



# **Technical Publications**

**Direction 5357330-1EN (DOC1498472)  
Revision 7**

***Xeleris™ 3.0 ,Xeleris™ 3.1, Xeleris™ 4.0, Xeleris™ 4 DR***  
**DICOM CONFORMANCE STATEMENT**



**LIST OF REVISIONS**

| <b>REV</b> | <b>DATE</b>   | <b>DESCRIPTION</b>   | <b>PAGES</b>   | <b>APPR.</b> |
|------------|---------------|--|--|--------------|
| 1          | August 2010   | Initial Release for Xeleris 3  | All  | M. Mesh      |
| 2          | February 2013 | Xeleris 3.1 release: <ul style="list-style-type: none"> <li>• Conformance statement overview</li> <li>• Communication protocols updates</li> <li>• Private Multi-Gated Acquisition Module, Table 3-32</li> <li>• Private Data Dictionary, Table A-2</li> </ul> | Preface<br>Chapter 2, Section 2.4<br>Chapter 3, Section 3.5.8.11 Appendix A  | M. Mesh      |
| 3          | January 2014  | Xeleris 3.1 new applications release: <ul style="list-style-type: none"> <li>• Adopt new document template</li> <li>• Update Private Dictionary</li> <li>• Add new Section (PET Information Object Definition)</li> </ul>                                      | All  | M. Mesh      |
| 4          | March 2016    | Xeleris 4.0 release: <ul style="list-style-type: none"> <li>• Add Xeleris 4.0 implementation to the list of supported</li> <li>• Update references to Xeleris implementations</li> </ul>   | Overview<br>1.1, 1.2<br>2.2.1,2.2.2<br>2.3.1.1.4<br>2.3.1.2.1.2<br>2.3.1.3.1.2.1<br>2.7<br>3.2<br>4.2, 4.6<br>5.1, 5.2,,5.4.3.8, 5.6<br>6.1, 6.2, 6.6<br>8.1 | M. Mesh      |
| 5          | November 2017 | Xeleris 4 DR Release <ul style="list-style-type: none"> <li>• Add Xeleris 4 DR implementation to the list of supported</li> <li>• Add new Section</li> </ul>   | Conformance Statement Overview<br>1.1, 1.2<br>2.3.1<br>2.3.1.1.4   | M.Mesh       |

|   |           |  |   |        |
|---|-----------|--|---|--------|
|   |           | (Encapsulated PDF Information Object Definition) | 2.3.1.2.1.2<br>2.3.1.3.1.2<br>2.3.1.3.1.2.1<br>2.4.1<br>2.5.1.1<br>3.4.5.1 Table 3-18<br>3.4.6.8 Table 3-27<br>3.4.6.11 Table 3-31<br>3.4.6.11 Table 3-32<br>3.4.6.14 Table 3-36<br>4.4.3.5 Table 4-11<br>5.4.3.9<br>5.4.3.11(New)<br>9 (New) |        |
| 6 | May 2018  | Obsolete   |   |        |
| 7 | July 2018 | Updated after external review                    | Section 1.2<br>Section 9.4.2.1  | M.Mesh |

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# CONFORMANCE STATEMENT OVERVIEW

Throughout this document, Xeleris WS refers to the following products:

- Xeleris 3.0
- Xeleris 3.1
- Xeleris 4.0
- Xeleris 4 DR

The Xeleris WS DICOM implementation allows the user to send images, curves and reports, acquired through a front-end acquisition system, created by Xeleris processing functionality, or received from any other DICOM compliant system, to another DICOM station.

Xeleris WS DICOM implementation supports storage commitment for the already transferred data. This guarantees the user that acquired image data, as well as processing results are safely archived for future use.

Xeleris WS is capable of receiving DICOM objects from another DICOM compliant station.

Xeleris also allows query and retrieve of data stored in its local database from a remote station and can query and retrieve images stored in a remote DICOM station.

The Xeleris WS DICOM implementation also provides a verification mechanism by which a remote application entity (AE) can verify application-level communication with the Xeleris DICOM Server. Also provided is a mechanism by which a Xeleris user can verify application-level communication with a remote DICOM AE.

The DICOM Print Services for Xeleris WS are defined in a separate document published by Cedara Inc. ( See [Reference A](#) in Section 1.6)

The DICOM Media Services for Xeleris WS are defined in a separate document published by CDP Ltd. The CDP document "CD Printer 5.6.3 DICOM Conformance Statement" has been attached to the end of this document with permission ([Appendix A](#)).

Table 0.1 provides an overview of the network services supported by Xeleris WS

**Table 0.1 – NETWORK SERVICES**

| SOP Classes  | User of Service (SCU) | Provider of Service (SCP) |
|--|-----------------------|---------------------------|
| <b>Transfer</b>  |                       |                           |
| CT Image Storage   | Yes                   | Yes                       |
| MR Image Storage   | Yes                   | Yes                       |
| Secondary Capture Image Storage                            | Yes                   | Yes                       |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | Yes                   | Yes                       |
| Multi-frame True Color Secondary Capture Image Storage     | Yes                   | Yes                       |
| Nuclear Medicine Image Storage                             | Yes                   | Yes                       |
| Enhanced SR  | Yes                   | Yes                       |
| Positron Emission Tomography Image Storage                 | Yes                   | Yes                       |
| Standalone Curve Storage                                   | Yes                   | Yes                       |
| Private SOP Class Storage                                  | No                    | Yes                       |
| Encapsulated PDF Storage                                   | Yes (*)               | Yes (*)                   |
| <b>Query/Retrieve</b>                                      |                       |                           |
| Patient Root Query/Retrieve Information Model - FIND       | No                    | Yes                       |
| Patient Root Query/Retrieve Information Model - MOVE       | No                    | Yes                       |
| Study Root Query/Retrieve Information Model - FIND         | Yes                   | Yes                       |

|  |     |     |
|--|-----|-----|
| Study Root Query/Retrieve Information Model - MOVE | Yes | Yes |
| <b>Print Management</b>                            |     |     |
| Basic Grayscale Print Management Meta SOP Class    | Yes | No  |
| Basic Color Print Management Meta SOP Class        | Yes | No  |
| <b>Workflow Management</b>                         |     |     |
| Storage Commitment Push Model SOP Class            | Yes | No  |

*Note:* (\*) Supported by Xeleris 4 DR configuration only

Table 0.2 provides an overview of the Media Storage Application Profiles supported by Xeleris WS.

**Table 0.2 - MEDIA SERVICES**

| <b>Media Storage Application Profile</b> | <b>Write Files<br/>(FSC or FSU)</b> | <b>Read Files<br/>(FSR)</b> |
|--|-------------------------------------|-----------------------------|
| <b>Compact Disk - Recordable</b>         |                                     |                             |
| General Purpose CD-R                     | Option*                             | No                          |
| <b>DVD</b>                               |                                     |                             |
| General Purpose JPEG DVD                 | Option*                             | No                          |

Option\*: This means that this service can be purchased separately

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# 1. INTRODUCTION

## 1.1 OVERVIEW

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

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

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

**Section 3 (NM Image Information Object Implementation)**, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a NM Image Information Object.

**Section 4 (PET Image Information Object Implementation)**, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a PET Image Information Object.

**Section 5 (Secondary Capture Information Object Implementation)**, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Secondary Capture Information Model and Multi-Frame Secondary Capture Information Model.

**Section 6 (Standalone Curve Information Object Implementation)**, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of an Standalone Curve Information Model. Note nevertheless DICOM Standard Curve SOP Class have been retired, Xeleris WS is still able to generate objects of this SOP Class.

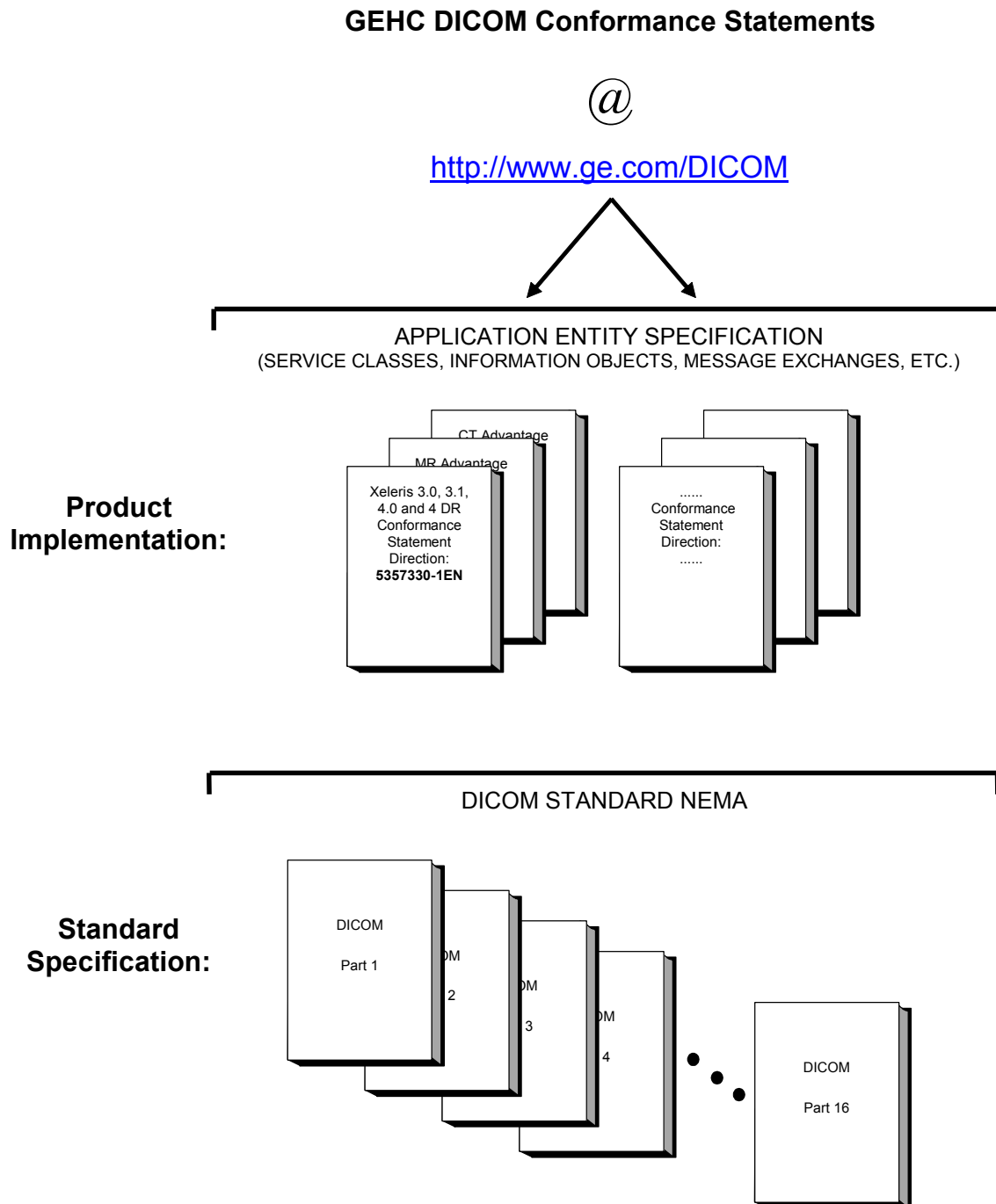
**Section 7 (Storage Commitment PUSH Model Implementation)**, which is used both for N-action storage commitment requests by the SCU and N-EVENT-REPORT storage commitment notifications by the SCP.

