard conformance to Media Storage Service Class (Interchange Option).

Details are listed in following Table:

Table 52 - Mapping of Application Profiles Supported

Application Profiles Supported	Activity	Role	SC Option
STD-GEN-CD	Browse Directory Information	FSR	Interchange
STD-GEN-DVD	Import into local Storage	FSR	Interchange
STD-GEN-DVD-JPEG STD-GEN-USB-JPEG	Export to local Archive Media	FSC, FSU	Interchange

5.2.1.1 Real-World Activities

5.2.1.1.1 Activity “Browse Directory Information”

The DICOM Archive application acts as FSR using the interchange option when requested to read the media directory.

The DICOM archive application will read the DICOMDIR and insert those directory entries that are valid for the application profiles supported, into a local database. The database can then be used for browsing media contents.

Note: Icon Image Sequence is also supported in DICOMDIR. But only those Icon Images with Bits Allocated (0028,0100) equal to 8 and size of 64x64 or 128x128 pixels are imported into the database and are visible in the Browser.

5.2.1.1.2 Activity “Import into Local Storage”

The DICOM Archive application acts as FSR using the interchange option when being requested to read SOP Instances from the media into the local storage.

The SOP Instance(s) selected from the media directory will be copied into the local storage. Only SOP Instances, that are valid for the application profile, can be retrieved from Media Storage.

For media conforming to the STD-GEN-xxx Profile the following SOP Classes will be supported as FSR:

Table 53 - STD-GEN-xxx profile supported SOP Classes

Information Object Definition	Transfer Syntax UID
Any image SOP Class detailed in “” section „Transfer (Image SOP Class)“.	Explicit VR Little Endian 1.2.840.10008.1.2.1

5.2.1.1.3 Activity “Export to Local Archive Media”

The DICOM Archive application acts as FSU (for media with existing DICOM file-set) or FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local storage to local Archive Media.

The DICOM Archive application will receive a list of SOP Instances to be copied to the local archive media. According to the state of the media inserted (new media, Media with DICOM file-set) the validity of the SOP Instances according to the applicable profile is checked. Only valid SOP Instances are accepted.

For media conforming to the STD-GEN-xxx Profile the following SOP Classes will be supported as FSC:

Table 54 - STD-GEN-xxx profile supported SOP Classes

Information Object Definition	Transfer Syntax UID
Any image SOP Class detailed in “” section „Transfer (Image SOP Class)“	Explicit VR Little Endian 1.2.840.10008.1.2.1 JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70

5.2.1.2 SOP Classes and Transfer Syntaxes

5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

5.3.1 Augmented Application Profiles

n.a

5.4 MEDIA CONFIGURATION

5.4.1 Single- / Multi-Session CD burning

Please refer to most recent Service / Configuration documentation of MAMMOMAT Revelation for changing between the single-session and multi-session recording modes.

5.4.2 “Viewer on CD”

Syngo FastView as application that is included onto the media as part of the “Viewer on CD” feature.

5.4.3 Auto Labeling

Please refer to most recent Service / Configuration documentation of MAMMOMAT Revelation for activating the auto-labeling of CD media to avoid the label inquiry dialog when using automatic media export. The auto-labeling can be activated with the “Viewer on CD” feature being implicitly checked or not.

6 Support of Extended Character Sets

The MAMMOMAT Revelation DICOM application supports the following character sets as defined in the four tables below:

Table 55 - Supported Single-Byte Character Sets (w/o Code Ext.)

Character Set Description	Defined Term	ISO registration number	Character Set
Default repertoire	none	ISO_IR 6	ISO 646:
Latin alphabet No. 1	ISO_IR 100	ISO_IR 100 ISO_IR 6	Supplementary set ISO 646:
Latin alphabet No. 2	ISO_IR 101	ISO_IR 101 ISO_IR 6	Supplementary set ISO 646
Latin alphabet No. 3	ISO_IR 109	ISO_IR 109 ISO_IR 6	Supplementary set ISO 646
Latin alphabet No. 4	ISO_IR 110	ISO_IR 110 ISO_IR 6	Supplementary set ISO 646
Cyrillic	ISO_IR 144	ISO_IR 144 ISO_IR 6	Supplementary set ISO 646
Arabic	ISO_IR 127	ISO_IR 127 ISO_IR 6	Supplementary set ISO 646
Greek	ISO_IR 126	ISO_IR 126 ISO_IR 6	Supplementary set ISO 646
Hebrew	ISO_IR 138	ISO_IR 138 ISO_IR 6	Supplementary set ISO 646
Latin alphabet No. 5	ISO_IR 148	ISO_IR 148 ISO_IR 6	Supplementary set ISO 646
Japanese	ISO_IR 13	ISO_IR 13 ISO_IR 14	JIS X 0201: Katakana JIS X 0201: Romaji

Table 56 - Supported Single-Byte Character Sets (with Code Ext.)

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence registration number	ISO	Character Set
Default repertoire	ISO 2022 IR 6	ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.1	ISO 2022 IR 100	ISO 2022 ISO 2022	ESC 02/13 04/01 ESC 02/08 04/02	ISO-IR 100 ISO-IR 6	Supplementary set ISO 646
Latin alphabet No.2	ISO 2022 IR 101	ISO 2022 ISO 2022	ESC 02/13 04/02 ESC 02/08 04/02	ISO-IR 101 ISO-IR 6	Supplementary set ISO 646
Latin alphabet No.3	ISO 2022 IR 109	ISO 2022 ISO 2022	ESC 02/13 04/03 ESC 02/08 04/02	ISO-IR 109 ISO-IR 6	Supplementary set ISO 646
Latin alphabet No.4	ISO 2022 IR 110	ISO 2022 ISO 2022	ESC 02/13 04/04 ESC 02/08 04/02	ISO-IR 110 ISO-IR 6	Supplementary set ISO 646
Cyrillic	ISO 2022 IR 144	ISO 2022 ISO 2022	ESC 02/13 04/12 ESC 02/08 04/02	ISO-IR 144 ISO-IR 6	Supplementary set ISO 646
Arabic	ISO 2022 IR 127	ISO 2022 ISO 2022	ESC 02/13 04/07 ESC 02/08 04/02	ISO-IR 127 ISO-IR 6	Supplementary set ISO 646
Greek	ISO 2022 IR 126	ISO 2022 ISO 2022	ESC 02/13 04/06 ESC 02/08 04/02	ISO-IR 126 ISO-IR 6	Supplementary set ISO 646

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence registration number	ISO	Character Set
Hebrew	ISO 2022 IR 138	ISO 2022 ISO 2022	ESC 02/13 04/08 ESC 02/08 04/02	ISO-IR 138 ISO-IR 6	Supplementary set ISO 646
Latin alphabet No.5	ISO 2022 IR 148	ISO 2022 ISO 2022	ESC 02/13 04/13 ESC 02/08 04/02	ISO-IR 148 ISO-IR 6	Supplementary set ISO 646
Japanese	ISO 2022 IR 13	ISO 2022 ISO 2022	ESC 02/09 04/09 ESC 02/08 04/10	ISO-IR 13 ISO-IR 14	JIS X 0201: Katakana JIS X 0201-1976: Romaji

Table 57 - Supported Multi-Byte Character Sets (w/o Code Ext.)

Character Set Description	Defined Term	ISO registration number	Character Set
Unicode	ISO_IR 192	ISO 10646	Unicode in UTF-8
Chinese	GB18030	GB18030	GB 18030-2000 (China Association for Standardization)

Table 58 - Supported Multi-Byte Character Sets (with Code Ext.)

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence registration number	ISO	Character Set
Japanese	ISO 2022 IR 87 ISO 2022 IR 159	ISO 2022 ISO 2022	ESC 02/04 04/02 ESC 02/04 02/08 04/04	ISO-IR 87 ISO-IR 159	JIS X 0208: Kanji JIS X 0212: Supplementary Kanji set
Chinese	ISO 2022 IR 58	ISO 2022	ESC 02/04 04/01	ISO-IR 58	GB2312-80 (China Association for Standardization)

When there is a mismatch between the Specific Character Set tag (0008,0005) and the characters in an IOD received by the system, then the following measures are taken to make the characters DICOM conform:

- Try to import with ISO_IR 100. If ISO_IR 100 fails, convert each illegal character to a'?'.

  There are now three categories of character sets which have to be differentiated because of their different encoding formats:

  - Conventional ISO character sets: ISO_IR 6, ISO 2022 IR 6, ISO_IR 100, etc.
    ➔ encoded in ISO 2022
  - ISO IR_192 à encoded in UTF-8
  - GB18030 à encoded in GB18030

It is not possible to recognize the following mismatches automatically on receiving or importing:

- An attribute value is encoded in ISO_IR 192 ß à (0008,0005) contains a conventional ISO character set as primary character set.
- An attribute value is encoded in GB18030 ß à (0008,0005) contains a conventional ISO character set as primary character set.
- An attribute value is encoded in ISO 2022 ß à (0008,0005) contains ISO_IR 192.
- An attribute value is encoded in ISO 2022 ß à (0008,0005) contains GB18030

An IOD that contains one of the above-mentioned inconsistencies is not DICOM conform. As these kinds of inconsistencies cannot be recognized by the system, the IOD will not be rejected but the character data might not be displayed as intended.

7 Attribute confidentiality profiles

7.1 De-identification

The MAMMOMAT Revelation application can de-identify attributes using three different levels. During export to filesystem it is the user responsibility to select the appropriate anonymization level. For full and reduced anonymization, private attributes are not included in anonymized Studies. For service anonymization all private attributes are included in anonymized Studies.

8 Security

8.1 Security Profiles

The MAMMOMAT Revelation conforms to the Basic TLS Transport Connection Profile supporting TLS Protocol V1.0, V1.1 and V1.2(preferred) and following types of X.509 certificates:

- Self-Signed certificate
- Certificate for which chain building (Trusted chain building, Trusted CA) is possible

The X.509 certificate imported and used for DICOM communication must have purpose set for Client and Server Authentication and must be exportable to generate the certificate file and private key file. If intermediate and root X.509 certificates are present the intermediate certificate must be imported to Intermediate Certificate Authorities -> Certificates. The root certificate must be imported to the Trusted Root Certificates -> Certificates.

The MAMMOMAT Revelation offers following cipher suite options:

- TLS_RSA_WITH_AES_128_CBC_SHA
- TLS_RSA_WITH_3DES_EDE_CBC_SHA

NOTE: NULL Cipher (TLS_RSA_WITH_NULL_SHA) is not supported.

8.2 Association Level Security

When “trusted host functionality” is enabled, the MAMMOMAT Revelation only accepts DICOM communication from other AE if the related System is configured with its hostname, port and AET.

8.3 Application Level Security

The MAMMOMAT Revelation supports security through the firewall of the underlying operating system active. The port in which the application acts as SCP for secure DICOM communication is 2762 (fixed). The port in which the application acts as SCP for unsecure DICOM communication is 104 (fixed).

9 Annexes

9.1 IOD Contents

9.1.1 Created SOP Instances

Abbreviations for “Presence of Value”:

ALWAYS	Attribute always present with a value
ANAP	Attribute not always present
EMPTY	Attribute is sent without a value (zero length)
VNAP	Attribute value not always present (zero length if no value is present)

Abbreviations for “Source”:

AUTO	Attribute value is generated automatically
CONFIG	Attribute value source is a configurable parameter
MWL	Attribute value is the same as the value received from source Modality Worklist
MPPS	Attribute value is the same as that use for Modality Performed Procedure Step
USER	Attribute value source is from User input

9.1.1.1 Digital Mammography X-Ray Image IOD

The MAMMOMAT Revelation system will create images during acquisition and with post processing applications. Those will be encoded as MG Standard Extended SOP Class.

Synthetic Insight 2D images generated during a Tomosynthesis examination are also encoded as MG Standard Extended SOP Class.

Insight CEM images are calculated 2D MG images created during Contrast Enhanced Mammography.

Table 59 – Digital Mammography IOD Module

IE	Module	Ref. [1]	Defined in Table	Presence of Module
Patient	Patient	C.7.1.1	Table 60 – Patient Module	ALWAYS
Study	General Study	C.7.2.1	Table 61 – General Study Module	ALWAYS
	Patient Study	C.7.2.2	Table 62 – Patient Study Module	ALWAYS
Series	General Series	C.7.3.1	Table 63 – General Series Module	ALWAYS
	DX Series	C.8.11.1	Table 64 – DX Series Module	ALWAYS
	Mammography Series	C.8.11.6	Table 65 –Mammography Series Module	ALWAYS
Frame of Reference	Frame of Reference	C.7.4.1	Table 66 – Frame of Reference Module	ANAP
Equipment	General Equipment	C.7.5.1	Table 67 – General Equipment Module	ALWAYS
Image	General Image	C.7.6.1	Table 68 – General Image Module	ALWAYS
	General Reference	C.12.4	Table 69 – General Reference Module	ALWAYS
	Image Pixel	C.7.6.3	Table 70 – Image Pixel Module	ALWAYS
	Contrast/Bolus	C.7.6.4	Table 71 – Contrast/ Bolus Module	ANAP
	DX Anatomy Image	C.8.11.2	Table 72 – DX Anatomy Imaged Module	ALWAYS
	DX Image	C.8.11.3	Table 73 – DX Image Module	ALWAYS
	DX Detector	C.8.11.4	Table 74 – DX Detector Module	ALWAYS
	DX Positioning	C.8.11.5	Table 75 – DX Positioning Module	ALWAYS
	X-Ray Acquisition Dose	C.8.7.8	Table 76 – X-Ray Acquisition Dose Module	ALWAYS
	X-Ray Generation	C.8.7.9	Table 77 – X-Ray Generation Module	ALWAYS
	X-Ray Filtration	C.8.7.10	Table 78 – X-Ray Filtration module	ALWAYS
	X-Ray Grid	C.8.7.11	Table 79 – X-Ray Grid Module	ALWAYS
	Mammography Image	C.8.11.7	Table 80 – Mammography Image Module	ALWAYS
	Overlay Plane	C.9.2	Table 81 – Overlay Plane	ANAP
	VOI LUT	C.11.2	Table 82 – VOI LUT	ANAP
	Acquisition Context	C.7.6.14	Table 83 – Acquisition Context Module	ALWAYS
	SOP Common	C.12.1	Table 84 – SOP Common Module	ANAP
Extended Attrib utes	Extended Attributes	n.a.	Table 85 – Extended Attributes	ALWAYS
Private Tags	Private Tags	n.a.	Table 137 - Data Dictionary of Private Attributes	ALWAYS

Table 60 – Patient Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	RIS or "Patient Name" input	ALWAYS	MWL / USER / MPPS
Patient ID	(0010,0020)	LO	RIS or "Patient ID" input	ALWAYS	MWL / USER / MPPS
Patient's Birth Date	(0010,0030)	DA	RIS or checked "Date of Birth" input	ALWAYS	MWL / USER/ MPPS
Patient's Sex	(0010,0040)	CS	RIS or input (M or F or O/unknown)	ALWAYS	MWL / USER/ MPPS
Other Patient IDs	(0010,1000)	LO	From RIS / Social Security Number	ANAP	MWL / USER

Attribute Name	Tag	VR	Value	Presence of Value	Source
> Patient ID	(0010,0020)	LO	RIS or Input	ANAP	MWL / USER
> Issuer of Patient ID	(0010,0021)	LO	RIS or Input	ANAP	MWL / USER
Other Patient Names	(0010,1001)	PN	From RIS	ANAP	MWL
Ethnic Group	(0010,2160)	SH	From RIS or Input	ANAP	MWL
Patient Comments	(0010,4000)	LT	“Additional Info”	ANAP	MWL/USER
Military Rank	(0010,1080)	LO	From RIS or Input	ANAP	MWL

Table 61 – General Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	From RIS or system generated	ALWAYS	MWL / AUTO
Study Date	(0008,0020)	DA	<yyyymmdd>	ALWAYS	AUTO
Study Time	(0008,0030)	TM	<hhmmss>	ALWAYS	AUTO
Referring Physician’s Name	(0008,0090)	PN	RIS or input	VNAP	MWL / USER
Study ID	(0020,0010)	SH	From RIS Requested Procedure ID or system created	ALWAYS	MWL / USER / AUTO / MPPS
Accession Number	(0008,0050)	SH	RIS or “Accession No.” input	VNAP	MWL / USER
Study Description	(0008,1030)	LO	Procedure name mapped from Requested Procedure Description (0032,1060) from Modality Work-list	ALWAYS	MWL / AUTO
Requesting Physician	(0032,1032)	PN	From RIS	ANAP	MWL
Referenced Study Se quence	(0008,1110)	SQ	From RIS	ANAP	MWL
>Referenced SOP Class UID	(0008,1150)	UI	From RIS	ANAP	MWL
>Referenced SOP Instance UID	(0008,1155)	UI	From RIS	ANAP	MWL
Procedure Code Sequence	(0008,1032)	SQ	Requested Procedure Code Sequence (0032,1064) from Modality Worklist or con-figured Code	ANAP	MWL / AUTO / MPPS
>Code Value	(0008,0100)	SH	Screening: R-42453 Diagnostic: R-408C3 Calibration: W-0001 Phantom: 113680	ANAP	MWL / AUTO / MPPS
>Coding Scheme Designator	(0008,0102)	SH	Screening: SRT Diagnostic: SRT Calibration: 199SMS_SPWH Phantom: DCM	ANAP	MWL / AUTO / MPPS