**Section 8 (QUERY Implementation)**, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Patient/Study Root Query/Retrieve service.

**Section 9 (Encapsulated PDF Information Object Implementation)**, which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Encapsulated PDF Information Object.

## 1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

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



This document specifies the DICOM implementation. It is entitled:

*Xeleris 3.0, Xeleris 3.1, Xeleris 4.0 and Xeleris 4 DR  
Conformance Statement for DICOM  
Direction 5357330-1EN*

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

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

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at <http://medical.nema.org>. Comments on the Standard may be addressed to:

DICOM Secretariat  
NEMA  
1300 N. 17<sup>th</sup> Street, Suite 1752  
Rosslyn, VA 22209  
USA  
Phone: +1.703.841.3200

### 1.3 INTENDED AUDIENCE

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

### 1.4 SCOPE AND FIELD OF APPLICATION

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

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

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

### 1.5 IMPORTANT REMARKS

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

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non-GE systems is the **user's**

responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

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

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

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEHC protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) described by these DICOM Conformance Statements.** The **user** should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **Interaction** - It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

## 1.6 REFERENCES

|                    |   |
|--------------------|---|
| <b>NEMA PS3</b>    | Digital Imaging and Communications in Medicine (DICOM) Standard, available free at <a href="http://medical.nema.org/">http://medical.nema.org/</a>  |
| <b>Reference A</b> | “Conformance Statement for Cedara Hardcopy Server as DICOM Print Management SCU”, available free at <a href="http://www.merge.com/MergeHealthcare/media/support/cedara/hardcopyserver_dicomprntmngmt.pdf">http://www.merge.com/MergeHealthcare/media/support/cedara/hardcopyserver_dicomprntmngmt.pdf</a> |

## 1.7 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Tag** – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

**Transfer Syntax** – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

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

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

## 1.8 SYMBOLS AND ABBREVIATIONS

|       |  |
|-------|--|
| AE    | Application Entity                             |
| AET   | Application Entity Title                       |
| CD-R  | Compact Disk Recordable                        |
| CSE   | Customer Service Engineer                      |
| CT    | Computed Tomography                            |
| DHCP  | Dynamic Host Configuration Protocol            |
| DICOM | Digital Imaging and Communications in Medicine |
| DNS   | Domain Name System                             |
| FSC   | File-Set Creator                               |
| FSU   | File-Set Updater                               |
| FSR   | File-Set Reader                                |
| HIS   | Hospital Information System                    |
| IHE   | Integrating the Healthcare Enterprise          |
| IOD   | Information Object Definition                  |
| IPv4  | Internet Protocol version 4                    |
| IPv6  | Internet Protocol version 6                    |
| ISO   | International Organization for Standards       |
| JPEG  | Joint Photographic Experts Group               |
| LUT   | Look-up Table                                  |
| MPEG  | Moving Picture Experts Group                   |
| MR    | Magnetic Resonance Imaging                     |
| NM    | Nuclear Medicine                               |
| O     | Optional (Key Attribute)                       |
| OSI   | Open Systems Interconnection                   |
| PACS  | Picture Archiving and Communication System     |



|        |   |
|--------|---|
| PET    | Positron Emission Tomography                    |
| PDO    | Protocol Data Object                            |
| PDU    | Protocol Data Unit                              |
| R      | Required (Key Attribute)                        |
| RTO    | Review Template Object                          |
| RIS    | Radiology Information System                    |
| SC     | Secondary Capture                               |
| SCP    | Service Class Provider                          |
| SCU    | Service Class User                              |
| SDO    | Series Data Object                              |
| SOP    | Service-Object Pair                             |
| SPS    | Scheduled Procedure Step                        |
| SR     | Structured Reporting                            |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| U      | Unique (Key Attribute)                          |
| UL     | Upper Layer                                     |
| VR     | Value Representation                            |

## 2. NETWORK CONFORMANCE STATEMENT

### 2.1 INTRODUCTION

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

Xeleris systems provide sophisticated image processing and storage functions on nuclear image data acquired through the front end acquisition system. In view of the requirements to conform to a global standard that permits interoperability across equipment produced by different vendors, Xeleris system will provide support for DICOM 3.0.

This section details the roles and DICOM Service Classes supported by the Xeleris WS implementations.

The Xeleris DICOM implementation allows the user to send images, curves and reports, acquired through a front-end acquisition system, created by Xeleris processing functionality, or received from any other DICOM compliant system, to another DICOM station. In this situation Xeleris is providing the DICOM C-STORE service as a service class user (SCU).

Xeleris is capable of receiving DICOM objects from another DICOM compliant station. In this situation Xeleris provides the DICOM C-STORE service as a service class provider (SCP).

Xeleris also allows query and retrieve of data stored in its local database from a remote station and can query and retrieve images stored in a remote DICOM station. In this situation Xeleris is providing the DICOM C-FIND and C-MOVE services as a service class provider (SCP) and that of a DICOM C-FIND and C-MOVE service class user (SCU).

Xeleris DICOM implementation supports storage commitment for the already transferred data. This guarantees the user that acquired image data, as well as processing results are safely archived for future use. In this situation Xeleris provides the DICOM Storage Commitment Service as Service Class User (SCU).

The Xeleris DICOM implementation also provides a verification mechanism by which a remote application entity (AE) can verify application-level communication with the Xeleris DICOM Server. Also provided is a mechanism by which a Xeleris user can verify application-level communication with a remote DICOM AE. In these situations, Xeleris provides the DICOM C-ECHO service as both a SCP and SCU, respectively.

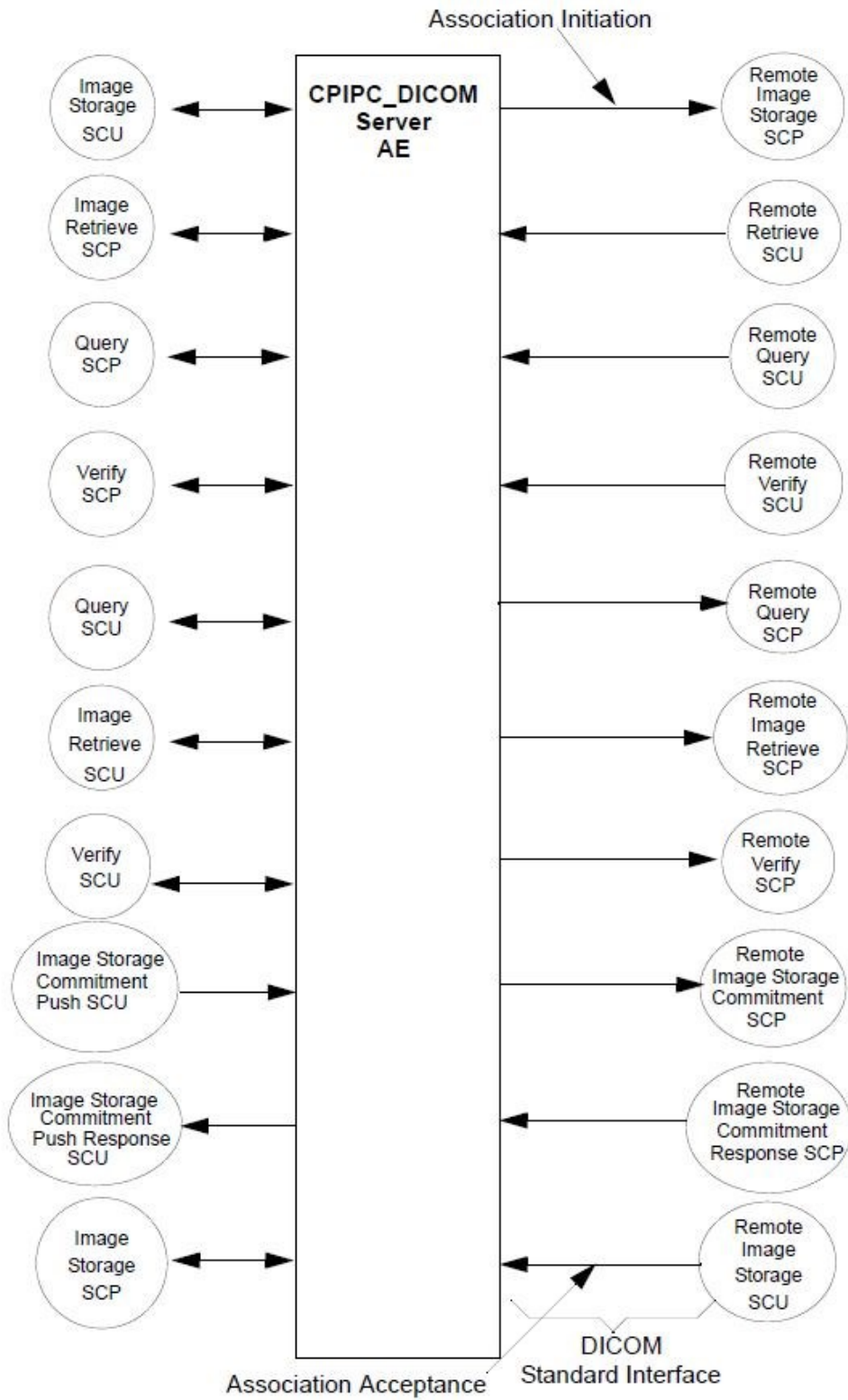
### 2.2 IMPLEMENTATION MODEL

#### 2.2.1 Application Data Flow Diagram

All DICOM functionality on the Xeleris product is logically provided by the CIPIC\_DICOM Server AE. The CIPIC\_DICOM Server AE is commanded to perform DICOM services through the use of the Xeleris user interface. The CIPIC\_DICOM Server AE also listens on a pre-defined port for incoming connections from remote DICOM AEs.

The network application model for the Xeleris WS is shown in the following Illustration :

**ILLUSTRATION 2-1**  
 XELERIS WS NETWORK APPLICATION MODEL AND DATA FLOW DIAGRAM



**2.2.2 Functional Definition of AE's**

The Xeleris C-STORE-DICOM Server Application Entity (AE) initiates the following functions:

- *Store*: Initiates a DICOM association in order to send images to a remote AE. If the remote AE accepts a presentation context applicable to the image(s) being sent, the C-STORE-DICOM Server will send the images via the C-STORE service.
- *Verify*: Initiates a DICOM association in order to send a verification message to a remote AE via a C-ECHO-RQ message.
- *Query*: Initiates a DICOM association in order to query images on a remote AE. If the remote AE accepts a presentation context applicable to the query request(s) being sent, the C-STORE-DICOM Server will receive appropriate query responses via the C-FIND service. Xeleris WS does not issue a C-FIND-CANCEL-RQ to terminate initiated query.
- *Retrieve*: Initiates a DICOM association in order to fetch images from a remote AE. If the remote AE accepts a presentation context applicable to the retrieve request(s), the remote AE initiates a DICOM association for C-STORE-RQ to the C-STORE-DICOM Server AE. If this is acceptable to the C-STORE-DICOM Server AE, then, the image(s) is (are) sent to the C-STORE-DICOM Server AE. C-STORE-DICOM Server AE can terminate the retrieve by sending a C-CANCEL-MOVE-RQ message.
- *Storage commitment*: Initiates a DICOM association in order to request a storage commitment from a remote AE. If the remote AE supports storage commitment the C-STORE-DICOM Server will request a storage commitment for the image(s) previously sent successfully via the N-ACTION-RQ.

The Xeleris C-STORE-DICOM Server AE responds to the following functions:

- *Store*: Responds to incoming C-STORE -RQ messages by storing the incoming data stream onto the disk.
- *Query*: Responds to incoming C-FIND-RQ messages by searching its local database for the requested attributes and returning a C-FIND-RSP message containing a match and a status of “pending.” All other matches are also returned in C-FIND-RSP messages with status of “pending” until the last message which is returned with a status of “success.” The remote AE can terminate the query by sending a C-CANCEL-FIND-RQ message.
- *Retrieve*: Responds to incoming C-MOVE-RQ messages by searching its local database for the requested image(s) and returning each via a C-STORE-RQ message. The C-STORE-DICOM Server will return a C-MOVE -RSP message after each image is sent. The status returned is “pending” until the last image is sent, in which case the appropriate status is returned. The remote AE can terminate the retrieve by sending a C-CANCEL-MOVE-RQ message.
- *Verify*: Responds to incoming C-ECHO-RQ messages by returning a C-ECHO-RSP message with a status of “success.”
- *Storage Commitment Response*: Responds to incoming N-EVENT\_REPORT messages arriving from Remote AE with the status of storage commitment for images previously requested by C-STORE-DICOM Server AE.

### 2.2.3 Sequencing of Real-World Activities

Xeleris Application Entity receives images acquired through a front-end acquisition station or performs query and retrieves images from PACS or another DICOM station; creates derived images using Xeleris processing functionality ; stores images and then requests Storage Commitment for previously stored images.

## 2.3 AE SPECIFICATIONS

### 2.3.1 CIPIC\_DICOM Server AE Specification

The CIPIC\_DICOM Server Application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU and/or as an SCP:

| SOP Class Name   | SOP Class UID                 | SCU     | SCP     |
|--|-------------------------------|---------|---------|
| Verification SOP Class                                     | 1.2.840.10008.1.1             | Yes     | Yes     |
| CT Image Storage   | 1.2.840.10008.5.1.4.1.1.2     | Yes     | Yes     |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7     | Yes     | Yes     |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2   | Yes     | Yes     |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | Yes     | Yes     |
| Nuclear Medicine Image Storage                             | 1.2.840.10008.5.1.4.1.1.20    | Yes     | Yes     |
| MR Image Storage   | 1.2.840.10008.5.1.4.1.1.4     | Yes     | Yes     |
| Enhanced SR Storage  | 1.2.840.10008.5.1.4.1.1.88.22 | Yes     | Yes     |
| Positron Emission Tomography Image Storage                 | 1.2.840.10008.5.1.4.1.1.128   | Yes     | Yes     |
| Standalone Curve Storage                                   | 1.2.840.10008.5.1.4.1.1.9     | Yes(*)  | Yes(*)  |
| Private SOP Class Storage                                  | 1.2.840.113619.4.27           | No      | Yes     |
| Patient Root Query/Retrieve Information Model – FIND       | 1.2.840.10008.5.1.4.1.2.1.1   | No      | Yes     |
| Patient Root Query/Retrieve Information Model - MOVE       | 1.2.840.10008.5.1.4.1.2.1.2   | No      | Yes     |
| Study Root Query/Retrieve Information Model - FIND         | 1.2.840.10008.5.1.4.1.2.2.1   | Yes     | Yes     |
| Study Root Query/Retrieve Information Model - MOVE         | 1.2.840.10008.5.1.4.1.2.2.2   | Yes     | Yes     |
| Storage Commitment Push Model                              | 1.2.840.10008.1.20.1          | Yes     | No      |
| Encapsulated PDF Storage                                   | 1.2.840.10008.5.1.4.1.1.104.1 | Yes(**) | Yes(**) |

**Note:**

(\*) Standalone Curve Storage has been retired in DICOM, but it is still supported by Xeleris WS.

(\*\*) Supported by Xeleris 4 DR implementation only.

### 2.3.1.1 Association Establishment Policies

#### 2.3.1.1.1 General

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

|                                 |                              |
|---------------------------------|------------------------------|
| <b>Application Context Name</b> | <b>1.2.840.10008.3.1.1.1</b> |
|---------------------------------|------------------------------|

The maximum length PDU receive size for the CPIPC\_DICOM Server is:

|                           |                                  |
|---------------------------|----------------------------------|
| <b>Maximum Length PDU</b> | <b>128000 (Not Configurable)</b> |
|---------------------------|----------------------------------|

#### 2.3.1.1.2 Number of Associations

The CPIPC\_DICOM Server will initiate a maximum of 4 simultaneous associations to remote nodes.

The CPIPC\_DICOM Server will support a maximum of 5 simultaneous associations initiated by remote nodes.

#### 2.3.1.1.3 Asynchronous Nature

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

#### 2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

|   |                             |
|---|-----------------------------|
| <b>Xeleris WS Implementation UID</b>          | <b>1.2.840.113619.6.281</b> |
| <b>Xeleris WS Implementation Version Name</b> | <b>Xeleris X.YZZZ(*)</b>    |

**Note(\*)** : X.Y –major version (3.0, 3.1, 4.0 or 4.1) ;ZZZ – minor version (ex., 317)

#### 2.3.1.2 Association Initiation Policy

The CPIPC\_DICOM Server AE initiates a new association:

- Due to an image send operation being initiated from the Xeleris user interface.
- Due to a Verify operation initiated to determine whether the remote DICOM station is operational.
- Due to image data being Queried from a Remote AE.
- Due to image data being Retrieved from a Remote AE.
- Due to a storage commitment request operation being initiated after successful image transfer.

When the CPIPC\_DICOM Server Application Entity initiates an Association for any Real-World Activity, it will propose the Presentation Contexts for all Real-World Activities

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

### 2.3.1.2.1 Real-World Activity: Image Send

#### 2.3.1.2.1.1 Associated Real-World Activity

The operator must select elements (study(ies)/ serie(s)/ image(s)/ curve(s)) to be transferred from the Patient Selector. Once these selections have been made, the operator selects any DICOM station as target to initiate image send job(s). DICOM station is added to the list of target repositories if “Send Images” flag is checked in the Remote DICOM Station definition.

All created jobs are registered in the Job Browser where job status is indicated. The status can be QUEUED, ACTIVE, COMPLETED, FAILED and CANCELED. Initial status of each job is QUEUED.

The CIPIC\_DICOM Server AE will then initiate an association with the remote AE in order to perform send job. Status of Job becomes ACTIVE. The exception to this is that, if image send fails due to network problems, the current association is closed and another is opened to finish the current send (if possible) and sending the remaining elements.

If all elements selected for transfer of the ACTIVE send job are successfully transferred, job status is changed to COMPLETED.

If transfer of at least one of the selected elements of the ACTIVE job fails, job final status is set to FAILED. Reason of failure is displayed in Job Browser.

Operator may cancel send job(s) from the Job Browser. He selects job(s) and push “Cancel” button. Job final status becomes CANCELED.

#### 2.3.1.2.1.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by CIPIC_DICOM Server AE for Activity “Image Send” |                               |  |  |      |                      |
|--|-------------------------------|--|--|------|----------------------|
| Abstract Syntax  |                               | Transfer Syntax  |  | Role | Extended Negotiation |
| Name   | UID                           | Name List  | UID List                                 |      |                      |
| Nuclear Medicine Image Storage   | 1.2.840.10008.5.1.4.1.1.20    | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| Stand-alone Curve Storage (*)  | 1.2.840.10008.5.1.4.1.1.9     | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| Secondary Image Capture Storage  | 1.2.840.10008.5.1.4.1.1.7     | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| CT Image Storage   | 1.2.840.10008.5.1.4.1.1.2     | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| PET Image Storage  | 1.2.840.10008.5.1.4.1.1.128   | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| MR Image Storage   | 1.2.840.10008.5.1.4.1.1.4     | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| Multi-frame Grayscale Byte Secondary Capture Image Storage                               | 1.2.840.10008.5.1.4.1.1.7.2   | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| Multi-frame True Color Secondary Capture Image Storage                                   | 1.2.840.10008.5.1.4.1.1.7.4   | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |
| Enhanced SR  | 1.2.840.10008.5.1.4.1.1.88.22 | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU  | None                 |

|                       |                               |  |  |     |      |
|-----------------------|-------------------------------|--|--|-----|------|
| Encapsulated PDF (**) | 1.2.840.10008.5.1.4.1.1.104.1 | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCU | None |
|-----------------------|-------------------------------|--|--|-----|------|

**Note :** (\*) Stand-alone Curve Storage SOP Class has been retired in DICOM, but it is still supported by Xeleris WS.  
(\*\*) Supported by Xeleris 4 DR implementation only.