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Coding Scheme Version	(0008,0103)	SH	From RIS	ANAP	MWL / AUTO / MPPS
>Code Meaning	(0008,0104)	SH	From RIS	ANAP MPPS	MWL / AUTO /
Reason for Performed Procedure Code Sequence	(0040,1012)	SQ	RIS or Input	ALWAYS	MWL / USER
>Coding Scheme Designa-or	(0008,0102)	SH	RIS or Input	ANAP	MWL / AUTO / MPPS
>Coding Scheme Version	(0008,0103)	SH	RIS or Input	ANAP	MWL / AUTO / MPPS
>Code Meaning	(0008,0104)	SH	RIS or Input	ANAP	AUTO

Table 62 – Patient Study Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Admitting Diagnosis Description	(0008,1080)	LO	"Admitting Diagnosis"	ANAP	MWL
Patient's Age	(0010,1010)	AS	Calculated from "Date of Birth" input	ALWAYS	AUTO
Patient's Size	(0010,1020)	DS	Patient's height in meters	ANAP	MWL / USER
Patient 's Weight	(0010,1030)	DS	(in kilograms)	ANAP	MWL / USER
Additional Patient History	(0010,21B0)	LT	From RIS	ANAP	MWL

Table 63 – General Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	See Table 64 – DX Series Module OR Table 89 – Enhanced Mammography Series	..	..
Series Instance UID	(0020,000E)	UI	generated	ALWAYS	AUTO
Series Number	(0020,0011)	IS	generated	ALWAYS	AUTO
Laterality	(0020,0062)	CS	Generated	ALWAYS	AUTO
Series Date	(0008,0021)	DA	<yyyymmdd>	ALWAYS	AUTO
Series Time	(0008,0031)	TM	<hhmmss.xxxxxx>	ALWAYS	AUTO
Performing Physician's Name	(0008,1050)	PN	Performing Physician	ANAP	MWL / USER
Protocol Name	(0018,1030)	LO	MG Image: MAMMOGRAM Stereo Image STEREO TOMO scan: TOMO_PROJ TOMO slices: TOMO Synthetic Mammogram: INSIGHT_2D Rotating mammogram: INSIGHT_3D Insight CEM: COMBINED	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Series Description	(0008,103E)	LO	See Below	ALWAYS	USER / AUTO
MG Images FOR PROCESSING MAMMOGRAM_raw, <purpose> MG Images FOR PRESENTATION MAMMOGRAM, <purpose> CT Object Tomosynthesis Projections FOR PROCESSING T_PR_raw <Laterality> + <Projection View>, <purpose> CT Object Tomosynthesis Projections FOR PRESENTATION T_PR< Laterality> + <Projection View>, <purpose> BTO Reconstructed slices BTO_TOMO <Laterality> + <Projection View>, < RPG Name>, <purpose> CTO Reconstructed slices TOMO <Laterality> + <Projection View>, < RPG Name>, <purpose> Synthetic 2D INSIGHT 2D <Laterality> + <Projection View>, <purpose> Rotating Mammogram CTO INSIGHT 3D < Laterality> + <Projection View>, <purpose> Rotating Mammogram BTO BTO_INSIGHT 3D < Laterality> + <Projection View>, <purpose> MG TiCEM images FOR PROCESSING TiCEM_raw <Laterality> + <Projection View>, <purpose> MG TiCEM images FOR PRESENTATION TiCEM <Laterality> + <Projection View>, <purpose> Insight CEM images Insight CEM <Laterality> + <Projection View>, <purpose> CTO Biopsy Scout Reconstruction TOMO <Laterality> + <Projection View> SC, <RPG Name>, <purpose> BTO Biopsy Scout Reconstruction BTO_TOMO <Laterality> + <Projection View> SC, <RPG Name>, <purpose> CTO Biopsy Scout Projections FOR PROCESSING T_PR_raw <Laterality> + <Projection View> SC, <purpose> CTO Biopsy Scout Projections FOR PRESENTATION T_PR <Laterality> + <Projection View> SC, <purpose> Where Purpose is Screening or Diagnostic					
Operator's Name	(0008,1070)	PN	"Operator 1" /" Operator 2" input	ANAP	USER
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	See Table 64 – DX Series / Mammography Series Module	..	..
>Referenced SOP Class UID	(0008,1150)	UI	See Table 64 – DX Series / Mammography Series Module	..	..
>Referenced SOP Instance UID	(0008,1155)	UI	See Table 64 – DX Series / Mammography Series Module	..	..
Body Part examined	(0018,0015)	IS	BREAST	ALWAYS	AUTO
Request Attributes Sequence	(0040,0275)	SQ	From RIS	ANAP	MWL
>Requested Procedure ID	(0040,1001)	SH	From RIS or "Request ID" input	ANAP	MWL / USER
Requested Procedure Description	(0032,1060)	LO	From RIS	ANAP	MWL

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Requested Procedure Code Sequence	(0032,1064)	SQ	From RIS	ANAP	MWL
>>Code Value	(0008,0100)	SH	From RIS	ANAP	MWL
>>Coding Scheme Designator	(0008,0102)	SH	From RIS	ANAP	MWL
>>Coding Scheme Version	(0008,0103)	SH	From RIS	ANAP	MWL
>>Code Meaning	(0008,0104)	LO	From RIS	ANAP MWL	
>Reason for requested Procedure Code Sequence	(0040,100A)	SQ	From RIS	ANAP	MWL
>>Code Value	(0008,0100)	SH	From RIS	ANAP	MWL
>>Coding Scheme Designa-or	(0008,0102)	SH	From RIS	ANAP	MWL
>>Coding Scheme Version	(0008,0103)	SH	From RIS	ANAP	MWL
>>Code Meaning	(0008,0104)	LO	From RIS	ANAP	MWL
>Scheduled Proced-ure Step ID	(0040,0009)	SH	From RIS	ANAP	MWL
>Scheduled Proced-ure Step Description	(0040,0007)	LO	From RIS	ANAP	MWL
>Scheduled Protocol Code Sequence	(0040,0008)	SQ	From RIS	ANAP	MWL
>> Code Value	(0008,0100)	SH	From RIS	ANAP	MWL
>> Coding Scheme Designator	(0008,0102	SH	From RIS	ANAP	MWL
>> Coding Scheme Version	(0008,0103)	SH	From RIS	ANAP	MWL
>>Coding Meaning	(0008,0104)	SH	From RIS	ANAP	MWL
Performed Procedure Step ID	(0040,0253)	SH	Supplied, even if MPPS SOP Class is not supported, “MGyyyymmddhhmmss” is set with 1st Image acquired	ALWAYS	AUTO/ MPPS
Performed Procedure Step Start Date	(0040,0244)	DA	supplied, even if MPPS SOP Class is not supported	ALWAYS	AUTO/ MPPS
Performed Procedure Step Start Time	(0040,0245)	TM	supplied, even if MPPS SOP Class is not supported	ALWAYS	AUTO/ MPPS
Performed Procedure Step Description	(0040,0254)	LO	Value of Study Description	ALWAYS	AUTO/ MPPS
Performed Protocol ode Sequence	(0040,0260)	SQ	Same as (0040,0275), (0040,0008)	ANAP	MWL/ MPPS
>Code Value	(0008,0100)	SH	From RIS	ANAP	MWL
>Coding Scheme Designator	(0008,0102)	SH	From RIS	ANAP	MWL
>Coding Scheme Version	(0008,0103)	SH	From RIS	ANAP	MWL

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Code Meaning	(0008,0104)	LO	From RIS	ANAP	MWL
Comments on the per-ormed Procedure Step	(0040,0280)	ST	From RIS	ANAP	MWL

Table 64 – DX Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	See Table 65 –Mammography Series Module	..	..
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	From RIS	ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	From RIS	ALWAYS	AUTO
>Referenced SOP In-stance UID	(0008,1155)	UI	From RIS	ALWAYS	AUTO
Presentation Intent Type	(0008,0068)	CS	Original Image: FOR PROCESSING Derived Image: FOR PRESENTATION Generated 2D: For Presentation	ALWAYS	AUTO

Table 65 – Mammography Series Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	MG	ALWAYS	AUTO / MPPS

Table 66 – Frame of Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame of Reference UID	(0020,0052)	UI	Insight 2D: MAMMO BTO: Generated	VNAP	AUTO
Positioner Reference Indicator	(0020,1040)	LO	Insight 2D: MAMMO BTO: Empty	VNAP	Auto

Table 67 – General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	SIEMENS	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	RIS or “Institution Name” input	ALWAYS	MWL / USER / CONFIG
Institution address	(0008,0081)	ST	From configuration	ALWAYS	CONGIG
Station Name	(0008,1010)	SH	from Configuration hostname	ALWAYS	CONFIG
Institutional Department Name	(0008,1040)	LO	From configuration	ALWAYS	AUTO
Manufacturer’s Model Name	(0008,1090)	LO	MAMMOMAT Revelation	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO	<modality serial number>	ALWAYS	AUTO
Software Version	(0018,1020)	LO	<version>	ALWAYS	AUTO
Date of last calibration	(0018,1200)	DA	See (0018,700C) Date of Last Detector Calibration	ALWAYS	AUTO
Time of last calibration	(0018,1201)	TM	See (0018,700E) Time of Last Detector Calibration	ALWAYS	AUTO
Pixel Padding Value	(0028,0120)	US	0 or 2 Bits Stored – 1	ALWAYS	AUTO

Table 68 – General Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Generated	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	Patient direction of the rows and columns of the image	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date of Creation	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time of Creation	ALWAYS	AUTO
Image Type	(0008,0008)	CS	See Table 79 – Image Type/ Frame Type		
Acquisition Number	(0020,0012)	IS	generated	ALWAYS	AUTO
Acquisition Date	(0008,0022)	DA	Date of Original Acquisition (X-Ray event)	ALWAYS	AUTO
Acquisition Time	(0008,0032)	TM	Time of Original Acquisition (X-Ray event)	ALWAYS	AUTO
Images in Acquisition	(0020,1002)	IS	Generated, Number of images in the series For Tomo Slices: Number of slices in the series For Tomo Projections: Number of Projections in the series (=26) For Rotating Mammogram: Number of images in the series	ALWAYS	AUTO
Image Comments	(0020,4000)	LT	Anytime: Entered in UI Insight 2D: INSIGHT 2D Insight Breast Density configured: INBD Grade or Reject Information TiCEM: Time since Injection if configured (TsI:x:y min:sec) Biopsy: Spacer Plate (If configured)	VNAP	USER
Quality Control Image	(0028,0300)	CS	YES or NO	ALWAYS	USER / AUTO
Burned In Annotation	(0028,0301)	CS	"NO"	ALWAYS	AUTO
Lossy Image Compres-ion	(0028,2110)	CS	If none or Lossless compression: "00", If USER configured Lossy: "01"	ALWAYS	AUTO
Irradiation Event UID	(0008,3010)	UI	Generated	ALWAYS	AUTO

Table 69 – General Reference Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Referenced Image Se-uence	0008,1140	SQ	Non-STEREO image: Not existing STEREO original Image: SOP Class/ Instance UID of attached stereo pair image STEREO derived Image: SOP Class/ Instance UID its stereo pair derived image	ANAP	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	Class UID	ANAP	AUTO
>Referenced SOP Instance UID	(0008,1151)	UI	Instance UID	ANAP	AUTO
Derivation Description	(0008,2111)	ST	CT: Table 73 – DX Image Module CT: Table 88 – Extended Attributes for CT Object	..	..
Source Image Sequence	(0008,2112)	SQ	FOR PROCESSING image: Not applicable FOR PRESENTATION image: Reference FOR PRO-CESSING image Insight 2D: References all projection images (FOR_PROCESSING) Insight 3D: References all projection images (FOR_PROCESSING) Tomo slices: References all projection images (FOR_PROCESSING)	ANAP	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	Class UID	ANAP	AUTO
>Referenced SOP Instance UID	(0008,1155)	UI	Instance UID	ANAP	AUTO
>Spatial Locations Pre-served	(0028,135A)	UI	FOR_PRESENTATION image: “YES”	ANAP	AUTO

Table 70 – Image Pixel Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	MONOCHROME1| MONOCHROME2	ALWAYS	AUTO
Rows	(0028,0010)	US	Paddle and mode specific	ALWAYS	AUTO
Columns	(0028,0011)	US	Paddle and mode specific	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	14 | 12	ALWAYS	AUTO
High Bit	(0028,0102)	US	13 | 11	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO
Pixel Aspect Ratio	(0028,0034)	IS	Default: not set 1:1 can be configured	ANAP	AUTO
Pixel Data	(7FE0,0010)	OW	Pixel data	ALWAYS	AUTO

Table 71 – Contrast/ Bolus Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contrast/Bolus Agent	(0018,0010)	LO	For TiCEM: Contrast Agent name Otherwise: Empty	VNAP	AUTO
Contrast/Bolus Volume	(0018,1041)	DS	For TiCEM: Volume injected in milliliters of diluted contrast agent Otherwise: Not existing	ANAP	AUTO
Contrast/Bolus Start Time	(0018,1042)	TM	For TiCEM: Time of start of injection Otherwise: Not existing	ANAP	AUTO
Contrast Flow Rate	(0018,1046)	DS	For TiCEM: Flow Rate(s) of injec-tion(s) in milliliters/sec Otherwise: Not existing	ANAP	AUTO
Contrast/Bolus Ingredient	(0018,1048)	CS	For TiCEM: Active ingredient of agent. Defined Terms: IODINE GADOLINIUM CARBON DIOXIDE BARIUM Otherwise: Not existing	ANAP	AUTO
Contrast/Bolus Ingredient: Concentration	(0018,1049)	DS	For TiCEM: Milligrams of active ingredient per milliliter of (diluted) agent Otherwise: Not existing	ANAP	AUTO

Table 72 – DX Anatomy Imaged Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Laterality	(0020,0062)		See Table 80 – Mammography Image Module	..	..
Anatomic Region Sequence	(0008,2218)		See Table 80 – Mammography Image Module	..	..
>'Code Sequence Macro' for Anatomic Region Sequence			See Table 80 – Mammography Image Module	..	..

Table 73 – DX Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	See Table 68 – General Image Module	..	..
Samples per Pixel	(0028,0002)	US	See Table 70 – Image Pixel Module	..	..
Photometric Interpretation	(0028,0004)	CS	See Table 70 – Image Pixel Module	..	..
Bits Allocated	(0028,0100)	US	See Table 70 – Image Pixel Module	..	..
Bits Stored	(0028,0101)	US	See Table 70 – Image Pixel Module	..	..
High Bit	(0028,0102)	US	See Table 70 – Image Pixel Module	..	..
Pixel Representation	(0028,0103)	US	See Table 70 – Image Pixel Module	..	..
Pixel Data	(7FE0,0010)	OB-OW	See Table 70 – Image Pixel Module	..	..
Pixel Intensity Relationship	(0028,1040)	CS	LIN | LOG	ALWAYS	AUTO
Pixel Intensity Relationship Sign	(0028,1041)	SS	1 | -1	ALWAYS	AUTO
Rescale Intercept	(0028,1052)	DS	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	US	ALWAYS	AUTO
Presentation LUT Shape	(2050,0020)	CS	INVERS or IDENTITY	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	See Table 68 – General Image Module	..	..
Derivation Description	(0008,2111)		Original Image: Empty Derived Image IPPG name Synthetic Mammogram: RPG name with extension "(2D)", Example: Empire (2D)	ALWAYS	AUTO
Acquisition Device Processing Description	(0018,1400)	LO	Same as (0028,2111) Derivation Description	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	See Table 68 – General Image Module	..	..
Calibration Image	(0050,0004)	CS	Yes or NO	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Burned In Annotation	(0028,0301)	CS	See Table 68 – General Image Module	..	..
VOI LUT Sequence	(0028,3010)	SQ	See Table 82 – VOI LUT	..	..
>LUT Descriptor	(0028,3002)	VR	See Table 82 – VOI LUT	..	..
>LUT Explanation	(0028,3003)	LO	See Table 82 – VOI LUT	..	..
>LUT data	(0028,3006) US-OW	See Table 82 – VOI LUT		..	..
Window Center	(0028,1050)	DS	Depending on Image processing	ALWAYS	AUTO / USER
Window Width	(0028,1051)	DS	Depending on Image processing	ALWAYS	AUTO / USER
Window Center and Width Explanation	(0028,1055)	LO	Linear LUT	ALWAYS	AUTO

Table 74 – DX Detector Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Type	(0018,7004)	CS	SCINTILLATOR | DIRECT	ALWAYS	AUTO
Detector Configuration	(0018,7005)	CS	AREA	ALWAYS	AUTO
Detector Description	(0018,7006)	LT	<descriptive text>	ALWAYS	AUTO
Detector Mode	(0018,7008)	LT	Mode description	ALWAYS	AUTO
Detector ID	(0018,700A)	SH	Factory Serial Number	ALWAYS	AUTO
Date of Last Detector Calibration	(0018,700C)	DA	<yyyymmdd>	ALWAYS	AUTO
Time of Last Detector Calibration	(0018,700E)	TM	<hhmmss>	ALWAYS	AUTO
Exposures on detector since last Calibration	(0018,7010)	IS	<number>	ALWAYS	AUTO
Exposures on Detector since manufactured	(0018,7011)	IS	<number>	ALWAYS	AUTO
Detector time since last Exposure	(0018,7012)	DS	<Time in seconds>	ALWAYS	AUTO
Detector Binning	(0018,701A)	DS	1\1	ALWAYS	AUTO
Detector Conditions Nominal Flag	(0018,7000)	CS	YES NO, if user was notified	ALWAYS	AUTO
Detector Temperature	(0018,7001)	DS	<value>	ALWAYS	AUTO
Sensitivity	(0018,6000)		Manufacturer specific units when available	ANAP AUTO	
Detector Element Physical Size	(0018,7020)	DS	0.085\0.085	ALWAYS	AUTO
Detector Element Spacing	(0018,7022)	DS	0.085\0.085	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Active Shape	(0018,7024)	CS	RECTANGLE	ALWAYS	AUTO
Detector Active Dimension(s)	(0018,7026)	DS	mm	ALWAYS	AUTO
Detector Active Origin	(0018,7028)	DS	0\0	ALWAYS	AUTO
Detector Active Time	(0018,7014)	DS	< Time in ms>	ALWAYS	AUTO
Detector Activation Offset from Exposure	(0018,7016)	DS	0	ALWAYS	AUTO
Field of View Shape	(0018,1147)	CS	RECTANGLE	ALWAYS	AUTO
Field of View dimension(s)	(0018,1149)		mm\mm	ALWAYS	AUTO
Field of View Origin	(0018,7030)	DS	<actual value>	ALWAYS	AUTO
Field of View Rotation	(0018,7032)	DS	“0”,”90”,”180” or “270”	ALWAYS	AUTO
Field of View Horizontal Flip	(0018,7034)	CS	“YES” or “NO”	ALWAYS	AUTO
Imager Pixel Spacing	(0018,1164)	DS	<row space, col space>(mm)	ALWAYS	AUTO
Pixel Spacing	(0028,0030)	DS	Default: not set Can be configured by Service	ANAP	AUTO
Pixel Data	(7FE0,0010)	OB-OW	See Table 70 – Image Pixel Module	..	..

Table 75 – DX Positioning Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
View Position	(0018,5101)	CS	Generated	ALWAYS	AUTO
View Code Sequence	(0054,0220)	SQ	See Table 80 – Mammography Image Module	..	..
Distance Source to Patient	(0018,1111)	DS	(mm) SOD	ALWAYS	AUTO
Distance Source to Detector	(0018,1110)	DS	(mm) SID	ALWAYS	AUTO / MPPS
Estimated Radiographic Magnification Factor	(0018,1114)	DS	<Ratio of SID/SOD>	ALWAYS	AUTO
Positioner Type	(0018,1508)	CS	See Table 80 – Mammography Image Module	..	..
Positioner Primary Angle	(0018,1510)	DS	See Table 80 – Mammography Image Module	..	..
Positioner Secondary Angle	(0018,1511)	DS	See Table 80 – Mammography Image Module	..	..
Detector Primary Angle	(0018,1530)	DS	Movement of the detector relative to X-Ray Source	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Detector Secondary Angle	(0018,1531)	DS	0	ALWAYS	AUTO
Table Type	(0018,113A)	CS	NONE	ALWAYS	AUTO
Table Angle	(0018,1138)	DS	0	ALWAYS	AUTO
Body Part Thickness	(0018,11A0)	DS	(mm)	ALWAYS	AUTO
Compression Force	(0018,11A2)	DS	(Newton)	ALWAYS	AUTO
Paddle Description	(0018,11A4)	LO	ID of Compression Paddle	ALWAYS	AUTO

Table 76 – X-Ray Acquisition Dose Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	KVP Insight CEM: Not available	VNNAP	AUTO
X-Ray Tube Current	(0018,1151)	IS	mA Insight CEM: Not available	VNAP	AUTO
X-Ray Tube Current in µA	(0018,8151)	DS	µA Insight CEM: Not available	VNAP	AUTO
Exposure Time	(0018,1150)	IS	<duration of x-Ray exposure>(ms)	ALWAYS	AUTO
Exposure Time in µs	(0018,8150)	DS	<time>	ALWAYS	AUTO
Exposure	(0018,1152)	IS	mAs Insight CEM: Not available	VNAP	AUTO
Exposure in µAs	(0018,1153)	IS	µAs Insight CEM: Not available	VNAP	AUTO
Distance Source to Detector	(0018,1110)	DS	See Table 75 – DX Positioning Module	..	..
Distance Source to Patient	(0018,1111)	DS	See Table 75 – DX Positioning Module	..	..
Body Part Thickness	(0018,11A0)	DS	See Table 75 – DX Positioning Module	..	..
Relative X-Ray Exposure	(0018,1405)	IS	Percentage value of maximum allowed dose Insight 2D: 0	ALWAYS	AUTO
Entrance Dose in dGy	(0040,0302)	US	Current value Insight 2D: 0	VNAP	AUTO/ MPPS
Entrance Dose in mGy	(0040,8302)	DS	Current value Insight 2D: 0	VNAP	AUTO/ MPPS
Distance Source to Entrance	(0040,0306)	DS	Current value	ALWAYS	AUTO/ MPPS
Comments on Radiaton Dose	(0040,0310)	LT	User defined Configuration possible to include calculated density values	VNAP	AUTO
Half Value Layer	(0040,0314)	DS	Current value	ALWAYS	AUTO
Organ Dose (dGy)	(0040,0316)	DS	Calculated according to Dance / Boone Insight 2D: 0	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Organ Exposed	(0040,0318)	CS	See Table 80 – Mammography Image Module	..	..
Anode Target Material	(0018,1191)	CS	TUNGSTEN	ALWAYS	AUTO
Filter Type	(0018,1160)	SH	STRIP	ALWAYS	AUTO
Filter Material	(0018,7050)	CS	TITANIUM or RHODIUM Insight CEM: TITANIUM and RHODIUM	ALWAYS	USER / AUTO
Filter Thickness Minimum	(0018,7052)	DS	Rhodium: 0.05 Titanium: 1.0 Note: in mm	ALWAYS	AUTO
Filter Thickness Maximum	(0018,7054)	DS	Rhodium: 0.05 Titanium: 1.0 Note: in mm	ALWAYS	AUTO
Rectification Type	(0018,1156)	CS	CONST POTENTIAL	ALWAYS	AUTO

Table 77 – X-Ray Generation Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	See Table 76 – X-Ray Acquisition Dose Module	..	..
X-Ray Tube Current	(0018,1151)	IS	See Table 76 – X-Ray Acquisition Dose Module	..	..
X-Ray Tube Current in µA	(0018,8151)	DS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Exposure Time	(0018,1150)	IS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Exposure Time in µs	(0018,8150)	DS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Exposure	(0018,1152)	IS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Exposure in µAs	(0018,1153)	IS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Exposure Control Mode	(0018,7060)	CS	MANUAL or AUTOMATIC	ALWAYS	USER / AUTO
Exposure Control Mode Description	(0018,7062)	LT	Text description of the mechanism of Exposure Control.	ALWAYS	USER / AUTO
Exposure Status	(0018,7064)	CS	NORMAL or ABORTED	ALWAYS	AUTO
Focal Spot	(0018,1190)	DS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Anode Target Material	(0018,1191)	CS	See Table 76 – X-Ray Acquisition Dose Module	..	..
Rectification Type	(0018,1156)	CS	See Table 76 – X-Ray Acquisition Dose Module	..	..

Table 78 – X-Ray Filtration module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Filter Type	(0018,1160)	SH	See Table 78 – X-Ray Filtration module	..	..
Filter Material	(0018,7050)	CS	See Table 78 – X-Ray Filtration module	..	..
Filter Thickness Minimum	(0018,7052)	DS	See Table 78 – X-Ray Filtration module	..	..
Filter Thickness Maximum	(0018,7054)	DS	See Table 78 – X-Ray Filtration module	..	..

Table 79 – X-Ray Grid Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Grid	(0018,1166)	DS	Acquisition with grid: FOCUSED\ PARALLEL Acquisition w/o grid. Antiscatter correction algorithm applied: NONE\ PRIME Acquisition w/o grid: NONE	ALWAYS	AUTO

Table 80 – Mammography Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	See Table 68 – General Image Module	..	..
Distance Source to Detector	(0018,1110)	DS	See Table 75 – DX Positioning Module	ALWAYS	AUTO / MPPS
Distance Source to Patient	(0018,1111)	DS	See Table 75 – DX Positioning Module	ALWAYS	AUTO
Positioner Primary Angle	(0018,1510)	DS	Sign of value - from vertical to patient's right is positive	ALWAYS	AUTO
Positioner Primary Angle direction	(0018,9559)	DS	CW	ALWAYS	AUTO
Positioner Secondary Angle	(0018,1511)	DS	0	ALWAYS	AUTO
Image Laterality	(0020,0062)	CS	R / L / B	ALWAYS	USER
Organ Exposed	(0040,0318)	CS	BREAST	ALWAYS	AUTO
Implant Present	(0028,1300)	CS	YES or NO	ALWAYS	AUTO
Partial View	(0028,1350)	CS	NO	ALWAYS	AUTO
Positioner Type	(0018,1508)	CS	MAMMOGRAPHIC	ANAP AUTO	
View Code Sequence	(0054,0220)	SQ	One value defined in CID 4014: CC MLO ML LMO LM FB SIO		

Attribute Name	Tag	VR	Value	Presence of Value	Source
			XCC XCCL XCCM SPEC XCCL, XCCM and SPEC: Special encoding can be configured	ALWAYS	AUTO / USER
> Code Value	(0008,0100)		According to CID 4014	ALWAYS	AUTO
> Coding Scheme Designator	(0008,0102)		SNM 3 XCCL, XCCM and SPEC: SRT	ALWAYS	AUTO
> Code Meaning	(0008,0104)		According to CID 4014	ALWAYS	AUTO
>View Modifier Code Sequence	(0054,0222)	SQ	0 or one value as defined in CID 4015: Cleavage CV Axillary Tail AT Rolled Lateral, RL Rolled Medial, RM Rolled Inferior, RI Rolled Superior, RS Implant Displaced, ID Magnification, M Spot, S Tangential, TAN Normally set by user. S and M defined by paddle	VNAP	AUTO / USER
>> Code Value	(0008,0100)	SH	According to CID 4015	VNAP	AUTO / USER
>> Coding Scheme Designator	(0008,0102)	SH	SNM 3 RI, RS SRT	VNAP	AUTO / USER
>> Code Meaning	(0008,0104)	SH	According to CID 4015	VNAP	AUTO / USER
Anatomic Region Sequence	(0008,2218)	SQ	One item containing (T-0400, SNM3, “Breast”	ALWAYS	AUTO
> Code Value	(0008,0100)	SH	T-0400	ALWAYS	AUTO
> Coding Scheme Designator	(0008,0102)	SH	SNM3		
> Code Meaning	(0008,0104)	SH	Breast	ALWAYS	AUTO
Biopsy Target Sequence	(0018,2041)	SQ	For Biopsy: For each submitted target one item is stored	ANAP	AUTO
>Target UID	(0018,2042)	UI	Unique identifier for the target.	ANAP	AUTO
>Localizing Cursor Position	(0018,2043)	FL	Coordinates of localizing cursor position with respect to the pixel Equivalent to data stored in Overlay group	ANAP	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>Calculated Target Position	(0018,2044)	FL	The calculated target position (x, y, z) in mm	ANAP	AUTO
>Target Label	(0018,2045)	SH	a number starting with 1 for the first target.	ANAP	AUTO
>Displayed Z Value	(0018,2046)	FL	The z value in mm displayed to the user at the time of biopsy.	ANAP	AUTO
>Needle Info	(0023,xx01)	LO	Needle Type, Needle Gauge and Needle Length in mm,e.g. Type:Fine Gauge:0.7 Length: 100.0 See Table 138 - Private Modules	ANAP	AUTO

Table 81 – Overlay Plane

Attribute Name	Tag	VR	Value	Presence of Value	Source
Overlay Planes are present in Derived images where annotation have been stored and for derived biopsy images where targets have been stored. otherwise not present.					
Overlay Rows	(60xx,0010)	US	101	ANAP	AUTO
Overlay Columns	(60xx,0011)	US	101	ANAP	AUTO
Overlay Type	(60xx,0040)	CS	G	ANAP	AUTO
Overlay Origin	(60xx,0050)	SS	1\1	ANAP	AUTO
Overlay Bits Allocated	(60xx,0100)	US	1	ANAP	AUTO
Overlay Bit Position	(60xx,0102)	US	0	ANAP	AUTO
Overlay Data	(60xx,3000)	OB-OW	data	ANAP	AUTO
Overlay Description	(60xx,0022)	LO	Siemens MedCom Object Graphics	ANAP	AUTO

Table 82 – VOI LUT

Attribute Name	Tag	VR	Value	Presence of Value	Source
VOI LUT Sequence	(0028,3010)	SQ	0-10 VOI Luts depending on configuration	ANAP	AUTO
>LUT Descriptor	(0028,3002)	VR	<num of LUT entries>, <first pixel val mapped>, <Entry bits alloc>	ANAP	AUTO
>LUT Explanation	(0028,3003)	LO	<configured name>	ANAP	AUTO
>LUT data	(0028,3006)	US-OW	<array of data, accord.descriptor>	ANAP	AUTO

Table 83 – Acquisition Context Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Acquisition Context Sequence	(0040,0555)	SQ	Empty	VNAP AUTO	
Acquisition Context Description	(0040,0556)	ST	Text description	ALWAYS	AUTO

Table 84 – SOP Common Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	Digital Mammography X-Ray Image Storage – For Pres. 1.2.840.10008.5.1.4.1.1.1.2 Digital Mammography X-Ray Image Storage – For Proc 1.2.840.10008. 5.1.4.1.1.1.2.1 Secondary Capture Image Storage 1.2.840.10008.5.1.4.1.1.7 Breast Tomosynthesis Image Storage 1.2.840.10008.5.1.4.1.1.13.1.3 Breast Projection X-Ray Image Storage – For Pres. 1.2.840.10008.5.1.4.1.1.13.1.4 Breast Projection X-Ray Image Storage – For Proc. 1.2.840.10008.5.1.4.1.1.13.1.5 CT Image Storage 1.2.840.10008.5.1.4.1.1.2 X-Ray Radiation Dose SR Storage 1.2.840.10008.5.1.4.1.1.88.67 Mammography CAD SR Storage 1.2.840.10008.5.1.4.1.1.88.50	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Created	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	From Configuration / RIS	ALWAYS	MWL / CONFIG
Instance Number	(0020,0013)	IS	See Table 68 – General Image Module	ALWAYS	AUTO

Table 85 – Extended Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
SISOD Distance Source to Isocenter	(0018,9402)		Tomo projection images: Distance Source to Isocenter TUNGSTEN Anode: Value 608.8	VNAP	AUTO
Pixel Spacing	(0028,0030)		Insight 2D 0.089	VNAP	AUTO

9.1.1.2 CT Standard Extended SOP Classes

This chapter describes the CT Image object which is used to store reconstructed tomo slices and rotating mammogram images

IE	Module	Ref. [1]	Defined in Table	Presence of Module
Patient	Patient	C.7.1.1	Table 60 – Patient Module	ALWAYS
Study	General Study	C.7.2.1	Table 61 – General Study Module	ALWAYS
	Patient Study	C.7.2.2	Table 62 – Patient Study Module	ALWAYS
Series	General Series	C.7.3.1	Table 63 – General Series Module	ALWAYS
Frame of Reference	Frame of Reference	C.7.4.1	Table 66 – Frame of Reference Module	ANAP
Equipment	General Equipment	C.7.5.1	Table 67 – General Equipment Module	ALWAYS
Image	General Image	C.7.6.1	Table 68 – General Image Module	ALWAYS
	Image Plane	C.7.6.2	Table 86 – Image Plane Module	ALWAYS
	Image Pixel	C.7.6.3	Table 70 – Image Pixel Module	ALWAYS
	CT Image	C.8.2.1	Table 87 – CT Image Module	ALWAYS
	Overlay Plane	C.9.2	Table 81 – Overlay Plane	ANAP
	VOI LUT	C.11.2	Table 82 – VOI LUT	ANAP
	SOP Common	C.12.1	Table 84 – SOP Common Module	ANAP
	Extended Attributes	n.a.	Table 88 – Extended Attributes for CT Object	ALWAYS
	Private Tags	n.a.	Table 137 - Data Dictionary of Private Attributes	ALWAYS

MAMMOMAT Revelation creates reconstructed Tomosynthesis slices and synthetic Insight 3D rotational images stored as single frame CT Image.