### 2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for All Storage SOP Classes

This implementation can perform multiple C-STORE operations over a single association. There is not any Time-outs defined in C-STORE operation.

Upon receiving a C-STORE confirmation containing a Successful status, this implementation will perform the next C-STORE operation. The association will be maintained if possible.

Upon receiving a C-STORE confirmation containing a status other than Successful, this implementation consider the request of the current images store to be a failure but will continue to attempt to send any remaining images in the same association.

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

| Service Status | Status Code | Further Meaning   | Application Behavior When Receiving Status Code  | Related Fields |
|----------------|-------------|---|--|----------------|
| Failed         | A700        | Refused: Out of resources   | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A710        | Refused: Write to remote database failed                                  | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A720        | Refused: Remote DICOM Toolkit problems                                    | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A730        | Refused: Remote cannot understand received DICOM message                  | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A740        | Refused: Cannot find Pixel data   | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A750        | Refused: Remote cannot store data on the archive device                   | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A760        | Refused: Default destination for PET RAW data re-direction is not defiled | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A780        | Refused: Sender is not defined on remote DICOM station                    | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | A900        | Error: Data set does not match SOP Class                                  | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |
|                | C000        | Error: Cannot understand  | Final image send job status is set to FAILED, appropriate reason message is displayed in the "Reason" column | None           |



|         |      |                                   |  |      |
|---------|------|-----------------------------------|--|------|
| Warning | B000 | Coercion of Data Elements         | Final image send job status is set to FAILED, appropriate reason message is displayed in the “Reason” column | None |
|         | B006 | Elements Discarded                | Final image send job status is set to FAILED, appropriate reason message is displayed in the “Reason” column | None |
|         | B007 | Data Set does not match SOP Class | Final image send job status is set to FAILED, appropriate reason message is displayed in the “Reason” column | None |
| Success | 0000 |                                   | Final image send job status is set to COMPLETED  | None |

*Note:* The error codes A700-A770 are Private Status Codes. Xeleris stations will return one of the above mentioned status codes (Refused and Error) in case of Image Send failure. DICOM PS3.4 provides the flexibility of returning private status codes. Xeleris uses them to provide more information to the Xeleris user in case of an Image Send failure.

If Non-Xeleris stations SCP return the same status code, Xeleris SCU will interpret them as per the table above. The non-Xeleris station’s interpretation of the status code will not be considered.

### 2.3.1.2.2 Real-World Activity: Verify

#### 2.3.1.2.2.1 Associated Real-World Activity

Service personnel invoke the DICOM “Echo” from the Xeleris Configuration. The operator selects one of the remote DICOM stations from list and presses “Echo” Button. The user may also select any remote DICOM station as Source or Destination system in the Patient Selector user interface and choose "Check Status" entry from associated menu. The CIPIC\_DICOM server will initiate an association with the remote DICOM AE in order to verify communication at the application level. The status of the verification process is displayed to the user.

#### 2.3.1.2.2.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by CIPIC_DICOM Server AE for Activity “Verify” |                   |  |  |      |                      |
|--|-------------------|--|--|------|----------------------|
| Abstract Syntax  |                   | Transfer Syntax  |  | Role | Extended Negotiation |
| Name   | UID               | Name List  | UID List                                 |      |                      |
| Verification SOP Class   | 1.2.840.10008.1.1 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |

#### 2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The CIPIC\_DICOM Server AE provides standard conformance to the DICOM Verification Service Class.

### 2.3.1.2.3 Real-World Activity: Query

#### 2.3.1.2.3.1 Associated Real-World Activity

Xeleris implements the query operation in 3 levels. The first level of query provides query results pertaining to the Patient and Study objects only. The second level of query provides results regarding the series for the given Study. The third level of query provides results regarding the images for the both given Study and Series.

The First Level Query operation is initiated by the selection of DICOM station from the pool of source repositories. DICOM station is added to pool of source repositories if “Query/Retrieve” flag is checked in the Remote DICOM Station definition dialog.

Before First Level Query, Verification of Remote station DICOM status is performed. If Verification returns “Online” status only, Query operation proceeds.

The operator can define Search Criteria for the First level Query, if “Filtered” flag is checked in the Remote DICOM Station definition.

If “Filtered” flag is checked and operator selects remote DICOM station as source repository “Filter Dialog” is opened. Operator may define search criteria by “Patient Name”, “Patient Id”, “Study ID”, “Study Description”, “Accession Number”, “Study Date” and “Modalities in Study” attributes or any combination of them. The operator must push “OK” button to initiate the Query operation.

If “Filtered” flag is not checked, the operator initiates Query operation without any search criteria by selection of the remote DICOM station as source repository. The CIPIC\_DICOM Server will then initiate an association with remote AE in order to query remote AE for the given search parameters. The results of the Query operation are indicated in the Patient Selector of Xeleris.

The operator may press on the folder icon of any Study entry from the Patient selector to initiate Second Level Query Operation. The CIPIC\_DICOM Server will then initiate an association with remote AE in order to query remote AE for the given Study UID as search criteria. The results of the Query operation are inserted as Series under the expanded Study in the Patient Selector.

The operator may press on the folder icon of any Series entry from the Patient selector to initiate Third Level Query Operation. The CIPIC\_DICOM Server will then initiate an association with remote AE in order to query remote AE for the given Study UID and Series UID as search criteria. The results of the Query operation are inserted as Datasets under the expanded Series in the Patient Selector.

No additional search criteria rather than “Study UID” and “Series UID” is provided for the Second Level Query and the Third Level Query.

Note that once initiated the Query operation cannot be cancelled by the operator from Xeleris UI.

Xeleris makes use of the Study Root Query/Retrieve Model to initiate a Query operation. Details of this model are provided in **Section 8** of this document. Note that for each level of query operation, a single association is established.

### 2.3.1.2.3.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by CIPIC_DICOM Server AE for Activity Query |                             |                           |                     |      |                      |
|---|-----------------------------|---------------------------|---------------------|------|----------------------|
| Abstract Syntax   |                             | Transfer Syntax           |                     | Role | Extended Negotiation |
| Name  | UID                         | Name List                 | UID List            |      |                      |
| Study Root Query/Retrieve Information Model - FIND                                | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|   |                             | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |

#### 2.3.1.2.3.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - FIND SOP Class

The CIPIC\_DICOM Server includes matching keys in the queries as described in Section 8

This implementation can perform multiple C-FIND operations over a single association. There is not any Time-outs defined in CIPIC\_DICOM Server for C-FIND operations.

Upon receiving a C-FIND confirmation containing a Successful status, this implementation will perform the next C-FIND operation. The association will be maintained if possible.

Upon receiving a C-FIND confirmation containing a Pending status, this implementation will wait for further C-FIND responses from the remote DICOM AE.

Upon receiving a C-FIND confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-FIND confirmation containing a status other than Successful, Pending or Refused, this implementation will consider the current request to be a failure but will continue to attempt to send any remaining query requests with a different association.

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

| <b>Service Status</b> | <b>Status Code</b> | <b>Further Meaning</b>   | <b>Application Behavior When Receiving Status Code</b>      |
|-----------------------|--------------------|--|---|
| Failure               | A700               | Refused: Out of resources  | No results are displayed in the Xeleris Patient Selector    |
|                       | A900               | Error: Identifier does not match SOP Class   | No results are displayed in the Xeleris Patient Selector    |
|                       | C000               | Error: Unable to process   | No results are displayed in the Xeleris Patient Selector    |
| Success               | 0000               | Matching is complete - No final identifier is supplied   | Query results are displayed in the Xeleris Patient Selector |
| Pending               | FF00               | Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.         | No Visible User Output                                      |
|                       | FF01               | Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier | No Visible User Output                                      |

#### 2.3.1.2.4 Real-World Activity: Retrieve

##### 2.3.1.2.4.1 Associated Real-World Activity

The Xeleris operator initiates invocation of the Retrieve (Fetch) operation by the selection of one or more search results (Study/Series/Image results) on the Patient Selector UI of the remote DICOM station and then by selection the move destination. This mechanism assumes that the operator has preceded the Fetch with a Query operation. The Fetch job is registered in the Job Browser where job status is indicated. The status can be QUEUED, ACTIVE, COMPLETED, FAILED and CANCELED. Initial status of each job is QUEUED.

CPIPC\_DICOM Server will then initiate an association with the remote AE in order to fetch DICOM images from the remote AE for the given Study/Series/Image selection. The status of operation becomes ACTIVE.

Xeleris makes use of the Study Root Query\Retrieve Model to initiate a Retrieve (Fetch) operation. Details of this model are provided in Section 5 of this document.

Note that multiple C-MOVE requests may be sent within one association established. There is not any Time-outs defined in CPIPC\_DICOM Server for C-MOVE operations.

The final status of Retrieve job is stated according to the final status returned by Retrieve SCP.

Operator may cancel Retrieve job(s) from the Job Browser. He selects job(s) and pushes “Cancel” button. Job final status becomes CANCELED.

**2.3.1.2.4.2 Proposed Presentation Context Table**

| <b>Presentation Context Table – Proposed by CIPIC_DICOM Server AE for Activity “Retrieve”</b> |                             |                           |                     |             |                             |
|---|-----------------------------|---------------------------|---------------------|-------------|-----------------------------|
| <b>Abstract Syntax</b>  |                             | <b>Transfer Syntax</b>    |                     | <b>Role</b> | <b>Extended Negotiation</b> |
| <b>Name</b>   | <b>UID</b>                  | <b>Name List</b>          | <b>UID List</b>     |             |                             |
| Study Root Query/Retrieve Information Model - MOVE  | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU         | None                        |
|   |                             | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |             |                             |

**2.3.1.2.4.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - MOVE SOP Class**

This implementation can perform multiple C-MOVE operations over a single association.