Table 86 – Image Plane Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Spacing	(0028,0030)	DS	For Tomo Slices: 0.085/0.085 For rotating mammogram: Set to 0.089 / Estimated Radiographic Magnification Factor (0018,1114)	ALWAYS	AUTO
Image Orientation (Patient)	(0020,0037)	DS	Direction cosines of the first row and the first column with respect to the patient.	ALWAYS	AUTO
Image Position (Patient)	(0020,0032)	DS	The x, y, and z coordinates of the upper left-hand corner (center of the first voxel transmitted) of the frame, in mm.	ALWAYS	AUTO
Slice Thickness	(0018,0050)	DS	Slice Thickness in mm	ALWAYS	AUTO
Slice Location	(0020,1041)		Tomo Slices: Generated Insight 3D: 0	ALWAYS	AUTO

Table 87 – CT Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	See Table 68 – General Image Module	..	..
Samples per Pixel	(0028,0002)	US	See Table 70 – Image Pixel Module	..	..
Photometric Interpretation	(0028,0004)	US	See Table 70 – Image Pixel Module	..	..
Bits Allocated	(0028,0100)	US	See Table 70 – Image Pixel Module	..	..
Bits Stored	(0028,0101)	US	See Table 70 – Image Pixel Module	..	..
High Bit	(0028,0102)	US	See Table 70 – Image Pixel Module	..	..
Rescale Intercept	(0028,1052)	DS	0	ALWAYS	AUTO
Rescale Slope	(0028,1053)	DS	1	ALWAYS	AUTO
Rescale Type	(0028,1054)	LO	US	ALWAYS	AUTO
KVP	(0018,0060)	DS	KVP	ALWAYS	AUTO
Acquisition Number	(0020,0012)	IS	Slices: Starting with 1 Insight 3D: Starting with 1	ALWAYS	AUTO
Scan Options	(0018,0022)	CS	Number of Projections	ALWAYS	AUTO
Distance Source to Detector	(0018,1110)	DS	(mm) SID	ALWAYS	AUTO / MPPS
Distance Source to Patient	(0018,1111)	DS	(mm) SOD	ALWAYS	AUTO
Exposure Time	(0018,1150)	IS	<duration of X-Ray exposure>(ms)	ALWAYS	AUTO
X-Ray Tube Current	(0018,1151)	IS	(mA)	ALWAYS	AUTO
Exposure	(0018,1152)	IS	(mAs)	ALWAYS	AUTO
Exposure in µAs	(0018,1153)	IS	(µAs)	ALWAYS	AUTO
Filter Type	(0018,1160)	SH	Type of Filter	ALWAYS	AUTO
Focal Spot	(0018,1190)	DS	0.3	ALWAYS	AUTO
Convolution Kernel	(0018,1210)	SH	RPG	ALWAYS	AUTO

Table 88 – Extended Attributes for CT Object

The following Extended attributes are used if not otherwise stated.

Attribute Name	Tag	VR	Value	Presence of Value	Source
Anatomic Region Sequence	(0008,2218)	SQ	See content	ALWAYS	AUTO
> Code Value	(0008,0100)	SH	T-0400	ALWAYS	AUTO
> Coding Scheme Designator	(0008,0102)	SH	SNM3	ALWAYS	AUTO
> Code Meaning	(0008,0104)	SH	Breast	ALWAYS	AUTO
View Code Sequence	(0054,0220)	SQ	One value defined in CID 4014: CC MLO ML LMO LM FB SIO XCC XCCL XCCM SPEC XCCL, XCCM and SPEC: Special encoding can be configured	ALWAYS	AUTO / USER
View Modifier Code Sequence	(0054,0222)	SQ	0 or one value as defined in CID 4015: Cleavage CV Axillary Tail AT Rolled Lateral, RL Rolled Inferior, RI Rolled Superior, RS Implant Displaced, ID Magnification, M Spot, S Tangential, TAN Normally set by user. S and M defined by paddle	VNAP	AUTO / USER
Anode Target Material	(0018,1191)	CS	TUNGSTEN	ALWAYS	AUTO
Filter Material	(0018,7050)	CS	RHODIUM	ALWAYS	USER / AUTO
Body Part Thickness	(0018,11A0)	DS	(mm)	ALWAYS	AUTO
SISOD Distance to Isocenter	(0018,9402)	FL	AUTOMATIC	ALWAYS	AUTO
Window Center	(0028,1050)	DS	Defined by Reconstruction algorithm.	ALWAYS	AUTO / USER
Window Width	(0028,1051)	DS	Defined by Reconstruction algorithm.	ALWAYS	AUTO / USER
Image Laterality	(0020,0062)	CS	generated	ALWAYS	USER
Positioner Primary Angle	(0018,1510)	DS	Positioner Primary Angle	ALWAYS	AUTO
Positioner Primary Angle Direction	(0018,9559)	DS	Angle Direction	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Compression Force	(0018,11A2)	DS	(Newton)	ALWAYS	AUTO
Derivation Description	(0008,2111)	ST	Tomo Slices: RPG name Rotating mammogram: RPG name with extension “(3D)”, Example: Empire (3D)	ALWAYS	AUTO
Detector ID	(0018,700A)	SH	Factory Serial Number	ALWAYS	AUTO
Acquisition Context Description	(0040,0556)	ST	Text description	ALWAYS	AUTO
Implant Present	(0028,1300)	CS	YES or NO	ALWAYS	AUTO
Detector Temperature	(0018,7001)	DS	<value>	ALWAYS	AUTO
Filter Thickness Minimum	(0018,7052)	CS	Rhodium: 0.05 Titanium: 1.0 Note: in mm	ALWAYS	AUTO
Filter Thickness Maximum	(0018,7054)	DS	Rhodium: 0.05 Titanium: 1.0 Note: in mm	ALWAYS	AUTO
Exposure Control Mode	(0018,7060)	CS	MANUAL or AUTOMATIC	ALWAYS	AUTO
Exposure Control Mode Description	(0018,7062)	LT	Text description of the mechanism of exposure control.	ALWAYS	AUTO
Date of Last Detector Calibration	(0018,700C)	DA	<yyyymmdd> from projection	ALWAYS	AUTO
Time of Last Detector Calibration	(0018,700E)	TM	<hhmmss> from projection	ALWAYS	AUTO
Entrance Dose in dGy	(0040,0302)	US	Current value of corresponding scan Insight 3D: Empty	ALWAYS	AUTO/ MPPS
Entrance Dose in mGy	(0040,8302)	DS	Accumulated Entrance Dose of all projections. 2D+3D: dose of the 2D image is not included Insight 3D: 0	ALWAYS	AUTO / MPPS
Organ Dose (dGy)	(0040,0316)	DS	Tomo slices: Accumulated Organ Dose of all projections Calculated ac-cording to Dance of corresponding scan Insight 3D: 0	ALWAYS	AUTO
Pixel Padding Value	(0028, 0120)	DS	Tomo Slices: 0 Insight_3D: Add Positioner Primary Angle (0018,1510)	ALWAYS	AUTO
Partial View	(0028,1350)	CS	NO	ALWAYS	AUTO
Paddle Description	(0018,11A4)	LO	ID of Compression Paddle Including spacer plate info when available	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Relative Exposure	(0018,1405)	DS	Tomo Slices: Relation of average glandular dose AGD to the maximum allowed dose Insight 3D: 0	ALWAYS	AUTO
Comments on Radiation Dose	(0040,0310)	LT	User defined Configuration possible to include calculated INBD values.	VNAP	AUTO
Overlay Planes are present in Derived images where annotation have been stored and for derived biopsy images where targets have been stored. otherwise not present.					
Overlay Rows	(60xx,0010)	US	101	ANAP	AUTO
Overlay Columns	(60xx,0011)	US	101	ANAP	AUTO
Overlay Type	(60xx,0040)	CS	G	ANAP	AUTO
Overlay Origin	(60xx,0050)	SS	1\1	ANAP	AUTO
Overlay Bits Allocated	(60xx,0100)	US	1	ANAP	AUTO
Overlay Bit Position	(60xx,0102)	US	0	ANAP	AUTO
Overlay Data	(60xx,3000)	OB-OW	data	ANAP	AUTO
Overlay Description	(60xx,0022)	LO	Siemens MedCom Object Graphics	ANAP	AUTO

9.1.1.1 Breast Tomosynthesis Standard Extended SOP Classes

MAMMOMAT Revelation creates reconstructed Tomosynthesis slices and synthetic Insight 3D rotational images. These images can be transferred utilizing Breast Tomosynthesis SOP class.

IE	Module	Ref. [1]	Defined in Table	Presence of Module
Patient	Patient	C.7.1.1	Table 60 – Patient Module	ALWAYS
Study	General Study	C.7.2.1	Table 61 – General Study Module	ALWAYS
	Patient Study	C.7.2.2	Table 62 – Patient Study Module	ALWAYS
Series	General Series	C.7.3.1	Table 63 – General Series Module	ALWAYS
	Enhanced Mammo-graphySeries	C.8.11.10	Table 89 – Enhanced Mammo-graphy Series	ALWAYS
Frame of Reference	Frame of Reference	C.7.4.1	Table 66 – Frame of Reference Module	ANAP
Equipment	General Equipment	C.7.5.1	Table 67 – General Equipment Module	ALWAYS
	Enhanced General Equipment	C.7.5.2	Table 90 –Enhanced General Equipment Module	ALWAYS
Image	Image Pixel	C.7.6.3	Table 70 – Image Pixel Module	ALWAYS
	Acquisition Context	C.7.6.14	Table 83 – Acquisition Context Module	ALWAYS
	Multi-frame Func-tional Groups	C.7.6.16	Table 91 – Multi frame Func-tional Groups Module	ALWAYS

IE	Module	Ref. [1]	Defined in Table	Presence of Module
Image	Pixel Measures Macro	C.7.6. 16. 2.1	Table 92 – Shared Functional Group Sequence	ALWAYS
	Frame Content Macro	C.7.6.16. 2.2	Table 98 – Per Frame Functional Group Sequence	ALWAYS
	Plane Position (Patient) Macro	C.7.6.16. 2.3	Table 98 – Per Frame Functional Group Sequence	ALWAYS
	Plane Orientation (Patient) Macro	C.7.6.16. 2.4	Table 92 – Shared Functional Group Sequence	ALWAYS
	Frame Anatomy	C.7.6.16. 2.8	Table 92 – Shared Functional Group Sequence	ALWAYS
	Pixel Value Transformation Macro	C.7.6.16. 2.9	Table 92 – Shared Functional Group Sequence	ALWAYS
	Frame VOI LUT Macro	C.7.6.16. 2.10	Table 92 – Shared Functional Group Sequence	ALWAYS
	X-Ray 3D Image	C.8.21.1	Table 103 – X-Ray 3D Image Module	ALWAYS
	Breast Tomosynthesis Contributing Source	C.8.21. 2.3	Table 104 – Breast Tomosynthesis Contributing Sources Module	ALWAYS
	Breast Tomosynthesis Acquisition	C.8.21. 3.4	Table 107 – Breast Tomosynthesis Acquisition Module	ALWAYS
	Breast Biopsy Target Macro	C.8.21. 5.2	Table 98 – Per Frame Functional Group Sequence	ALWAYS
	Breast View	C.8.21.6	Table 111 – Breast View Module	ALWAYS
	SOP Common	C.12.1	Table 84 – SOP Common Module	ALWAYS
	Extended Attributes	n.a.	Table 112 – Extended Attributes BTO	ALWAYS
	Private Tags	n.a.	Table 137 - Private Modules	ALWAYS

Table 89 – Enhanced Mammography Series

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	MG	ALWAYS	AU-TO/MPPS
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	From RIS	ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)	UI	Class UID	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)	UI	Instance UID	ALWAYS	AUTO
Request Attributes Sequence	(0040,0275)	SQ	From RIS	ANAP	MWL
>Requested Procedure ID	(0040,1001)	SH	From RIS or “Request ID” input	ANAP	MWL / USER

Table 90 –Enhanced General Equipment Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	SIEMENS	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	MAMMOMAT Revelation	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO	<modality serial number>	ALWAYS	AUTO
Software Version	(0018,1020)	LO	<version>	ALWAYS	AUTO

Table 91 – Multi frame Functional Groups Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Shared Functional Groups Sequence	(5200,9229)	SQ	See Table 92 – Shared Functional Group Sequence	..	..
Per Frame Functional Groups Sequence	(5200,9230)	SQ	See Table 100 – Per Frame Functional Group Sequence	..	..
Instance Number	(0020,0013)	IS	generated	ALWAYS	AUTO
Content Date	(0008,0023)	DA	Date of Creation	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time of Creation	ALWAYS	AUTO
Number of Frames	(0028,0008)	IS	Number of frames	ALWAYS	AUTO
Representative Frame Number	(0028,6010)	US	First frame = 1	ALWAYS	AUTO

Table 92 – Shared Functional Group Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Measures Sequence	(0028,9110)	SQ	See Table 93 – Pixel Measures Sequence	..	..
Plane Orientation Sequence	(0020,9116)	SQ	See Table 94 – Plane Orientation Sequence	..	..
Frame Anatomy Sequence	(0020,9071)	SQ	See Table 95 – Frame Anatomy Sequence	..	..
Pixel Value Transformation Sequence	(0028,9145)	SQ	See Table 96 – Pixel Value Transformation Sequence	..	..
Frame VOI LUT sequence	(0028,9132)	SQ	See Table 97 – Frame VOI LUT Sequence	..	..

Table 93 – Pixel Measures Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Measures Sequence	(0028,9110)	SQ		ALWAYS	AUTO
>Pixel Spacing	(0028,0030)	DS	calculated	ALWAYS	AUTO
>Slice Thickness	(0018,0050)	DS	calculated	ALWAYS	AUTO

Table 94 – Plane Orientation Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Plane Orientation Sequence	(0020,9116)	SQ		ALWAYS	AUTO
> Image Orientation (Patient)	(0020,0037)	DS	Direction cosines of the first row and the first column with respect to , the patient.	ALWAYS	AUTO

Table 95 – Frame Anatomy Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Anatomy Sequence	(0020,9071)	SQ		ALWAYS	AUTO
>Frame Laterality	(0020,9072)	CS	R / L / B	ALWAYS	AUTO
>Anatomic Region Sequence	(0008,2218)	SQ		ALWAYS	AUTO
>> Code Value	(0008,9205)	SH	T-0400	ALWAYS	AUTO
>> Coding Scheme Designator	(0008,9206)	SH	SRT	ALWAYS	AUTO
>> Code Meaning	(0008,9207)	LO	Breast	ALWAYS	AUTO

Table 96 – Pixel Value Transformation Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Value Transformation Sequence	(0028,9145)	SQ		ALWAYS	AUTO
>Rescale Intercept	(0028,1052)	DS	0	ALWAYS	AUTO
>Rescale Slope	(0028,1053)	DS	1	ALWAYS	AUTO
>Rescale Type	(0028,1054)	LO	US	ALWAYS	AUTO

Table 97 – Frame VOI LUT Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame VOI LUT sequence	(0028,9132)	SQ		ALWAYS	AUTO
>Window Center	(0028,1050)	DS	calculated	ALWAYS	AUTO
>Window Width	(0028,1051)	DS	calculated	ALWAYS	AUTO
>Window Center and Width Explanation	(0028,1055)	LO	linear LUT	ALWAYS	AUTO
>VOI LUT Function	(0028,1056)	LO	LINEAR	ALWAYS	AUTO

Table 98 – Per Frame Functional Group Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Content Sequence	(0020,9111)	SQ	See Table 99 – Frame Content Sequence	..	..
Plane Position Sequence	(0020,9113)	SQ	See Table 100 – Plane Position Sequence	..	..
X-Ray 3D Frame Type	(0018,9504)	SQ	See Table 101 – X-ray 3D Frame Type Sequence	..	..
Biopsy Target Sequence	(0018,2041)	SQ	See Table 102 – Biopsy Target Sequence	..	..

Table 99 – Frame Content Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame Content Sequence	(0020,9111)	SQ		ALWAYS	AUTO
>Frame Acquisition Number	(0020,9156)	UL	Acquisition Number	ALWAYS	AUTO
>Frame Acquisition Date and Time	(0018,9074)	DT	Date and Time	ALWAYS	AUTO
>Frame Comment	(0020,9158)	UL	User comment | INBD values, if configured	ANAP	USER | AUTO

Table 100 – Plane Position Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Plane Position Sequence	(0020,9113)	SQ		ALWAYS	AUTO
> Image Position (Patient)	(0020,0032)	DS	x, y, z	ALWAYS	AUTO

Table 101 – X-ray 3D Frame Type Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
X-Ray 3D Frame Type Sequence	(0018,9504)	SQ		ALWAYS	AUTO
> Frame Type	(0008,9007)	CS	See Table 144 – Image Type/ Frame Type	ALWAYS	AUTO
> Pixel Presentation	(0008,9205)	CS	MONOCHROME	ALWAYS	AUTO
>Volumetric Properties	(0008,9206)	CS	VOLUME	ALWAYS	AUTO
>Volumetric Based Calculation Technique	(0008,9207)	CS	TOMOSYNTHESIS	ALWAYS	AUTO

Table 102 – Biopsy Target Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
Biopsy Target Sequence	(0018,2041)	SQ	For each submitted target in this frame one item is stored	ANAP	AUTO
>Target UID	(0018,2042)	UI	Unique identifier for the target.	ANAP	AUTO
>Localizing Cursor Position	(0018,2043)	FL	Coordinates of localizing cursor position with respect to the pixel in this frame	ANAP	USER
>Calculated Target Position	(0018,2044)	FL	The calculated target position (x, y, z)	ANAP	USER
>Target Label	(0018,2045)	SH	Target description: a number starting with 1 for the first target.	ANAP	AUTO
>Displayed Z Value	(0018,2046)	FL	The z value in mm displayed to the user at the time of biopsy. Note: This is the same as the z value of Calculated Target Position.	ANAP	AUTO
>Needle Info	(0023,xx01)	LO	Needle Type, Needle Gauge and Needle Length in mm, e.g. Type:Fine Gauge:0.7 Length: 100.0. See Table 139 - (Private) Acquisition Data	ANAP	USER

Table 103 – X-Ray 3D Image Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	See Table 144 – Image Type/ Frame Type		
Pixel Presentation	(0008,9205)	CS	See Table 70 – Image Pixel Module		
Volumetric Properties	(0008,9206)	CS	VOLUME	ALWAYS	AUTO
Volumetric Based Calculation Technique	(0008,9207)	CS	TOMOSYNTHESIS	ALWAYS	AUTO
Bits Allocated	(0028,0100)	US	See Table 70 – Image Pixel Module		
Bits Stored	(0028,0101)	US	See Table 70 – Image Pixel Module		
High Bit	(0028,0102)	US	See Table 70 – Image Pixel Module		
Samples per Pixel	(0028,0002)	US	See Table 70 – Image Pixel Module		
Photometric Interpretation	(0028,0004)	CS	See Table 70 – Image Pixel Module		
Content Qualification	(0018,9004)	CS	PRODUCT	ALWAYS	AUTO
Burned In Annotation	(0028,0301)	CS	See Table 68 – General Image Module		
Lossy Image Compression	(0028,2110)	CS	See Table 68 – General Image Module		
Lossy Image Compression Ratio	(0028,2112)	CS	calculated		
Lossy Image Compression Method	(0028,2114)	CS	JPEG Lossy Compression	VNAP	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Comments	(0020,4000)	LT	Anytime: Entered in UI Insight Breast Density (if configured): INBD Grade or Reject Information	VNAP	USER
Quality Control Image	(0028,0300)	CS	YES or NO	ALWAYS	USER / AUTO
Presentation LUT Shape	(2050,0020)	CS	IDENTITY	ALWAYS	AUTO
Source Irradiation Event Sequence	(0008,3011)		from projections	ALWAYS	AUTO
>Irradiation Event UID	(0008,3010)	UI	from projections	ALWAYS	AUTO

Table 104 – Breast Tomosynthesis Contributing Sources Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contributing Sources Sequence	(0018,9506)	SQ		..	..
>		SQ	See Table 105 – General Contributing Macro	..	..
>		SQ	Table 106 – Contributing Image Sources Macro	..	..
>Detector Type	(0018,7004)	CS	SCINTILLATOR | DIRECT	ALWAYS	AUTO
>Detector ID	(0018,700A)	SH	Factory Serial Number	ALWAYS	AUTO
>Date of Last Detector Calibration	(0018,700C)	DA	<yyyymmdd> from projection	ALWAYS	AUTO
>Time of Last Detector Calibration	(0018,700E)	TM	<hhmmss>from projection	ALWAYS	AUTO
>Detector Element Spacing	(0018,7022)	DS	0.085\0.085	ALWAYS	AUTO

Table 105 – General Contributing Macro

Attribute Name	Tag	VR	Value	Presence of Value	Source
Contributing SOP Instances Reference Sequence	(0020,9529)	SQ		ALWAYS	AUTO
>Study Instance UID	(0020,000D)	UI	From RIS or system gener-ated	ALWAYS	MWL / AUTO
>Referenced Series Sequence	(0008,1115)		1	ALWAYS	AUTO
>>Series Instance UID	(0020,000E)	UI	generated	ALWAYS	AUTO
>>Series Number	(0020,0011)	IS	generated	ALWAYS	AUTO
>>Referenced In-stance Sequence	(0008,114A)		1 item for each Projection Image For Processing	ALWAYS	AUTO
>>> Referenced SOP Class UID	(0008,1150)	UI	SOP Class	ALWAYS	AUTO
>>> Referenced SOP Instance UID	(0008,1155)	UI	Instance UID	ALWAYS	AUTO
>>>Instance Number	(0020,0013)		Instance Number	ALWAYS	AUTO
Manufacturer	(0008,0070)	LO	See Table 90 – Enhanced General Equipment Module	..	..
Manufacturer's Model Name	(0008,1090)	LO	See Table 90 – Enhanced General Equipment Module	..	..
Device Serial Number	(0018,1000)	LO	See Table 90 – Enhanced General Equipment Module	..	..
Software Version	(0018,1020)	LO	See Table 90 – Enhanced General Equipment Module	..	..
Acquisition Date Time	(0008,002A)	DT	Value	ALWAYS	AUTO
Station Name	(0008,1010)	SH	Table 67 – General Equipment Module	..	..
Operator's Name	(0008,1070)	PN	See Table 63 – General Series Module	..	..
Protocol Name	(0018,1030)	LO	See Table 63 – General Series Module	..	..
Performed Protocol Code Sequence	(0040,0260)	SQ	See Table 63 – General Series Module	..	..
>Code Value	(0008,0100)	SH	See Table 63 – General Series Module	..	..
>Coding Scheme Designator	(0008,0102)	SH	See Table 63 – General Series Module	..	..
>Coding Scheme Version	(0008,0103)	SH	See Table 63 – General Series Module	..	..
>Code Meaning	(0008,0104)	LO	See Table 63 – General Series Module	..	..

Table 106 – Contributing Image Sources Macro

Attribute Name	Tag	VR	Value	Presence of Value	Source
Rows	(0028,0010)	US	See Table 70 – Image Pixel Module	..	..
Columns	(0028,0011)	US	See Table 70 – Image Pixel Module	..	..
Bits Stored	(0028,0101)	US	See Table 70 – Image Pixel Module	..	..
Lossy Image Compression	(0028,2110)	CS	See Table 68 – General Image Module	..	..
Lossy Image Compression Ratio	(0028,2112)	CS	See Table 102 – X-Ray 3D Image Module	..	..
Lossy Image Compression Method	(0028,2114)	CS	See Table 102 – X-Ray 3D Image Module	..	..

Table 107 – Breast Tomosynthesis Acquisition Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
X-Ray 3D Acquisition Sequence	(0018,9507)	SQ	na	ALWAYS	AUTO
>Field of View Shape	(0018,1147)	CS	RECTANGLE	ALWAYS	AUTO
>X-Ray Receptor Type	(0018,9420)	CS	DIGITAL_DETECTOR	ALWAYS	AUTO
> X-Ray 3D General Shared Acquisition Macro Attributes		SQ	See Table 107 – X-Ray 3D General Shared Acquisition Macro Attributes	..	..
> X-Ray 3D General Positioner Movement Macro Attributes		SQ	See Table 108 – X-Ray 3D General Positioner Movement Macro Attributes	..	..
>Distance Source to Detector	(0018,1110)	DS	(mm) SID	ALWAYS	AUTO
>Distance Source to Patient	(0018,1111)	DS	(mm) SOD	ALWAYS	AUTO
>Estimated Radiographic Factor	(0018,1114)	DS	(mm) SID/SOD	ALWAYS	AUTO
>Anode Target Material	(0018,1191)	CS	TUNGSTEN	ALWAYS	AUTO
>Body Part Thickness	(0018,11A0)	DS	(mm)	ALWAYS	AUTO
>Exposure Control Mode	(0018,7060)	CS	AUTOMATIC	ALWAYS	AUTO
>Exposure Control Mode Description	(0018,7062)	LT	Text description of the mechanism of exposure control	ALWAYS	AUTO
>Half Value Layer	(0040,0314)	DS	Current value	ALWAYS	AUTO
>Organ dose	(0040,0316)	DS	For all projections	ALWAYS	AUTO
>Entrance Dose in mGy	(0040,8302)	DS	Current value	ALWAYS	AUTO
>Focal Spot	(0018,1190)	DS	0.3	ALWAYS	AUTO
>Detector Binning	(0018,701A)	DS	1\1	ALWAYS	AUTO
>Detector Temperature	(0018,7001)	DS	<value>	ALWAYS	AUTO
>Filter Type	(0018,1160)	SH	STRIP	ALWAYS	AUTO
>Filter Material	(0018,7050)	CS	RHODIUM	ALWAYS	AUTO
>Filter Thickness Minimum	(0018,7052)	DS	Rhodium: 0.05 Note: in mm	ALWAYS	AUTO
>Filter Thickness Maximum	(0018,7054)	DS	Rhodium: 0.05 Note: in mm	ALWAYS	AUTO
>Compression Force	(0018,11A2)	DS	(Newton)	ALWAYS	AUTO
>Paddle Description	(0018,11A4)	LO	ID of Compression Paddle	ALWAYS	AUTO
>Per Projection Acquisition Sequence	(0018,9538)	SQ	See Table 110 – Per Projection Acquisition Sequence	ALWAYS	AUTO

Table 108 – X-Ray 3D General Shared Acquisition Macro Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Source Image Sequence	(0008,2112)	SQ		ALWAYS	AUTO
> Referenced SOP Class UID	(0008,1150)	UI	Insight 3D: References all projection images (FOR_PROCESSING) Tomo slices: References all projection images (FOR_PROCESSING)	ALWAYS	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI	Insight 3D: References all projection images (FOR_PROCESSING) Tomo slices: References all projection images (FOR_PROCESSING)	ALWAYS	AUTO
Field of View Dimension(s) in Float	(0018,9461)	FL	mm	ALWAYS	AUTO
Field of View Origin	(0018,7030)	DS	<actual value>	ALWAYS	AUTO
Field of View Rotation	(0018,7032)	DS	“0”,”90”,”180” or “270”	ALWAYS	AUTO
Field of View Horizontal Flip	(0018,7034)	CS	“YES” or “NO”	ALWAYS	AUTO
Grid	(0018,1166)	DS	NONE	ALWAYS	AUTO
KVP	(0018,0060)	DS	value	ALWAYS	AUTO
X-Ray TubeCurrent	(0018,9330)	FD	(mA)	ALWAYS	AUTO
Exposure Time	(0018,9328)	FD	<duration of x-Ray exposure>(ms)	ALWAYS	AUTO
Exposure in mAs	(0018,9332)	FD	(mAs)	ALWAYS	AUTO
Start Acquisition Date Time	(0018,9516)	DT	Current value	ALWAYS	AUTO

Table 109 – X-Ray 3D General Positioner Movement Macro Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Primary Positioner Scan Arc	(0018,9508)	FL	48	ALWAYS	AUTO
Primary Positioner Scan Start Angle	(0018,9510)	FL	Current value	ALWAYS	AUTO
Primary Positioner Increment	(0018,9514)	FL	Current value	ALWAYS	AUTO

Table 110 – Per Projection Acquisition Sequence

Attribute Name	Tag	VR	Value	Presence of Value	Source
KVP	(0018,0060)	DS	value	ALWAYS	AUTO
X-Ray Tube Current	(0018,9330)	FD	(mA)	ALWAYS	AUTO
Positioner Primary Angle	(0018,1510)	DS	value	ALWAYS	AUTO
Exposure Time	(0018,9328)	FD	<duration of x-Ray exposure>(ms)	ALWAYS	AUTO
Exposure in mAs	(0018,9332)	FD	(mAs)	ALWAYS	AUTO
Relative X-Ray Exposure	(0018,1405)	IS	Percentage value of maximum allowed dose	ALWAYS	AUTO
Organ dose	(0040,0316)	DS	Organ dose for scan	ALWAYS	AUTO
Entrance Dose in mGy	(0040,8302)	DS	Value	ALWAYS	AUTO

Table 111 – Breast View Module

Attribute Name	Tag	VR	Value	Presence of Value	Source
Image Type	(0008,0008)	CS	See table 79 – image type/ frame type		
View Code Sequence	(0054,0220)	SQ	One value defined in CID 4014: CC MLO ML LMO LM FB SIO XCC XCCL XCCM SPEC XCCL, XCCM and SPEC: Special encoding can be configured	ALWAYS	AUTO / USER
> Code Value	(0008,0100)	SH	According to CID 4014	ALWAYS	AUTO
> Coding Scheme Designator	(0008,0102)	SH	Snm 3 Xccl, xccm and spec: Srt	ALWAYS	AUTO
> Code Meaning	(0008,0104)	SH	According to CID 4014	ALWAYS	AUTO
>View Modifier Code Sequence	(0054,0222)	SQ	0 or one values as defined in CID 4015: Cleavage CV Axillary tail AT Rolled lateral, RL Rolled medial, RM Rolled inferior, RI Rolled superior, RS Implant displaced, ID Magnification, M Spot, S Tangential, TAN Normally set by user. S and M defined by paddle	VNAP	AUTO / USER
>> Code Value	(0008,0100)	SH	According to CID 4015	VNAP	AUTO
>> Coding Scheme Designator	(0008,0102)	SH	SNM 3 RI, RS: SRT	VNAP	AUTO
>> Code Meaning	(0008,0104)	SH	According to CID 4015	VNAP	AUTO
Breast Implant Present	(0028,1300)	CS	Yes or No	ALWAYS	AUTO
Partial View	(0028,1350)	CS	No	ALWAYS	AUTO

Table 112 – Extended Attributes BTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Derivation Description	(0008,2111)	DS	Tomo Slices: RPG name Insight 3D: RPG name with extension "(3D)"	ALWAYS	AUTO
Comments on Radiaton Dose	(0040,0310)	LT	calculated configuration possible for calculated density values	VNAP	AUTO

9.1.1.2 X-Ray Radiation Dose SR IOD

MAMMOMAT Revelation automatically creates Projection X-Ray Radiation Dose Structured Reports using following tailored and extended Template TID 10001 Projection X-Ray Radiation Dose.