Upon receiving a C-MOVE confirmation containing a Successful status, this implementation will proceed with next C-MOVE request. When all C-MOVE requests are processed, the implementation will close the association.

Upon receiving a C-MOVE confirmation containing a Pending status, this implementation will wait for further C-MOVE responses from the remote DICOM AE.

Upon receiving a C-MOVE confirmation containing a Refused status, this implementation will terminate the association.

Upon receiving a C-MOVE confirmation containing a status other than Successful, Pending or Warning, this implementation will consider the current request to be a failure.

The C-MOVE-RQ will use the AE Title of the selected as destination remote system Application Entity as the Move Destination AE Title

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

| <b>Service Status</b> | <b>Status Code</b> | <b>Further Meaning</b>  | <b>Application Behavior When Receiving Status Code</b>                                |
|-----------------------|--------------------|---|---|
| Failure               | A701               | Refused: Out of resources - Unable to calculate number of matches | Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser |
|                       | A702               | Refused: Out of resources - Unable to perform sub-operations      | Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser |
|                       | A801               | Refused: Move Destination Unknown                                 | Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser |
|                       | A900               | Error: Identifier does not match SOP Class                        | Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser |
|                       | C000               | Error: Unable to process  | Retrieve Job is moved to FAILED state; Failure Reason is displayed in the Job Browser |
| Cancel                | FE00               | Sub-operations terminated due                                     | Retrieve Job is moved to CANCELLED state  |

|         |      |   |  |
|---------|------|---|--|
|         |      | to a Cancel indication                          |  |
| Warning | B000 | Sub-operations Complete - One or more Failures. | No Visible User Output                   |
| Success | 0000 | Sub-operations Complete - No Failure.           | Retrieve Job is moved to COMPLETED state |
| Pending | FF00 | Sub-operations are continuing -                 | No Visible User Output                   |

### 2.3.1.2.5 Real-World Activity: Storage Commitment

#### 2.3.1.2.5.1 Associated Real-World Activity

The operator must both select image(s) to be transferred from the Patient Selector and select a destination by pressing the “Destination” button. The CIPIC\_DICOM server will then initiate an association with the remote AE in order to send the selected image(s) and will accept interparty responses received from the remote AE. If the destination is configured as storage commitment capable or the destination is configured to use other storage commitment capable devices, the CIPIC\_DICOM Server will initiate an association with the remote storage commitment capable AE in order to request a storage commitment for the successfully transferred image(s).

The storage commitment request it will always use a new association for requesting a commitment for the successfully transferred image(s). The storage commitment response will usually require the remote AE to initiate a new association with the CIPIC\_DICOM.

The UI shows the status of the storage commitment request progress. The status can be either WAITING FOR COMMITMENT, SUCCESS, or FAILURE. The associated error messages due to a failure can be found in the system log.

#### 2.3.1.2.5.2 Proposed Presentation Context Table

| Presentation Context Table – Proposed by CIPIC_DICOM Server AE for Activity “Storage Commitment” |                      |  |  |      |                      |
|--|----------------------|--|--|------|----------------------|
| Abstract Syntax  |                      | Transfer Syntax  |  | Role | Extended Negotiation |
| Name   | UID                  | Name List  | UID List                                 |      |                      |
| Storage Commitment Push Model SOP Class  | 1.2.840.10008.1.20.1 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |

#### 2.3.1.2.5.2.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class SCU

The storage commitment request (N-ACTION) can perform a storage commitment request for multiple images over a single association. A new association is initiated for the storage commitment request for list of successfully transferred image(s) belonging to the same study. There is not any Time-outs defined in CIPIC\_DICOM Server for Storage Commitment N-ACTION request.

Upon receiving a N-ACTION confirmation containing a “Successful” status, the next N\_ACTION\_RQ operation is performed for the new association.

Upon receiving a N-ACTION confirmation containing a “Failed” status, the association is terminated. The reason for termination is recorded in the system log file.

The CIPIC\_DICOM Server AE uses DICOM network storage services to transfer SOP Instances which are to be committed. It does not support the optional Storage Media File-Set ID and UID Attributes in the Storage Commitment N-ACTION for transfer of SOP Instances by media for Storage Commitment.

The CIPIC\_DICOM Server AE may request Storage Commitment for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1.2.1.2.1).

The Storage Commitment Information Object is described in Section 7

The CIPIC\_DICOM Server AE waits for a N-EVENT-REPORT during predefined time limit, which is configurable in user interface. Default value is 24 Hours. If N-EVENT\_REPORT is not arrived during this period, storage commitment request status is changed to FAILURE and appropriate error message is logged.

Following are the status codes that are more specifically processed when receiving N-Action responses from a **Storage Commitment** SCP equipment:

| Service Status | Status Code | Further Meaning         | Application Behavior When Receiving Status Code                                       |
|----------------|-------------|-------------------------|---|
| Failure        | 0119        | Class-instance conflict | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0210        | Duplicate invocation    | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0115        | Invalid argument value  | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0117        | Invalid SOP Instance    | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0212        | Mistyped argument       | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0123        | No such action          | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0118        | No such SOP Class       | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0112        | No such SOP Instance    | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
|                | 0110        | Processing failure      | Transfer Job is moved to FAILED state. Failure Reason is displayed in the Job Browser |
| Success        | 0000        |                         | Transfer Job is moved to WAITING FOR COMMITMENT state                                 |

Upon receiving a N-ACTION confirmation containing a status other than the defined values, the current request is considered to be a failure and will terminate the association. The reason for termination is recorded in the system log file.

As part of the storage commitment implementation, Remote AE (SCP) will initiate an association to this implementation and will send an N-EVENT-REPORT. The attribute of the N-EVENT-REPORT message will include an indication on all images for which a commitment has succeeded and those for which it has failed.

The receipt of a N-EVENT-REPORT on an association that CIPIC\_DICOM has initiated is not supported. The Remote AE (SCP) must initiate a new association in order to return the new N-EVENT-REPORT.

### 2.3.1.3 Association Acceptance Policy

Only those remote DICOM AE added to Xeleris DICOM configuration may connect to the CIPIC\_DICOM Server AE. The maximum number of associations accepted in parallel is limited to 5.

The CIPIC\_DICOM Server AE responds to image store operations from remote AE's. Any Remote AE can send data (CT/PT/MR/NM/SC/MFSC/ Structure Reports/Standalone Curves) to Xeleris to be stored in the local Xeleris database.

Any remote AE can open an association to the DICOM Server AE for the purpose of application level communication verification.

The CIPIC\_DICOM Server AE responds to query requests from remote AE's with matching responses. Any remote AE can also request the CIPIC\_DICOM Server AE to retrieve image data from Xeleris, and to send this data to the remote AE.

As part of the storage commitment implementation, the CIPIC\_DICOM Server responds to N-EVENT-REPORT received from remote AE.

#### 2.3.1.3.1 Real-World Activity Store Images

##### 2.3.1.3.1.1 Associated Real-World Activity

The DICOM Server AE is always listening for associations. No operator action is required to respond to a Store request.

The real-world activity associated with the Store request is to store the image data in the local database and send a C-STORE -RSP message with the status of "success" for each image that can be stored in the local database. A C-STORE-RSP message with the status "failed" is sent for each image that cannot be stored in the local database.

There is not any Time-outs defined in CIPIC\_DICOM Server for Image Storage operation.

##### 2.3.1.3.1.2 Accepted Presentation Context Table

| Presentation Context Table - Accepted by CIPIC_DICOM Server AE for Activity "Store Images" |                             |  |  |      |                      |
|--|-----------------------------|--|--|------|----------------------|
| Abstract Syntax  |                             | Transfer Syntax  |  | Role | Extended Negotiation |
| Name   | UID                         | Name List  | UID List                                 |      |                      |
| Nuclear Medicine Image Storage   | 1.2.840.10008.5.1.4.1.1.20  | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| CT Image Storage   | 1.2.840.10008.5.1.4.1.1.2   | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| MR Image Storage   | 1.2.840.10008.5.1.4.1.1.4   | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| Standalone Curve Storage (*)   | 1.2.840.10008.5.1.4.1.1.9   | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| Private SOP Class Storage  | 1.2.840.113619.4.27         | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| Secondary Image Capture Storage  | 1.2.840.10008.5.1.4.1.1.7   | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |
| PET Image Storage  | 1.2.840.10008.5.1.4.1.1.128 | Implicit VR Little Endian                              | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |

|  |                               |  |  |     |      |
|--|-------------------------------|--|--|-----|------|
|  |                               | Explicit VR Little Endian                              |  |     |      |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2   | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP | None |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP | None |
| Enhanced SR  | 1.2.840.10008.5.1.4.1.1.88.22 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP | None |
| Encapsulated PDF(**)                                       | 1.2.840.10008.5.1.4.1.1.104.1 | Explicit VR Little Endian<br>Implicit VR Little Endian | 1.2.840.10008.1.2.1<br>1.2.840.10008.1.2 | SCP | None |

**Note :** (\*) Stand-alone Curve Storage SOP Class has been retired in DICOM, but it is still supported by Xeleris WS.

(\*\*) Supported by Xeleris 4 DR implementation only.

### 2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

The CIPIC\_DICOM Server provides Level 2 (FULL) Conformance CT, PET, MR, Enhanced SR and Encapsulated PDF SOP Classes, and stores all standard and private data elements of received SOP Instances.

The AE provides Digital Signature Level 3 support of above mentioned SOP Classes, as it provides full fidelity storage of received SOP Instances.

The CIPIC\_DICOM Server provides Level 1 (BASE) Conformance NM images, Stand-alone Curves, Secondary capture and Multi-frame Secondary Capture Storage SOP Classes, and stores all mandatory (Type 1 and 2) data elements of received SOP Instances. It also stores selected optional (Type 3) data elements, and private data elements for which it has a data dictionary entry, as described in Sections 3, 4, 5, 6 .

The AE provides Digital Signature Level 0 support for above mentioned SOP Classes , as it does not provide Level 2 (FULL) Conformance.

Stand-alone Curve Storage SOP Class has been retired in DICOM, but it is still supported by Xeleris WS.

The AE validates that the Attributes of the SOP Instance meet the requirements of the IOD with respect to Value Representation, presence of Type 1 and 2 elements, valid values, and consistency between image attributes and pixel data.