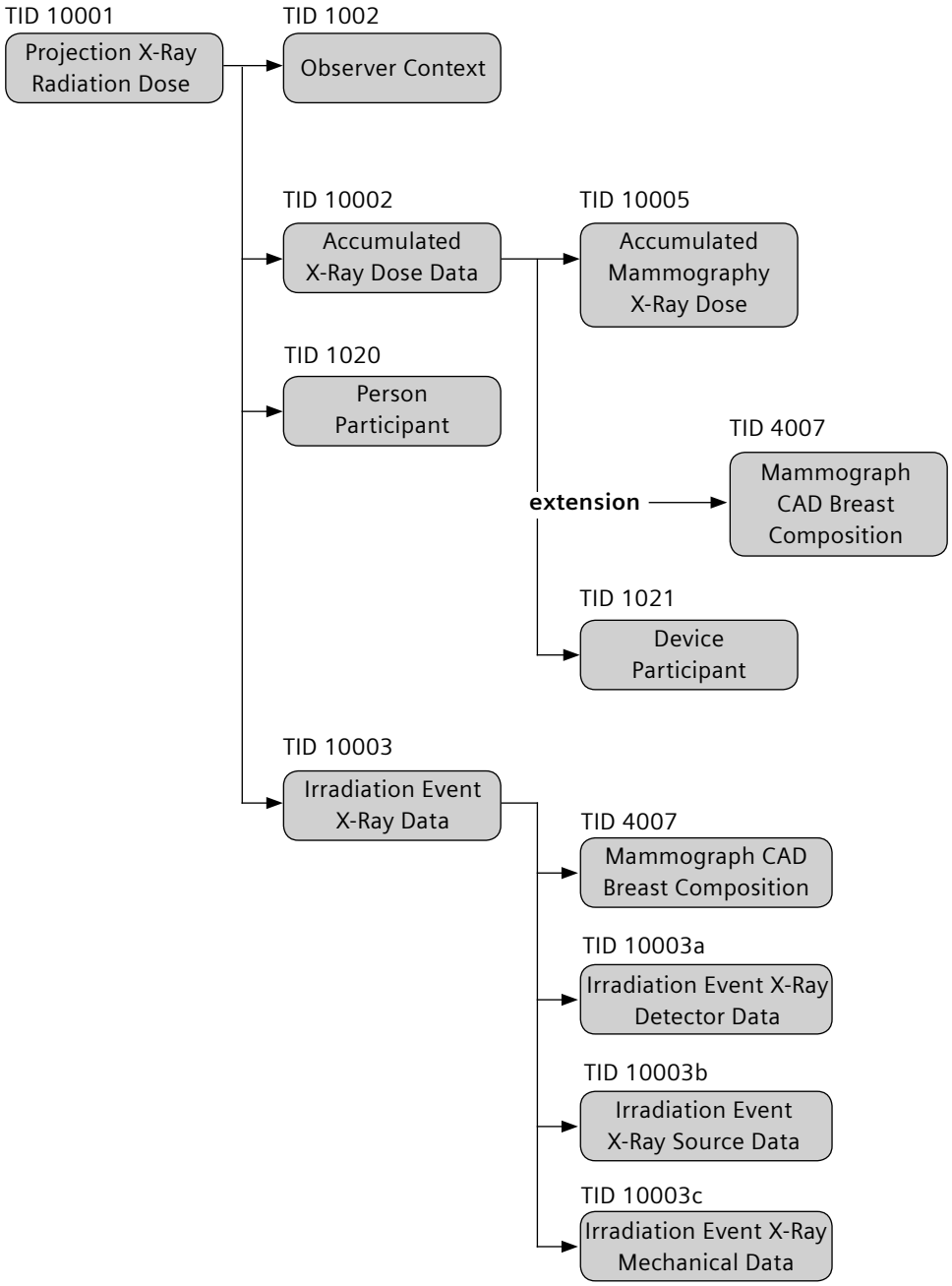


Figure 3: X-Ray Radiation Dose SR IOD Template Structure

9.1.1.2.1 Projection X-Ray Radiation Dose

Table 113 – X-Ray Radiation Dose SR IOD Module

IE	Module	Ref. [1]	Defined in Table	Presence of Module
Patient	Patient	C.7.1.1	Table 60 – Patient Module	ALWAYS
Study	General Study	C.7.2.1	Table 61 – General Study Module	ALWAYS
	Patient Study	C.7.2.2	Table 62 – Patient Study Module	ALWAYS
Series	SR Document Series	C.17.1	Table 114 - SR Document Series Module Attributes	ALWAYS
Equipment	General Equipment	C.7.5.1	Table 67 – General Equipment Module	ALWAYS
	Enhanced General Equipment	C.7.5.2	Table 90 –Enhanced General Equipment Module	ALWAYS
Document	SR Document General	C.17.2	Table 115 - SR Document General Module Attributes	ALWAYS
	SR Document	C.17.3	Table 116 - SR Document Content Macro Attributes	ALWAYS
	SOP Common	C.12.1	Table 84 – SOP Common Module	ALWAYS

Table 114 - SR Document Series Module Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	1	SR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.	ALWAYS	AUTO
Series Number	(0020,0011)	1	No SR-specific semantics are specified.	ALWAYS	AUTO
Series Date	(0008,0021)	3	yyyymmdd	ALWAYS	AUTO
Series Time	(0008,0031)	3	Time	ALWAYS	AUTO
Protocol Name	(0018,1030)	3	Procedure name	ALWAYS	AUTO
Series Description	(0008,103E)	3	“Radiation Dose Structured Report”	ALWAYS	AUTO
Referenced Performed Procedure Step Sequence	(0008,1111)	2	n.a.	ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)		1.2.840.10008.3.1.2.3.3	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)		Copy from corresponding MPPS	ALWAYS	AUTO

Table 115 - SR Document General Module Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	1	1	ALWAYS	AUTO
Completion Flag	(0040,A491)	1	COMPLETE	ALWAYS	AUTO
Verification Flag	(0040,A493)	1	UNVERIFIED	ALWAYS	AUTO
Content Date	(0008,0023)	1	generate	ALWAYS	AUTO
Content Time	(0008,0033)	1	generate	ALWAYS	AUTO

Table 116 - SR Document Content Macro Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Value Type	(0040,A040)	1	CONTAINER	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	1C	n.a.	ALWAYS	AUTO
>Code Value	(0008,0100)	1C	113701	ALWAYS	AUTO
>Code Scheme Designator	(0008,0102)	1C	DCM	ALWAYS	AUTO
>Code Meaning	(0008,0104)	1C	X-Ray Radiation Dose Report	ALWAYS	AUTO
Continuity of Content	(0040,A050)	1C	SEPARATE	ALWAYS	AUTO
Content Template Sequence	(0040,A504)	1C	n.a.	ALWAYS	AUTO
>Mapping Resource	(0008,0105)	1	DCMR	ALWAYS	AUTO
>Template Identifier	(0040,DB00)	1	10001	ALWAYS	AUTO
Content Sequence	(0040,A730)	1	See Table 117 – TID 10001 Projection X-Ray Radiation Dose	ALWAYS	AUTO

Table 117 – TID 10001 Projection X-Ray Radiation Dose

NL	REL WITH PARENT	VT	CONCEPT NAME	VALUE
		CONTAINER	EV (113701, DCM, "X-Ray Radiation Dose Report")	Root node
>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure reported")	DT (P5-40010, SRT, "Mammography")
>>	HAS CONCEPT MOD	CODE	EV (G-C0E8, SRT, "Has Intent")	EV (R-408C3, SRT, "Diagnostic Intent")
DTID 1002 1004 "Observer Context"				
>	HAS OBS CONTEXTS	CODE	EV (121005, DCM, "Observer Type")	EV (121007, DCM, "Device")
>	HAS OBS CONTEXTS	UIDREF	EV (121012, DCM, "Device Observer UID")	1.3.12.2.1107.5.12.7
>	HAS OBS CONTEXTS	CODE	EV (121005, DCM, "Observer Type")	EV (121006, DCM, "Person")
>	HAS OBS CONTEXTS	PNAME	EV (121008, DCM, "Person Observer Name")	Performing physician| operator| unknown
>	HAS OBS CONTEXTS	CODE	EV (121011, DCM, "Person Observer's Role in this procedure	EV (113851, DCM, " Irradiation Administering")
>	HAS OBS CONTEXT	CODE	EV (113705, DCM, "Scope of Accumulation")	EV (113016, DCM, "Performed Procedure Step")
>>	HAS PROPERTIES	UIDREF	EV (121126, DCM, "Performed Procedure Step SOP Instance UID")	MPPS UID
>	CONTAINS	CODE	EV (113945, DCM, "X-Ray Detector Data Available")	EV (R-0038D, SRT, "Yes")
>	CONTAINS	CODE	EV (113943, DCM, "X-Ray Source Data Available")	EV (R-0038D, SRT,"Yes")
>	CONTAINS	CODE	EV (113944, DCM, "X-Ray Mechanical Data Available")	EV (R-0038D, SRT,"Yes")
>	CONTAINS	INCLUDE	DTID 10002 "Accumulated X-Ray Dose"	See Table 68 – TID 10002 Accumulated X-Ray Dose
>	CONTAINS	INCLUDE	DTID 10003 "Irradiation Event X-Ray Data"	For each Irradiation Event See Table 69 – TID 10003 Irradiation Event X-Ray Data
>	CONTAINS	CODE	EV (113854, DCM, "Source of Dose Information")	EV (113856,DCM, "Automated Data Collection")

9.1.1.2.2 Accumulated X-Ray Dose

Table 118 – TID 10002 Accumulated X-Ray Dose

NL	REL WITH PARENT	VT	CONCEPT NAME	VALUE
		CONTAINER	EV (113702, DCM, "Accumulated X-Ray Dose Data")	
>	HAS CONCEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	113622, DCM, "Single Plane"
DTID 10005 "Accumulated Mammography X-Ray Dose"				
>	CONTAINS	NUM	EV (111637, DCM, "Accumulated Average Glandular Dose")	Per examination
>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	EV(SRT,T-04030,"Left Breast")
>	CONTAINS	NUM	EV (111637, DCM, "Accumulated Average Glandular Dose")	Per examination
>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	EV(T-04020, SRT, "Right Breast")
Bilateral density extension standard extended attributes TID 4007				
>	CONTAINS	CODE	EV (F-01710, SRT, "Breast composition")	Insight Breast Density Grade per examination, if Insight Breast Density is configured
>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	(T-04080, SRT, "Both breasts")

9.1.1.2.3 Irradiation Event X-Ray Data

Table 119 – TID 10003 Irradiation Event X-Ray Data

NL	REL WITH PARENT	VT	CONCEPT NAME	VALUE
		CONTAINER	EV (113706, DCM, "Irradiation Event X-Ray Data")	
>	HAS CON-CEPT MOD	CODE	EV (113764, DCM, "Acquisition Plane")	EV (113622, DCM, "Single Plane")
>	CONTAINS	UIDREF	EV (113769, DCM, "Irradiation Event UID")	Fom image hint: One UID for one Tomosynthesis view only
>	CONTAINS	DATETIME	DT (111526, DCM, "DateTime Started")	From image
>	CONTAINS	CODE	EV (113721, DCM, "Irradiation Event Type")	EV(113611, DCM, "Stationary Acquisition" for 2D images) or EV(113613, DCM, "Rotational Acquisition") for TOMO
>	CONTAINS	TEXT	EV (125203, DCM, "Acquisition Protocol")	MAMMOGRAM|STEREO|TOMO_PROJ

NL	REL WITH PARENT	VT	CONCEPT NAME	VALUE
>	CONTAINS	CODE	EV (T-D0005, SRT, “Anatomical structure”)	EV (T-04000, SRT,“Breast”)
>	CONTAINS	NUM	EV (111634, DCM, “Half Value Layer”)	UNITS = EV (mm, UCUM, “mm”) , copy value from raw image
>	CONTAINS	NUM	EV (111638, DCM, “Patient Equivalent Thickness”)	UNITS = EV (mm, UCUM, “mm”), body part thickness
>	CONTAINS	NUM	EV (111636, DCM, “Entrance Exposure at RP”)	UNITS = EV (mGy, UCUM, “mGy”),
>	CONTAINS	CODE	EV (113780, DCM, “Reference Point Definition”)	EV(113865,DCM, “Entrance exposure to a 4.2 cm breast thickness”)
DTID 4007 “Mammography CAD Breast Composition”				
>	CONTAINS	CODE	EV (F-01710, SRT, “Breast composition”)	Grade Per Image, if Insight Breast Density is configured: (F-01711,SRT, Almost entirely fat) (F-01712,SRT, Scattered fibroglandular densities) (F-01713,SRT, Hetero-geneously dense) (F-01714,SRT, Extremely dense)
>	CONTAINS	NUM	EV (111046, DCM, “Percent Fibroglandular Tissue”)	VBD Value Per Image, if Insight Breast Density is configured Value = 0 - 100
DTID 10003A “Irradiation Event X-Ray Detector Data”				
>	CONTAINS	IMAGE	EV (113795, DCM, “Acquired Image”)	References to raw images. In case of TOMO all raw projection images are referenced. Row needs to be repeated for each image
>	CONTAINS	INCLUDE	DTID 10003B “Irradiation Event X-Ray Source Data”	See Table 70 – TID 10003B Irradiation Event X-Ray Source Data
>	CONTAINS	INCLUDE	DTID 10003C “Irradiation Event X-Ray Mechanical Data”	See Table 71 – TID 10003C Irradiation Event X-Ray Mechanical Data

9.1.1.2.4 Irradiation Event X-Ray Source Data

Table 120 – TID 10003B Irradiation Event X-Ray Source Data

NL	REL WITH PARENT	VT	CONCEPT NAME	VALUE
		NUM	EV (111631, DCM, "Average Glandular Dose")	AGD from image, in case of Tomo from one projection only
		NUM	EV (113742, DCM, "Irradiation Duration")	Duration time taking this image
		NUM	EV (113733, DCM, "KVP")	KV from image
		NUM	EV (113767, DCM, "Average X-Ray Tube Current")	mA from image
		NUM	EV (113824, DCM, "Exposure Time")	Exposure time from image
		NUM	EV (113736, DCM, "Exposure")	Exposure from image
		NUM	EV (113766, DCM, "Focal Spot Size")	UNITS = EV (mm, UCUM, "mm")
		CODE	EV (111632, DCM, "Anode Target Material")	From image
		CONTAINER	EV (113771, DCM, "X-Ray Filters")	n.a.
>	CONTAINS	CODE	EV (113772, DCM, "X-Ray Filter Type")	From image
>	CONTAINS	CODE	EV (113757, DCM, "X-Ray Filter Material")	From image
>	CONTAINS	NUM	EV (113758, DCM, "X-Ray Filter Thickness Minimum")	From image
>	CONTAINS	NUM	EV (113773, DCM, "X-Ray Filter Thickness Maximum")	From image
		CODE	EV (111635, DCM, "X-Ray Grid")	One of: • EV(DCM,111646, No grid) • EV(DCM,111646, No grid) and EV(199SMS_SPWH, G_001, Prime) • EV(DCM,111642, Focused grid) and EV(DCM,111644, Parallel grid)

9.1.1.2.5 Irradiation Event X-Ray Mechanical Data

Table 121 – TID 10003C Irradiation Event X-Ray Mechanical Data

NL	REL WITH PARENT	VT	CONCEPT NAME	VALUE
		NUM	EV (112011, DCM, "Positioner Primary Angle")	From image
		NUM	EV (112012, DCM, "Positioner Secondary Angle")	From image
		NUM	EV (113739, DCM, "Positioner Primary End Angle")	From image - Set only if Tomo
		NUM	EV (113740, DCM, "Positioner Secondary End Angle")	From image - Set only if Tomo
		NUM	EV (111633, DCM, "Compression Thickness")	From image
		NUM	EV(113748,DCM,"Distance Source to Isocenter")	From image
		NUM	EV(113750,DCM,"Distance Source to Detector")	From image

9.1.1.3 Mammo CAD SR IOD

MAMMOMAT Revelation automatically creates a Mammo CAD SR Object for storage of Breast Density Data using following tailored and extended Template TID 4000.