Successfully received SOP Instances may be accessed via the user interface and by DICOM network query retrieve. SOP Instances are stored until manually deleted by the user.

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

| Service Status | Status Code | Further Meaning           | Status Code Explanation   | Related Fields Sent Back to the SCU |
|----------------|-------------|---------------------------|---|-------------------------------------|
| Failure        | A700        | Refused: Out of resources | Returned if the DICOM Server runs out of resources (e.g. memory); error logged. | None                                |
|                | A710        | Refused: Out of Resources | Returned if Dataset not written into the remote database; error logged.         | None                                |
|                | A720        | Refused: Out of Resources | Returned if Internal error in the DICOM AE; error logged.                       | None                                |



|         |      |   |  |      |
|---------|------|---|--|------|
|         | A730 | Refused: Out of Resources               | Returned if DICOM AE failed to understand DICOM stream; error logged.  | None |
|         | A740 | Refused: Out of Resources               | Returned if DICOM AE failed to access pixel data in the DICOM stream; error logged.  | None |
|         | A900 | Error: Dataset does not match SOP Class | Returned by DICOM Server if affected SOP Class is not supported by Xeleris, the Store operation failed; error logged.                  | None |
|         | C000 | Error: Cannot Understand                | Returned by the DICOM Server if for any other reason, not specified elsewhere in this table, the Store operation failed; error logged. | None |
| Warning | B000 | Coercion of Data Elements               | Warning! Dataset does not match SOP Class or Coercion of Data Elements   | None |
|         | B007 | Data Set does not match SOP Class       | Warning! Dataset does not match SOP Class or Coercion of Data Elements   | None |
|         | B006 | Elements Discarded                      | Warning! Dataset does not match SOP Class or Coercion of Data Elements   | None |
| Success | 0000 |   |  | None |

**Note:** The error codes A700-A740 are Private Status Codes. Xeleris stations will return one of the above mentioned status codes (Refused and Error) in case of Image Receive Failure. DICOM PS3.4 provides the flexibility of returning private status codes. Xeleris uses them to provide more information to the Xeleris user in case of an Image Receive failure.

### 2.3.1.3.1.3 Presentation Context Acceptance Criterion

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

### 2.3.1.3.1.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CPIPC\_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian.

### 2.3.1.3.2 Real-World Activity Query SCP

#### 2.3.1.3.2.1 Associated Real-World Activity

The CPIPC\_DICOM Server AE is always listening for associations. No operator action is required to respond to Query request.

The real-world activity associated with the Query request is to search the local database for all entries that match the request and send a C-FIND-RSP message with the status of “pending” for each matching entry. The exception to this is the last message which is sent with a status of “success.”

**2.3.1.3.2.2 Accepted Presentation Context Table**

| <b>Presentation Context Table - Accepted by CIPIC_DICOM Server AE for Activity "Query SCP"</b> |                             |  |  |             |                             |
|--|-----------------------------|--|--|-------------|-----------------------------|
| <b>Abstract Syntax</b>   |                             | <b>Transfer Syntax</b>                                 |  | <b>Role</b> | <b>Extended Negotiation</b> |
| <b>Name</b>  | <b>UID</b>                  | <b>Name List</b>                                       | <b>UID List</b>                          |             |                             |
| Patient Root Query/Retrieve Information Mode- FIND   | 1.2.840.10008.5.1.4.1.2.1.1 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP         | None                        |
| Study Root Query/Retrieve Information Mode- FIND   | 1.2.840.10008.5.1.4.1.2.2.1 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP         | None                        |

**2.3.1.3.2.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model – FIND and Study Root Query/Retrieve Information Model - FIND SOP Classes**

The CIPIC\_DICOM Server provides matching against query keys as described in Section 8.

The AE does not support Relational Search.

The AE supports case-insensitive matching for the attributes of Value Representation PN as described in Section 8.2.2

Following are the status codes the Application may send back to the SCU Equipment while performing the requested Query :

| <b>Service Status</b> | <b>Status Code</b> | <b>Further Meaning</b>   | <b>Status Code Explanation</b>  | <b>Related Fields Sent Back to the SCU</b> |
|-----------------------|--------------------|--|---|--|
| Failure               | A700               | Refused: Out of resources  | Returned if the DICOM Server runs out of resources (e.g. memory); error logged.   | None                                       |
|                       | C000               | Error: Unable to process   | Returned by the DICOM Server if for any other reason, not specified elsewhere in this table, the Find operation failed; error logged. | None                                       |
| Cancel                | FE00               | Matching terminated due to cancel  | Returned if the DICOM Server receives a C-CANCEL-FIND-RQ message; error logged.   | None                                       |
| Success               | 0000               | Matching is complete - No final identifier is supplied   |   | None                                       |
| Pending               | FF00               | Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.         |   |  |
|                       | FF01               | Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier |   |  |

**2.3.1.3.2.3 Presentation Context Acceptance Criterion**

The CIPIC\_DICOM Server evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for Query SCP Real-World Activity.

**2.3.1.3.2.4 Transfer Syntax Selection Policies**

Within each Presentation Context, the CIPIC\_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian.

**2.3.1.3.3 Real-World Activity Image Retrieve SCP**

**2.3.1.3.3.1 Associated Real-World Activity**

The DICOM Server AE is always listening for associations. No operator action is required to respond to an Image Retrieve request.

The real-world activity associated with the Image Retrieve request is to send all images corresponding to the C-MOVE request to the specified Move destination AE through a separate association. Xeleris supports Move Destination set with a different AE Title than the one initiating the association for the C-MOVE.

**2.3.1.3.3.2 Accepted Presentation Context Table**

| <b>Presentation Context Table - Accepted by CIPIC_DICOM Server AE for Activity “Image Retrieve SCP”</b> |                             |                           |                     |             |                             |
|---|-----------------------------|---------------------------|---------------------|-------------|-----------------------------|
| <b>Abstract Syntax</b>  |                             | <b>Transfer Syntax</b>    |                     | <b>Role</b> | <b>Extended Negotiation</b> |
| <b>Name</b>   | <b>UID</b>                  | <b>Name List</b>          | <b>UID List</b>     |             |                             |
| Patient Root Query/Retrieve Information Model - MOVE  | 1.2.840.10008.5.1.4.1.2.1.2 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCP         | None                        |
|   |                             | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |             |                             |
| Study Root Query/Retrieve Information Model – MOVE  | 1.2.840.10008.5.1.4.1.2.2.2 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCP         | None                        |
|   |                             | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |             |                             |

**2.3.1.3.3.2.1 SOP Specific DICOM Conformance Statement for the Patient Root Query/Retrieve Information Model - MOVE and Study Root Query/Retrieve Information Model - MOVE SOP Classes**

The CIPIC\_DICOM Server supports Storage Sub-operations for Instances of any of the Composite SOP Classes it supports as an SCU (see Section 2.3.1).

There is not any Time-out defined in CIPIC\_DICOM Server for Image Retrieve SCP operation.

This implementation does not support extended negotiation for the C-MOVE Service, including that for relational-retrieve.

Following are the status codes the Application may send back to the SCU Equipment while performing the requested **Retrieve** :

| Service Status | Status Code | Further Meaning   | Status Code Explanation  | Related Fields Sent Back to the SCU |
|----------------|-------------|---|--|-------------------------------------|
| Failure        | A701        | Refused: Out of resources - Unable to calculate number of matches | Returned if the DICOM Server can't find requested SOP instance(s); error logged.   | None                                |
|                | A702        | Refused: Out of resources - Unable to perform sub-operations      | Returned if the DICOM Server runs out of resources (e.g. memory); error logged.  | None                                |
|                | A801        | Error: Move Destination Unknown                                   | Returned if the DICOM Server has no information on destination AE; error logged.   | None                                |
|                | A900        | Error: Identifier does not match SOP Class                        | Returned if the DICOM Server receives other than the Patient Root Query/Retrieve Information Model or Study Root Query/Retrieve Information Model SOP class. | None                                |
|                | C000        | Error: Unable to process  | Returned if the DICOM Server cannot successfully interpret the C-MOVE-RQ message.  | None                                |
| Cancel         | FE00        | Sub-operations terminated due to a Cancel indication              | Returned if the DICOM Server receives a C-CANCEL-MOVE-RQ message.  | None                                |
| Warning        | B000        | Sub-operations Complete - One or more Failures.                   | Returned upon completion if one or more of the specified images failed to transfer to the destination AE.  | None                                |
| Success        | 0000        | Sub-operations Complete - No Failure.                             | Returned after the transfer of the last image.   | None                                |
| Pending        | FF00        | Sub-operations are continuing -                                   | Returned after the transfer of each image except for the last.   | None                                |

### 2.3.1.3.3.3 Presentation Context Acceptance Criterion

The CPIPC\_DICOM Server evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for Retrieve Image SCP Real-World Activity.

### 2.3.1.3.3.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CPIPC\_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian

### 2.3.1.3.4 Real-World Activity Verify SCP

#### 2.3.1.3.4.1 Associated Real-World Activity

The CPIPC\_DICOM Server AE is always listening for associations. No operator action is required to respond to a Verification request.

The real-world activity associated with the Verification request is to send a C-ECHO-RSP message with a status of “success” to the requesting AE.

There is not any Time-out defined in CIPIC\_DICOM Server for Verify SCP operation.

#### 2.3.1.3.4.2 Accepted Presentation Context Table

| Presentation Context Table - Accepted by CIPIC_DICOM Server AE for Activity “Verify SCP” |                   |  |  |      |                      |
|--|-------------------|--|--|------|----------------------|
| Abstract Syntax  |                   | Transfer Syntax  |  | Role | Extended Negotiation |
| Name   | UID               | Name List  | UID List                                 |      |                      |
| Verification SOP Class   | 1.2.840.10008.1.1 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |

#### 2.3.1.3.4.2.1 SOP Specific DICOM Conformance Statement for Verification SOP Class

The CIPIC\_DICOM Server AE provides standard conformance to the DICOM verification service class.

#### 2.3.1.3.4.3 Presentation Context Acceptance Criterion

The CIPIC\_DICOM Server evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for Verify SCP Real-World Activity.