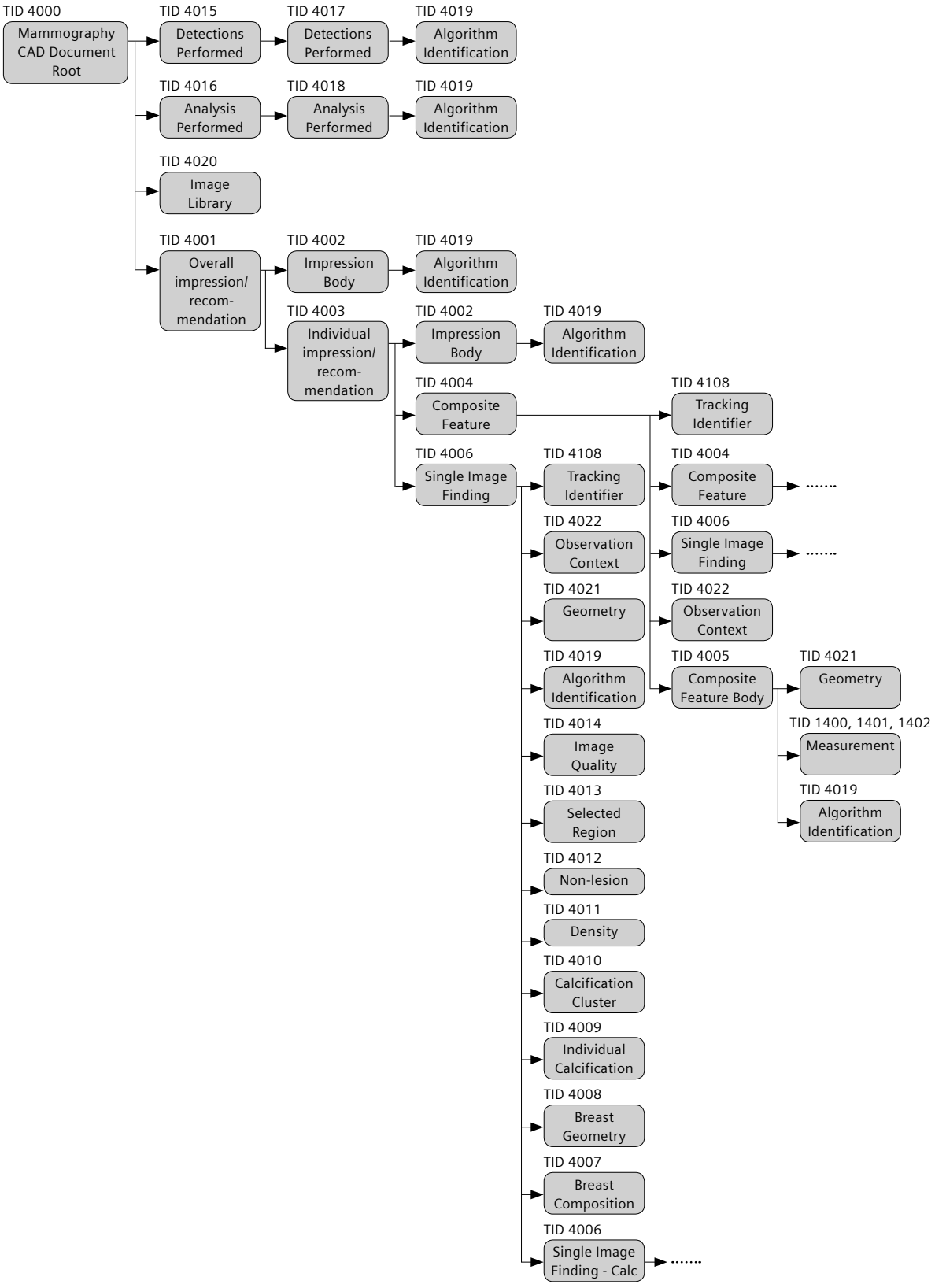


Table 122 – Mammography CAD SR IOD Modules

NL	REL WITH PARENT	Ref(1)	Defined in table	Presence of Module
Patient	Patient	C.7.1.1	Table 60 – Patient Module	ALWAYS
Study	General Study	C.7.2.1	Table 61 – General Study Module	ALWAYS
	Patient Study	C.7.2.2	Table 62 – Patient Study Module	ALWAYS
Series	SR Document Series	C.17.1	Table 123 – SR Document Series Module Attributes	ALWAYS
Equipment	General Equipment	C.7.5.1	Table 67 – General Equipment Module	ALWAYS
Document	SR Document General	C.17.2	Table 124 – SR Document General Module Attributes	ALWAYS
	SR Document Content	C.17.3	Table 125 – SR Document Content Macro Attributes	ALWAYS
	SOP Common	C.12.1	Table 84 – SOP Common Module	ALWAYS

Table 123 – SR Document Series Module Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	1	SR	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Unique identifier of the Series.	ALWAYS	AUTO
Series Number	(0020,0011)	1	No SR-specific semantics are specified.	ALWAYS	AUTO
Series Date	(0008,0021)	DT	yymmdd	ALWAYS	AUTO
Series Time	(0008,0031)	TM	hhmmss	ALWAYS	AUTO
Protocol Name	(0018,1030)	3	Procedure name	ALWAYS	AUTO
Series Description	(0008,103E)	3	“Breast Density Report”	ALWAYS	AUTO
Referenced Performed Procedure Step Sequence	(0008,1111)	2		ALWAYS	AUTO
>Referenced SOP Class UID	(0008,1150)		1.2.840.10008.3.1.2.3.3	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)		Copy from corresponding MPPS	ALWAYS	AUTO

Table 124 – SR Document General Module Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	1	1	ALWAYS	AUTO
Completion Flag	(0040,A491)	1	COMPLETE	ALWAYS	AUTO
Verification Flag	(0040,A493)	1	UNVERIFIED	ALWAYS	AUTO
Content Date	(0008,0023)	1	yymmdd	ALWAYS	AUTO
Content Time	(0008,0033)	1	hhmmss	ALWAYS	AUTO
Performed Procedure Code Sequence	(0040,A372)	2	Zero or more Items shall be included in this Sequence.	ALWAYS	AUTO
Current Requested Procedure Evidence Sequence	(0040,A375)	1C	One or more Items shall be included in this Sequence. Contains references to series and images used for the density calculation	ALWAYS	AUTO

Table 125 – SR Document Content Macro Attributes

Attribute Name	Tag	VR	Value	Presence of Value	Source
Value Type	(0040,A040)	1	CONTAINER	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	1C	n.a	ALWAYS	AUTO
>Code Value	(0008,0100)	1C	111036	ALWAYS	AUTO
>Code Scheme Designator	(0008,0102)	1C	DCM	ALWAYS	AUTO
>Code Meaning	(0008,0104)	1C	Mammography CAD Report	ALWAYS	AUTO
Continuity of Content	(0040,A050)	1C	SEPARATE	ALWAYS	AUTO
Content Template Sequence	(0040,A504)	1C	n.a.	ALWAYS	AUTO
>Mapping Resource	(0008,0105)	1	DCMR	ALWAYS	AUTO
>Template Identifier	(0040,DB00)	1	4000	ALWAYS	AUTO
Content Sequence	(0040,A730)	1	Sequence containing multiple items according to TID 4000	ALWAYS	AUTO
>		1	Table 127 – TID 1204 Language Content Item and Descendants	ALWAYS	AUTO
>		1	Table 128 – TID 4020 CAD Image Library Entry	ALWAYS	AUTO
>		1	Table 129 – TID 4001 “Mammography CAD Overall Impression/ Recommendation”	ALWAYS	AUTO
>		1	Table 132 – TID 4002 “Mammography CAD Impression/Recommendation Body”	ALWAYS	AUTO
>		1	Table 131 – TID 4003 “Mammography CAD Individual Impression/ Recommendation”	ALWAYS	AUTO
>		1	Table 133 – TID 4006 “Mammography CAD Single Image Finding	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
>		1	Table 134 – TID 4007 “Mammography CAD Breast Composition”	ALWAYS	AUTO
>		1	Table 135 – TID 4016 “CAD Analysis Performed”	ALWAYS	AUTO
>		1	Table 136 – TID 4018 “CAD Analysis Performed”	ALWAYS	AUTO
>		1	Table 130 – TID 4019 „CAD Algorithm Identification “	ALWAYS	AUTO

Table 126 – TID 4000 Mammography CAD Document Root

NL	Rel with Parent	VT	Concept Name	Value
		CONTAINER	EV (111036, DCM, “Mammography CAD Report”)	Root node
>	HAS CONCEPT MOD	INCLUDE	DTID 1204 „Language of Content Item and Descendants”	Included once. See Table 127 – TID 1204 Language Content Item and Descendants
>	CONTAINS	CONTAINER	EV (111028, DCM, “Image Library”)	SEPARATE
>>	CONTAINS	INCLUDE	DTID 4020 “CAD Image Library Entry”	See Table 128 – TID 4020 CAD Image Library Entry One sequence item is included for each image in the Study
>	CONTAINS	INCLUDE	DTID 4001 “Mammography CAD Overall Impression/ Recommendation”	See Table 129 – TID 4001 “Mammography CAD Overall Impression/ Recommendation”
>	CONTAINS	CODE	EV (111064, DCM, “Summary of Detections”)	111225, DCM, Not Attempted
>	CONTAINS	CODE	EV (111065, DCM, “Summary of Analyses”)	111222, DCM, Succeeded, 111223, DCM, Partially Succeeded 111224, DCM, Failed 111225 is not used
>>	INFERRED FROM	INCLUDE	DTID 4016 “CAD Analyses Performed”	$AnalysisCode = DCID 6043 “Types of Mammography CAD Analysis” See Table 135 – TID 4016 “CAD Analysis Performed”

Table 127 – TID 1204 Language Content Item and Descendants

NL	Rel with Parent	VT	Concept Name	How set
	HAS CONCEPT MOD	CODE	EV (121049, DCM, “Language of Content Item and Descendants”)	En,RFC3066, English
>	HAS CONCEPT MOD	CODE	EV (121046, DCM, “Country of Language”)	US, ISO3166_1, “UNITED STATES”)

Table 128 – TID 4020 CAD Image Library Entry

NL	Rel with Parent	VT	Concept Name	How set
		IMAGE		SOP Instance UID of source image
>	HAS ACQ CON-TEXT	CODE	EV (111027, DCM, “Image Laterality”)	Set to (0020,0062) from source image OR Right Breast: T-04020, SRT, “Right breast” Left Breast: T-04030, SRT, “Left breast”
>	HAS ACQ CONTEXT	CODE	EV (111031, DCM, “Image View”)	Set to (0054,0220) from source image
>>	HAS CONCEPT MOD	CODE	EV (111032, DCM, “Image View Modifier”)	Set to (0054,0222) from source image
>	HAS ACQ CONTEXT	TEXT	EV (111044, DCM, “Patient Orientation Row”)	Set to (0020,0020) from source image IF PRESENT
>	HAS ACQ CONTEXT	TEXT	EV (111043, DCM, “Patient Orientation Column”)	Set to (0020,0020) from source image IF PRESENT
>	HAS ACQ CONTEXT	DATE	EV (111060, DCM, “Study Date”)	Set to (0008,0020) from source image
>	HAS ACQ CONTEXT	TIME	EV (111061, DCM, “Study Time”)	Set to (0008,0030) from source image
>	HAS ACQ CONTEXT	DATE	EV (111018, DCM, “Content Date”)	Set to (0008,0023) from source image
>	HAS ACQ CONTEXT	TIME	EV (111019, DCM, “Content Time”)	Set to (0008,0033) from source image
>	HAS ACQ CONTEXT	NUM	EV (111026, DCM, “Horizontal Pixel Spacing”)	Set to 0018,1164 from source image
>	HAS ACQ CONTEXT	NUM	EV (111066, DCM, “Vertical Pixel Spacing”)	Set to 0018,1164 from source image

Table 129 – TID 4001 “Mammography CAD Overall Impression/ Recommendation”

NL	Rel with Parent	VT	Concept Name	Value
		CODE	EV (111017, DCM, “CAD Processing and Findings Summary”)	111241, DCM, “All algorithms succeeded; without findings” – not used 111242, DCM, “All algorithms succeeded; with findings” if a Density Grade could be calculated 111243, DCM “Not all algorithms succeeded; without findings Not Used 111244, DCM, “Not all algorithms succeeded; with findings” density grade could be calculated but one or more images failed to yield a result. 111245, DCM, “No algorithms succeeded; without findings” if a density grade could not be generated
	HAS PROPERTIES	INCLUDED	TID 4002 “Mammography CAD Impression/Recommendation Body”	See Table 132 – TID 4002 “Mammography CAD Impression/ Recommendation Body” (summary – Study)
	INFERRED FROM	INCLUDE	DTID 4003 “Mammography CAD Individual Impression/ Recommendation”	See Table 131 – TID 4003 “Mammography CAD Individual Impression/Recommendation” (summary - per laterality)

Table 130 – TID 4019 „CAD Algorithm Identification “

NL	Rel with Parent	VT	Concept Name	Value
	CONTAINS	TEXT	111001, DCM, “Algorithm Name”	“Insight BD”
	CONTAINS	TEXT	111003, DCM, “Algorithm Version”	Version of the algorithm
	CONTAINS	TEXT	111002, DCM, “Algorithm Parameters”	Breast Density Algorithm (0021,xx01)Average / Highest Breast density thresholds (0021,0005) 4.3\8.1\17

Table 131 – TID 4003 “Mammography CAD Individual Impression/Recommendation”

NL	Rel with Parent	VT	Concept Name	How set
		CONTAINER	EV (111034, DCM, “Individual Impression/ Recommendation”)	
	HAS CONCEPT MOD	CODE	EV (111056, DCM, “Rendering Intent”)	11150, DCM, ‘Presentation Required: Rendering device is expected to be present
>	CONTAINS	INCLUDE	DTID 4002 “Mammography CAD Impression/Recommendation Body”	Repeat for: Study, Laterality L, Laterality R See Table 132 – TID 4002 “Mammography CAD Impression/Recommendation Body”
>	CONTAINS	INCLUDE	DTID 4006 “Mammography CAD Single Image Finding“	Repeat for each single image See Table 133 – TID 4006 “Mammography CAD Single Image Finding

Table 132– TID 4002 “Mammography CAD Impression/Recommendation Body”

NL	Rel with Parent	VT	Concept Name	Value
	CONTAINS	TEXT	EV (111033, DCM, “Impression Description”)	“Insight BD Breast Density Assessment”
	INFERRED FROM	INCLUDE	DTID 4019 „Algorithm Identification “	See Table 130 – TID 4019 „CAD Algorithm Identification “
Results for Study (both lateralities considered)				
	HAS PROPERTIES	INCLUDE	DTID 4007 “Mammography CAD Breast Composition”	See Table Table 134 – TID 4007 “Mammography CAD Breast Composition”
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, “Laterality”)	T-04080, SRT, Both Breasts
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, “Derivation”)	112188, DCM, “Two-dimensional method”
		NUM	DCID 6142 Calculated Value Calculated Value %,	112191, DCM, “Breast tissue density”) UCUM, “%” Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, “Laterality”)	T-04080, SRT, Both Breasts

NL	Rel with Parent	VT	Concept Name	Value
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, “Derivation”)	112188, DCM, “Two-dimensional method”
>	HAS CONCEPT MOD	TEXT	EV (112034, DCM, “Calculation Description”)	“AVERAGE” or “MAXIMUM”, as reported in Breast Density Algorithm (0021,xx01)
>	HAS CON-CEPT MOD	TEXT	EV (112034, DCM, “Calculation Description”)	As reported in Breast Density Thresholds (0021,0005)
Results for Laterality RIGHT				
		NUM	DCID 6142 Calculated Value	112193, DCM, “Volume of breast”) UCUM “cm3” Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, “Laterality”)	T-04020, SRT, Right Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, “Derivation”)	112188, DCM, “Two-dimensional method”
		NUM	DCID 6142 Calculated Value	112192, DCM, “Volume of parenchymal tissue” UCUM “cm3” Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, “Laterality”)	T-04020, SRT, Right Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, “Derivation”)	112188, DCM, “Two-dimensional method”
		NUM	DCID 6142 Calculated Value Calculated Value %,	112191, DCM, “Breast tissue density”) UCUM, “%” Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, “Laterality”)	T-04020, SRT, Right Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, “Derivation”)	112188, DCM, “Two-dimensional method”
>	HAS PROPERTIES	INCLUDE	DTID 4007 “Mammography CAD Breast Composition”	See Table 134 – TID 4007 “Mammography CAD Breast Composition”
		NUM	DCID 225 “Measurement Uncertainty Concepts”	R-00363, SRT, „-3 to + 3“
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, “Laterality”)	T-04020, SRT, Right Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, “Derivation”)	112188, DCM, “Two-dimensional method”

NL	Rel with Parent	VT	Concept Name	Value
Results for Laterality LEFT				
		NUM	DCID 6142 Calculated Value	112193, DCM, "Volume of breast") UCUM "cm3" Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	T-04030, SRT, Left Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, "Derivation")	112188, DCM, "Two-dimensional method"
		NUM	DCID 6142 Calculated Value	112192, DCM, "Volume of parenchymal tissue" UCUM "cm3" Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	T-04030, SRT, Left Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, "Derivation")	112188, DCM, "Two-dimensional method"
		NUM	DCID 6142 Calculated Value Calculated Value %,	112191, DCM, "Breast tissue density") UCUM, "%" Present if 111017 (in TID 4000) is 111242 or 111244.
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	T-04030, SRT, Left Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, "Derivation")	112188, DCM, "Two-dimensional method"
>	HAS PROPERTIES	INCLUDE	DTID 4007 "Mammography CAD Breast Composition"	See Table 134 – TID 4007 "Mammography CAD Breast Composition"
		NUM	DCID 225 "Measurement Uncertainty Concepts"	R-00363, SRT, „-3 to + 3"
>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	T-04030, SRT, Left Breast
>	HAS CONCEPT MOD	CODE	EV (121401, DCM, "Derivation")	112188, DCM, "Two-dimensional method"