#### 2.3.1.3.4.4 Transfer Syntax Selection Policies

Within each Presentation Context, the CIPIC\_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian

#### 2.3.1.3.5 Real-World Activity Receive N-EVENT-REPORT from Storage Commitment SCP

##### 2.3.1.3.5.1 Associated Real-World Activity

As part of the storage commitment implementation, Remote AE (SCP) initiates an association to this implementation and sends an N-EVENT-REPORT. The attribute of the N-EVENT-REPORT message includes an indication on all images for which a commitment has succeeded and those for which it has failed.

The receipt of an N-EVENT-REPORT on an association that CIPIC\_DICOM Server AE has initiated is not supported. The Remote AE (SCP) must initiate a new association in order to send the new N-EVENT-REPORT.

On reception of a successful N-EVENT-REPORT-RQ notification from the Storage Commitment Provider, the images are flagged as committed in the database and appropriate entry is added to Archive History if Archive functionality is enabled on the Xeleris.

There is not any Time-out defined in CIPIC\_DICOM Server for Receive N-EVENT-REPORT operation.

#### 2.3.1.3.5.2 Accepted Presentation Context Table

| Presentation Context Table - Accepted by CIPIC_DICOM Server AE for Activity “Receive N-EVENT-REPORT from Storage Commitment SCP” |     |                 |          |      |                      |
|--|-----|-----------------|----------|------|----------------------|
| Abstract Syntax  |     | Transfer Syntax |          | Role | Extended Negotiation |
| Name   | UID | Name List       | UID List |      |                      |

|                               |                      |                           |                     |     |      |
|-------------------------------|----------------------|---------------------------|---------------------|-----|------|
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU | None |
|                               |                      | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |     |      |

**2.3.1.3.5.2.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class SCU**

The CIPIC\_DICOM Server will only accept the SCU role (which must be proposed via SCP/SCU Role Selection Negotiation) within a Presentation Context for the Storage Commitment Push Model SOP Class.

Upon receiving a Storage Commitment N-EVENT-REPORT (Storage Commitment Result), the CIPIC\_DICOM Server AE will validate the Transaction UID against its list of outstanding Storage Commitment Request Transaction UIDs. If it matches an outstanding Request, the AE will mark all SOP Instances for which a success status is indicated with an Archived flag, shown on the user interface with "Archived" icon. In addition appropriate entry is added to Archive History if Archive functionality is enabled on the Xeleris.

When at least one Instance associated with a Study is "Archived", the Study on the user interface will also be shown on the user interface with "Archived icon.

If the Storage Commitment Result indicates any failure status, an error message will be written to the error log. Any retry must be manually reinitiated as a new Storage Commitment Request (see Section 2.3.1.2.5). The list of specific Failure Reason Codes that this AE will be able to process is described in Section 7.1.2.1.

Following are the status codes the Application may send back in the **N-Event-Report** response command to the **Storage Commitment** SCP Equipment that sent the N-Event-Report request:

| Service Status | Status Code | Further Meaning         | Status Code Explanation  | Related Fields Sent Back to the SCU |
|----------------|-------------|-------------------------|--|-------------------------------------|
| Failure        | 0119        | Class-instance conflict | SOP Class UID of Notification does not match Storage Commitment Push Model SOP Class | None                                |
|                | 0113        | No such event type      | Event type ID is not recognized  | (0000,0002)<br>(0000,1002)          |
|                | 0110        | Processing failure      | Any general error occurred   | (0000,0002)<br>(0000,1000)          |
| Success        | 0000        |                         | N-EVENT-REPORT message is successfully processed                                     | None                                |

**2.3.1.3.5.3 Presentation Context Acceptance Criterion**

The CIPIC\_DICOM Server evaluates each Presentation Context independently, and accepts any Presentation Context that matches an Abstract Syntax for Receive N-EVENT-REPORT from Storage Commitment SCP Real-World Activity.

**2.3.1.3.5.4 Transfer Syntax Selection Policies**

Within each Presentation Context, the CIPIC\_DICOM Server will select Transfer Syntaxes according to the following priority (highest priority first):

- Explicit VR Little Endian
- Implicit VR Little Endian

## **2.4 COMMUNICATION PROFILES**

### **2.4.1 Supported Communication Stacks**

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

For Xeleris 3.0 implementation, the TCP/IP stack is inherited from the Windows XP (SP3) Operating System.

For Xeleris 3.1 and Xeleris 4.0 implementations, the TCP/IP stack is inherited from the Windows Embedded Standard 7 Operating System.

For Xeleris 4 DR implementation, the TCP/IP stack is inherited from the Windows 10 Enterprise 2016 LTSC Operating System.

### **2.4.2 Physical Media Support**

Ethernet 802.3 provides the physical network layer for this product.

### **2.4.3 Additional Protocols**

Xeleris WS implementations support DHCP Protocol

### **2.4.4 IPv4 and IPv6 Support**

Xeleris WS implementations support IPv4 only

## **2.5 EXTENSIONS / SPECIALIZATIONS/ PRIVATIZATIONS**

### **2.5.1 Standard Extended / Specialized / Private SOP Classes**

#### **2.5.1.1 Standard Extended SOP Classes**

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

Xeleris NM Images are Standard Extended NM Image Storage SOP Class (see Section 3 for a complete description).

Xeleris PET Images are Standard Extended PET Image Storage SOP Class (see Section 4 for a complete description).

Xeleris Secondary Capture Images are Standard Extended Secondary Capture Image Storage SOP Class (see Section 5 or a complete description).

Xeleris Multi-Frame Secondary Capture Images are Standard Extended Multi-Frame Secondary Capture Image Storage SOP Class (see Section 5 for a complete description).

Xeleris Curve Objects are Standard Extended Stand-Alone Curve Storage SOP Class (see Section 6 for a complete description).

Xeleris Encapsulated PDF Objects are Standard Extended Enhanced PDF Storage SOP Class (see Section 9 for a complete description).

### 2.5.1.2 Private SOP Class

Xeleris does not implement any Private SOP Class but supports Private Storage SOP Class as SCP.

### 2.5.2 Private Transfer Syntaxes

No Private Transfer Syntax is supported.

## 2.6 CONFIGURATION

The Xeleris system is configured by GEHC Field Service Engineers. The DICOM configuration items below are configurable or re-configurable by a Field Service Engineer but are not accessible through the Xeleris user interface.

### 2.6.1 AE Title/Presentation Address Mapping

Xeleris allows for the configuration of the mapping of remote AE titles to IP addresses and ports. The IP address of a remote AE may be in a different subnet (using routing). A router is configurable to ensure communication from one sub-net to another.

This configuration is performed by GEHC Field Service Engineers.

### 2.6.2 Configurable Parameters

The following fields are configurable for CIPIC\_DICOM Server AE (local):

- Local AE Title (default value is XELERIS)
- Local IP Address
- Local Listening Port Number (default value is 104)
- Time limit (in hours) of SCU waiting for a Storage Commitment N-EVENT-REPORT from SCP - default value is 24 Hours

The following fields are configurable for every remote DICOM AE:

- Remote AE Title
- Remote IP Address
- Listening TCP/IP Port Number
- Remote AE functionality flags:
  - Store Images
  - Query/Retrieve
  - Pre-filter
  - PET Raw data destination
  - Storage commit server
  - Storage commit on: (AE Title of one of previously defined Storage Commitment Servers)

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

## 2.7 SUPPORT OF EXTENDED CHARACTER SETS

The Xeleris WS is configurable with a single single-byte extended character set, either the default ISO\_IR 100 (Latin alphabet Number 1 supplementary set), or the alternate ISO\_IR 101 (Latin alphabet Number 2 supplementary set).



## **2.8 CODES AND CONTROLLED TERMINOLOGY**

### **2.8.1 Fixed Coded Terminology**

The product uses the fixed (non-configurable, non-extensible) coded terminology in Image SOP Instance:

- (0040,0555) - Acquisition Context Module (See Section 3.4.6.3)
- (0054, 0300) - Radionuclide Code Sequence (See Section 3.4.6.11)
- (0054, 0304) - Radiopharmaceutical Code Sequence (See Section 3.4.6.11)
- (0054, 0410) - Patient Orientation (See Section 3.4.3.5)
- (0054, 0412) - Patient Orientation Modifier (See Section 3.4.3.5)
- (0054, 0414) - Patient Gantry Relationship (See Section 3.4.3.5)
- (0054, 0200) - View (See Section 3.4.6.13)

### **2.8.2 Mapped Coded Terminology**

The product uses no mapped coded terminology.

### **2.8.3 Configurable Coded Terminology**

The product uses no configurable coded terminology.

## **2.9 SECURITY PROFILES**

The product does not conform to any defined DICOM Security Profiles.

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

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

## 3. NM INFORMATION OBJECT IMPLEMENTATION

### 3.1 INTRODUCTION

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

### 3.2 XELERIS WS MAPPING OF DICOM ENTITIES

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

**TABLE 3-1**  
**MAPPING OF DICOM ENTITIES TO XELERIS WS ENTITIES**

| DICOM IE | Xeleris WS Entity |
|----------|-------------------|
| Patient  | Patient           |
| Study    | Study             |
| Series   | Series            |
| Image    | Dataset           |