Table 133 – TID 4006 “Mammography CAD Single Image Finding

NL	Rel with Parent	VT	Concept Name	Value
		CODE	EV (111059, DCM, “Single Image Finding”)	(F-01710, SRT, “Breast composition”),
>	HAS CONCEPT MOD	CODE	EV (111056, DCM, “Rendering Intent”)	111151, DCM, Presentation Optional: Rendering device May Present
>	HAS PROPERTIES	INCLUDE	DTID 4019 “CAD Algorithm Identification”	See Table 130 – TID 4019 „CAD Algorithm Identification “
>	HAS PROPERTIES	INCLUDE	DTID 4007 “Mammography CAD Breast Composition”	See Table 134 – TID 4007 “Mammography CAD Breast Composition”
>	INFRERRED FROM	CODE		Reference to an image content item in the Image Library. FOR EACH IMAGE
		TEXT	“Per Image Values”	Set to Per image Values (0021,0010) Note: V_b: cm3 V_fg: cm3 VBD. %
		TEXT	“Per Image Grade”	Set to Per Image Grade (0021,0011) Note: “a”, “b”, “c” or “d”

Table 134 – TID 4007 “Mammography CAD Breast Composition”

NL	Rel with Parent	VT	Concept Name	Value
		CODE	EV (F-01710, SRT, “Breast composition”)	DCID 6000 “Overall Breast Composition” Include CID 6001 F-01711 Almost entirely fat F-01712 Scattered fibro glandular densities F-01713 Hetero-geneously dense F-01714 Extremely Dense

Table 135 – TID 4016 “CAD Analysis Performed”

NL	Rel with Parent	VT	Concept Name	Value
		CONTAINER	EV (111062, DCM, “Successful Analyses”)	Present if value of parent is (111222, DCM, “Succeeded”)
>	CONTAINS	INCLUDE	DTID 4018 “CAD Analysis Performed”	See Table 136 – TID 4018 “CAD Analysis Performed”
		CONTAINER	EV (111024, DCM, “Failed Analyses”)	Present if value of parent is (111224, DCM, “Failed”)
>	CONTAINS	INCLUDE	DTID 4018 “CAD Analysis Performed”	See Table 136 – TID 4018 “CAD Analysis Performed”

Table 136 – TID 4018 “CAD Analysis Performed”

NL	Rel with Parent	VT	Concept Name	Value
		CODE	EV (111004, DCM, “Analysis Performed”)	DCID 6043, SRT, P5-B3414, Breast Composition Analysis
>	HAS PROPERTIES	INCLUDE	DTID 4019 “CAD Algorithm Identification”	See Table 130 – TID 4019 „CAD Algorithm Identification “
>	HAS PROPERTIES	IMAGE		Ref Image Content Image Library

9.1.1.4 Key Object Selection

Correction of images will be documented in Key Object Selections with Document Title valued: 113037, DCM, “Rejected for Patient Safety Reasons

Rejected images will be documented with Key Object Selection with the Document Title valued: 113001, DCM, “Rejected for Quality Reasons

Both objects use the Template TID 2010. The creation of KOS objects is configurable.

9.1.2 Usage of attributes from received IODs

Please refer to the “SOP specific conformance...” sections in the DICOM networking part of this DCS for more details on attribute specific handling.

9.1.3 Attribute mapping

The MAMMOMAT Revelation implements an actor Acquisition Modality according to the IHE Scheduled Workflow (SWF) profile.

The relationships between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in Table 40 - Basic Worklist C-FIND-RSP Return Key Attributes

The MAMMOMAT Revelation DICOM application is not performing data coercion.

9.2 Data Dictionary of Private Attributes

Table 137 - Data Dictionary of Private Attributes

Tag	Private Owner Code	Name	VR	VM
(0019,xx01)	SIEMENS MED SP DXMG WH AWS 1	AEC Coordinates	UL	n
(0019,xx02)	SIEMENS MED SP DXMG WH AWS 1	AEC Coordinates Size	US	2
(0019,xx05)	SIEMENS MED SP DXMG WH AWS 1	AEC Control Image Row	US	1
(0019,xx06)	SIEMENS MED SP DXMG WH AWS 1	AEC Control Image Column	US	1
(0019,xx07)	SIEMENS MED SP DXMG WH AWS 1	AEC Control Image Pixel	OB	1
(0019,xx10)	SIEMENS MED SP DXMG WH AWS 1	Derivation Description	ST	1
(0021,xx01)	SIEMENS MED SP DXMG WH AWS 1	Breast Density Algorithm	CS	1
(0021,xx02)	SIEMENS MED SP DXMG WH AWS 1	Breast Density Version	SH	1
(0021,xx05)	SIEMENS MED SP DXMG WH AWS 1	Breast Density ThresholdValues	SH	3
(0021,xx10)	SIEMENS MED SP DXMG WH AWS 1	Insight Breast Density values per Image	LO	1
(0021,xx11)	SIEMENS MED SP DXMG WH AWS 1	Insight Breast Density Grade per Image	SH	1
(0021,xx012)	SIEMENS MED SP DXMG WH AWS 1	Insight Breast Density values per Breast	LO	1
(0021,xx13)	SIEMENS MED SP DXMG WH AWS 1	Insight Breast Density Grade per Breast	SH	1
(0021,xx14)	SIEMENS MED SP DXMG WH AWS 1	Insight Breast Density Uncertainty per Breast	DS	1
(0021,xx15)	SIEMENS MED SP DXMG WH AWS 1	Insight Breast Density Grade per Patient	SH	1
(0025,xx01)	SIEMENS MED SP DXMG WH AWS 1	Energy Weighting Factor	DS	1
(0029,xx08)	SIEMENS CSA HEADER	Modality Image Header Type	CS	1
(0029,xx09)	SIEMENS CSA HEADER	Modality Image Header Version	LO	1
(0029,xx10)	SIEMENS CSA HEADER	Modality Image Header Info	OB	1
(0029,xx18)	SIEMENS CSA HEADER	Modality Series Header Type	CS	1
(0029,xx19)	SIEMENS CSA HEADER	Modality Series Header Version	LO	1
(0029,xx20)	SIEMENS CSA HEADER	Modality Series Header Info	OB	1
(0041,xx02)	SIEMENS MED SP DXMG WH AWS 1	Reason of Requested Procedure	LO	1
(0051,xx10)	SIEMENS MED SP DXMG WH AWS 1	Reconstruction Center	DS	1
(0051,xx20)	SIEMENS MED SP DXMG WH AWS 1	Autowindow Percentile ST	1	
(0051,xx21)	SIEMENS MED SP DXMG WH AWS 1	SIEMENS_TOMO LO	1	
(0051,xx32)	SIEMENS MED SP DXMG WH AWS 1	Image Position (Tomo) DS	3	
(0051,xx37)	SIEMENS MED SP DXMG WH AWS 1	Image Orientation (Tomo) DS	6	
(0051,xx50)	SIEMENS MED SP DXMG WH AWS 1	Projection Series Instance UID	UI	1
(0051,xx60)	SIEMENS MED SP DXMG WH AWS 1	Primary Positioner Scan Arc DS	1	
(0051,xx61)	SIEMENS MED SP DXMG WH AWS 1	Secondary Positioner Scan Angle	DS	1
(0051,xx62)	SIEMENS MED SP DXMG WH AWS 1	Primary Positioner Scan Start Angle	DS	1
(0051,xx63)	SIEMENS MED SP DXMG WH AWS 1	Secondary Positioner Scan Start Angle	DS	1
(0051,xx64)	SIEMENS MED SP DXMG WH AWS 1	Primary Positioner Increment DS	1	
(0051,xx65)	SIEMENS MED SP DXMG WH AWS 1	Secondary Positioner Increment	DS	1
(0055,xx01)	SIEMENS MED SP DXMG WH AWS 1	Display Name of Projection View	LO	1

9.3 Coded Terminology and Templates

n.a

9.4 Grayscale Image Consistency

The high resolution TFT display monitor option of MAMMOMAT Revelation comes with a DICOM Grayscale Standard Display Function (GSDF) compliant factory pre-setting. A typical working environment setup is assumed for ambient light.

9.5 Standard Extended / Specialized / Private SOP Clas-ses

9.5.1 Standard Extended SOP Classes

The SOP Instances created by MAMMOMAT Revelation are standard extended by adding the following private modules. The used shadow owner code is “SIEMENS MED SP DXMG WH AWS 1”.

Table 138 - Private Modules

IE	Module	Reference	Usage	Note
Image	AEC Information	9.5.1.1	U	private AEC Information
	Acquisition Data	9.5.1.2	U	additional private Information about image Acquisition
	TiCEM	9.5.1.3	U	TiCEM Data
	Breast Density	9.5.1.4	U	Breast Density Data

U = User Option

9.5.1.1 AEC Information Module

The table in this section contains private IOD Attributes that describe AEC control.

Table 139 - (Private) AEC Information

Attribute Name	Tag	VR	Description
AEC Coordinates	(0019,xx01)	UL	internal use only
AEC Coordinates Size	(0019,xx02)	US	internal use only

9.5.1.2 Acquisition Data Module

The table in this section contains private IOD Attributes that describe additional acquisition parameters.

Table 140 - (Private) Acquisition Data

Attribute Name	Tag	VR	Description
Attribute Name	Tag	VR	Description
Projection View Display String	(0055,xx01)	LO	internal use only
Reason for the Requested Procedure	(0041,xx02)	LO	internal use only

9.5.1.3 TiCEM Module

The table in this section contains private IOD Attributes that describe additional dual energy parameters.

Table 141 - (Private) Acquisition Data

Attribute Name	Tag	VR	Description
Energy Weighting Factor	(0025,xx01)	DS	The parameter background used to generate the processed Insight CEM image of the dual energy sequence

9.5.1.4 Breast Density Module

Following table describes private attributes containing results of breast density measurements calculated during acquisition.

Table 142 - (Private) Acquisition Data

Attribute Name	Tag	VR	Format
Breast Density Algorithm	(0021,xx01)	CS	average or highest
Breast Density Version	(0021,xx02)	SH	<version>
Breast Density ThresholdValues	(0021,xx05)	SH	3 values
Insight Breast Density values per Image	(0021,xx10)	LO	V_b: <Breast Volume>cm3 V_fg :< Fibro glandular Volume>cm3 VBD:<Volumetric breast density>%
Insight Breast Density Grade per Image	(0021,xx11)	SH	Breast Density grade of image

9.5.1.5 Tomosynthesis Module

Following table describes additional data stored during a Tomosynthesis acquisition.

Table 143 - (Private) Acquisition Data

Attribute Name	Tag	VR	Format
Reconstruction Center	(0051,xx10)	ST	Reconstruction parameter: “ReconCenter: <>; FocalSpotOffset:<>; DetectorRadius:<>; FocusRadius:<>”
Autowindow Percentiles	(0051,xx20)	ST	Internal use only
Image Position (Tomo)	(0051,xx32)	DS	Center position of the first pixel in mm in the tomo equipment coordinate system (x, y, z). x/y plane = detector plane Righthanded Cartesian. Origin in detector center
Image Orientation (Tomo)	(0051,xx37)	DS	In tomo equipment coordinate system
Projection Series	(0051,xx50)	UI	Instance UID of the projection series
Primary Positioner Scan Arc	(0051,xx60)	DS	CT Image only
Secondary Positioner Scan Arc	(0051,xx61)	DSO	CT Image only
Primary Positioner Scan Start Angle	(0051,xx62)	DS	CT Image only
Secondary Positioner Scan Start Angle	(0051,xx63)	DS	CT Image only
Primary Positioner Increment	(0051,xx64)	DS	CT Image only
Secondary Positioner Increment	(0051,xx65)	DS	CT Image only

9.5.1.6 SOP Common Module - Image Type Extensions

Additional values for the Image Type (0008,0008) and frame Type (0008,9007) attributes are used to designate the purpose of the SOP instance created by the MAMMOMAT Revelation system. Please see the following table for details.

Table 144 – Image Type/ Frame Type

Value	Description
FFDM Images	
ORIGINAL | PRIMARY | | <laterality>	MG Image FOR PROCESSING
DERIVED | PRIMARY | | <laterality>	MG Image FOR PRESENTATION
Tomosynthesis	
ORIGINAL | PRIMARY | TOMO_PROJ | <laterality>	Tomosynthesis projections FOR PROCESSING
DERIVED | PRIMARY | TOMO_PROJ | <laterality>	Tomosynthesis projections FOR PRESENTATION
ORIGINAL | PRIMARY | TOMO_2D | <laterality>	Tomo + 2D first projection FOR PROCESSING
DERIVED | PRIMARY | TOMO_2D | <laterality>	Tomo + 2D first projection FOR PRESENTATION
DERIVED | PRIMARY | TOMO | <laterality>	Tomo Slices in CT format
DERIVED | PRIMARY | TOMOSYNTHESIS | NONE	Tomo Slices in BTO format
Synthetic Images	
DERIVED | PRIMARY | TOMO_2D | <laterality>| INSIGHT_2D	Insight 2D Mammograms in CT format
DERIVED | PRIMARY | TOMO_2D | <laterality>| INSIGHT_2D	Insight 2D Mammograms in BTO format
DERIVED | PRIMARY | TOMO | <laterality>| INSIGHT_3D	Insight 3D Mammograms in CT format
DERIVED | PRIMARY | TOMOSYNTHESIS | INSIGHT_3D	Insight 3D Mammograms in BTO format
2D Biopsy Images	
ORIGINAL | PRIMARY | STEREO_SCOUT| <laterality>	MG Stereo Biopsy SCOUT Image FOR PROCESSING
ORIGINAL | PRIMARY | STEREO_MINUS| <laterality>	MG Stereo Biopsy MINUS Image FOR PROCESSING
ORIGINAL | PRIMARY | STEREO_PLUS| <laterality>	MG Stereo Biopsy PLUS Image FOR PROCESSING
DERIVED | PRIMARY | STEREO_SCOUT| <laterality>	MG Stereo Biopsy SCOUT Image FOR PRESENTATION
DERIVED | PRIMARY | STEREO_MINUS| <laterality>	MG Stereo Biopsy MINUS Image FOR PRESENTATION
DERIVED | PRIMARY | STEREO_PLUS| <laterality>	MG Stereo Biopsy PLUS Image FOR PRESENTATION
Tomosynthesis Biopsy Scout	
DERIVED | PRIMARY | TOMO_SCOUT | <laterality>	CTO Tomosynthesis Biopsy Scout Reconstructed
DERIVED | PRIMARY | TOMO_SCOUT | NONE	BTO Tomosynthesis Biopsy Scout Reconstructed
Including Tomo with multihole paddle for 2D Biopsy	
ORIGINAL | PRIMARY | TOMO_PROJ_SCOUT | <laterality>	Tomosynthesis Biopsy Scout Projections FOR PROCESSING Including: Original tomo projection with multi-hole paddle for 2D biopsy
DERIVED | PRIMARY | TOMO_PROJ_SCOUT | <laterality>	Tomosynthesis Biopsy Scout Projections FOR PRESENTATION Including: Derived tomo projection with multi-hole paddle for 2D biopsy

Value	Description
TiCEM	
ORIGINAL | PRIMARY | LOW_ENERGY | <laterality>| LOW_ENERGY	MG TiCEM Low Energy image FOR PROCESSING
ORIGINAL | PRIMARY | HIGH_ENERGY | <laterality>| HIGH_ENERGY	MG TiCEM High Energy image FOR PROCESSING
DERIVED | PRIMARY | LOW_ENERGY | <laterality>| LOW_ENERGY	MG TiCEM High Energy image FOR PRESENTATION
DERIVED | PRIMARY | RECOMBINED | SUBTRACTION | INSIGHT_CEM	Insight CEM Recombined Subtraction Image

NOTE: <laterality>: LEFT, RIGHT or BOTH in accordance with (0020,0062) Image Laterality

9.6 Private Transfer Syntaxes

No private Transfer Syntaxes are defined for or requested by MAMMOMAT Revelation DICOM application.

Annex A: Index of Tables

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