### 3.3 IOD MODULE TABLE

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

**TABLE 3-2**  
**NM IMAGE IOD MODULES**

| Entity Name        | Module Name                | Usage  | Reference |
|--------------------|----------------------------|--|-----------|
| Patient            | Patient                    | Used   | 3.4.1.1   |
|                    | Private Patient            | Used   | 3.4.1.2   |
|                    | Clinical Trial Subject     | Not Used   | N/A       |
| Study              | General Study              | Used   | 3.4.2.1   |
|                    | Patient Study              | Used   | 3.4.2.2   |
|                    | Private Study              | Used   | 3.4.2.3   |
|                    | Standard Extended Study    | Used   | 3.4.2.4   |
|                    | Clinical Trial Study       | Not Used   | N/A       |
| Series             | General Series             | Used   | 3.4.3.1   |
|                    | Clinical Trial Series      | Not Used   | N/A       |
|                    | Private Series             | Used   | 3.4.3.2   |
|                    | Private NM Series          | Used   | 3.4.3.3   |
|                    | Standard Extended Series   | Used   | 3.4.3.4   |
|                    | NM/PET Patient Orientation | Used   | 3.4.3.5   |
| Frame of Reference | Frame of Reference         | Used for images where Image Type (0008,0008) Value 3 is TOMO or RECON TOMO | 3.4.4.1   |

|                                     |   |   |          |
|-------------------------------------|---|---|----------|
|                                     | Synchronization   | Not Used  | N/A      |
| Equipment                           | General Equipment   | Used  | 3.4.5.1  |
| Image                               | General Image   | Used  | 3.4.6.1  |
|                                     | Image Pixel   | Used  | 3.4.6.2  |
|                                     | Acquisition Context   | Used for Cardiac SPECT images only  | 3.4.6.3  |
|                                     | Device  | Not Used  | N/A      |
|                                     | NM Image Pixel  | Used  | 3.4.6.4  |
|                                     | Private Image Pixel   | Used  | 3.4.6.5  |
|                                     | Specimen  | Not Used  | N/A      |
|                                     | Multi-frame   | Used  | 3.4.6.6  |
|                                     | NM Multi-frame  | Used  | 3.4.6.7  |
|                                     | NM Image  | Used  | 3.4.6.8  |
|                                     | Private Image   | Used  | 3.4.6.9  |
|                                     | Private NM Image  | Used  | 3.4.6.10 |
|                                     | NM Isotope  | Used  | 3.4.6.11 |
|                                     | Private Isotope   | Used  | 3.4.6.12 |
|                                     | NM Detector   | Used  | 3.4.6.13 |
|                                     | Private Detector  | Used  | 3.4.6.14 |
|                                     | NM Tomo Acquisition   | Used for Images when Image Type (0008,0008) Value 3 is TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO | 3.4.6.15 |
|                                     | Private Tomo Acquisition  | Used for Images when Image Type (0008,0008) Value 3 is TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO | 3.4.6.16 |
|                                     | NM Multi-gated Acquisition  | Used for Images when Image Type (0008,0008) Value 3 is GATED, GATED TOMO or RECON GATED TOMO            | 3.4.6.17 |
|                                     | Private Multi-gated Acquisition   | Used for Images when Image Type (0008,0008) Value 3 is GATED, GATED TOMO or RECON GATED TOMO            | 3.4.6.18 |
|                                     | NM Phase  | Used for Images when Image Type (0008,0008) Value 3 is DYNAMIC  | 3.4.6.19 |
| NM Reconstruction                   | Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON GATED TOMO | 3.4.6.20  |          |
| Private SPECT Reconstruction Module | Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON            | 3.4.6.21  |          |

|                                       | GATED TOMO  |          |
|---------------------------------------|---|----------|
| Private SPECT Backprojection Module   | Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON GATED TOMO | 3.4.6.22 |
| Private SPECT Oblique Reformat Module | Used for Images when Image Type (0008,0008) Value 3 is RECON TOMO or RECON GATED TOMO | 3.4.6.23 |
| Overlay Plane                         | Not Used  | N/A      |
| Multi-frame Overlay                   | Not Used  | N/A      |
| VOI LUT                               | Used  | 3.4.6.24 |
| SOP Common                            | Used  | 3.4.6.25 |
| Frame Extraction                      | Not Used  | N/A      |

### 3.4 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define <what values they may take and where these values are obtained from when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

Private attributes are defined in private modules, each of which follow the related Standard module. Private data element tags are assigned following the rules given in Part 5 of the DICOM v3.0 Standard, and are identified using the (gggg, xxnn) format, where xx represents a reserved block of element numbers within the group gggg.

Private Modules contain *private* Attributes that convey information not contained in the related DICOM Standard v3.0 Modules.

Also note that Attributes not present in tables are not supported.

#### 3.4.1 Patient Entity Modules

##### 3.4.1.1 Patient Module

**TABLE 3-3  
PATIENT MODULE ATTRIBUTES**

| Attribute Name                           | Tag         | Type | Attribute Description  |
|--|-------------|------|--|
| Patient's Name                           | (0010,0010) | 2    | Patient's full name  |
| Patient ID                               | (0010,0020) | 2    | Primary hospital identification number or code for the patient                                       |
| Issuer of Patient ID                     | (0010,0021) | 3    | Not Used   |
| Issuer of Patient ID Qualifiers Sequence | (0010,0024) | 3    | Not Used   |
| Patient's Birth Date                     | (0010,0030) | 2    | Birth date of the patient.<br>Sent as ZERO LENGTH value if value is not retrieved from input images. |
| Patient's Sex                            | (0010,0040) | 2    | Sex of the named patient   |

|                     |             |   |  |
|---------------------|-------------|---|--|
|                     |             |   | Enumerated Values:<br>M = male<br>F = female<br>O = other<br>Sent as ZERO LENGTH value if value is not retrieved from input images |
| Other Patient IDs   | (0010,1000) | 3 | Other identification numbers or codes used to identify the patient.  |
| Other Patient Names | (0010,1001) | 3 | Other names used to identify the patient.  |
| Ethnic Group        | (0010,2160) | 3 | Ethnic group or race of the patient.   |
| Patient Comments    | (0010,4000) | 3 | User-defined additional information about the patient.   |

### 3.4.1.2 Private Patient Module

**TABLE 3-4  
PRIVATE PATIENT MODULE ATTRIBUTES**

| <b>Attribute Name</b> | <b>Tag</b>  | <b>Private Creator ID</b> | <b>Attribute Description</b>        |
|-----------------------|-------------|---------------------------|-------------------------------------|
| Patient Object Name   | (0009,xx40) | GEMS_GENIE_1              | Name of the Database Patient Object |
| Patient Flags         | (0009,xx41) | GEMS_GENIE_1              | Defines patient information.        |
| Patient Creation Date | (0009,xx42) | GEMS_GENIE_1              | Date of Patient Entity creation     |
| Patient Creation Time | (0009,xx43) | GEMS_GENIE_1              | Time of Patient Entity creation     |

### 3.4.2 Study Entity Modules

#### 3.4.2.1 General Study Module

**TABLE 3-5  
GENERAL STUDY MODULE ATTRIBUTES**

| Attribute Name                     | Tag         | Type | Attribute Description  |
|------------------------------------|-------------|------|--|
| Study Instance UID                 | (0020,000D) | 1    | Unique identifier for the Study. Internally generated for locally created study or when any Study attributes is modified by user in Xeleris UI.              |
| Study Date                         | (0008,0020) | 2    | Creation date of study entity.   |
| Study Time                         | (0008,0030) | 2    | Creation time of study entity.   |
| Referring Physician's Name         | (0008,0090) | 2    | Name of the patient's referring physician Only<br>Sent as ZERO LENGTH value if value is not retrieved from input images or from user input.                  |
| Study ID                           | (0020,0010) | 2    | User or equipment generated Study identifier.  |
| Accession Number                   | (0008,0050) | 2    | A RIS generated number that identifies the order for the Study.<br>Sent as ZERO LENGTH value if value is not retrieved from input images or from user input. |
| Study Description                  | (0008,1030) | 3    | Study Description  |
| Name of Physician(s) Reading Study | (0008,1060) | 3    | Name of Physician(s) Reading Study   |

#### 3.4.2.2 Patient Study Module

**TABLE 3-6  
PATIENT STUDY MODULE ATTRIBUTES**

| Attribute Name               | Tag         | Type | Attribute Description  |
|------------------------------|-------------|------|--|
| Patient's Age                | (0010,1010) | 3    | Age of the Patient.  |
| Patient's Size               | (0010,1020) | 3    | Length or size of the Patient, in meters,<br>Default Value is "0". |
| Patient's Weight             | (0010,1030) | 3    | Weight of the Patient, in kilograms;<br>Default Value is "0".      |
| Occupation                   | (0010,2180) | 3    | Patient Occupation.  |
| Additional Patient's History | (0010,21B0) | 3    | Additional information about the Patient's medical history.        |

#### 3.4.2.3 Private Study Module

**TABLE 3-7  
PRIVATE STUDY MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Private Creator ID | Attribute Description                                |
|------------------------|-------------|--------------------|--|
| Study Name             | (0009,xx10) | GEMS_GENIE_1       | Name of the Database Study Object                    |
| Study Flags            | (0009,xx11) | GEMS_GENIE_1       | Defines study information.                           |
| Study Type             | (0009,xx12) | GEMS_GENIE_1       | Defines type of study.                               |
| Study Comments         | (0013,xx26) | GEMS_GENIE_1       | User-defined additional information about the study. |
| Protocol Data Sequence | (0033,xx50) | GEMS_XELPRV_01     | SQ with items encoding Protocol data                 |

|                            |             |                |   |
|----------------------------|-------------|----------------|---|
|                            |             |                | Object (PDO) attributes; May contain 0 or more items  |
| >Object Type               | (0033,xx08) | GEMS_XELPRV_01 | Private object type<br>Always set to "PROTOCOL DATA"  |
| >Modified                  | (0033,xx10) | GEMS_XELPRV_01 | Modified Flag; Default value is 0, not modified.  |
| >Name                      | (0033,xx11) | GEMS_XELPRV_01 | Name of Database Object   |
| >Database Object Unique ID | (0033,xx16) | GEMS_XELPRV_01 | Database UID of PDO; contains value of PDO UID tag (0033, xx52) generated at time of object creation. |
| >Date                      | (0033,xx17) | GEMS_XELPRV_01 | Date  |
| >Time                      | (0033,xx18) | GEMS_XELPRV_01 | Time  |
| >ObjectFlags               | (0033,xx19) | GEMS_XELPRV_01 | Protocol Data Flags   |
| >ProtocolName              | (0033,xx1A) | GEMS_XELPRV_01 | Protocol Name   |
| >Relevant data UID         | (0033,xx1B) | GEMS_XELPRV_01 | Contains value of Study Id.   |
| >BulkData                  | (0033,xx1C) | GEMS_XELPRV_01 | Bulk Data   |
| >IntData                   | (0033,xx1D) | GEMS_XELPRV_01 | Int Data  |
| >DoubleData                | (0033,xx1E) | GEMS_XELPRV_01 | Double Data   |
| >StringData                | (0033,xx1F) | GEMS_XELPRV_01 | String Data   |
| >BulkDataFormat            | (0033,xx20) | GEMS_XELPRV_01 | Bulk Data Format  |
| >IntDataFormat             | (0033,xx21) | GEMS_XELPRV_01 | Int Data Format   |
| >DoubleDataFormat          | (0033,xx22) | GEMS_XELPRV_01 | Double Data Format  |
| >StringDataFormat          | (0033,xx23) | GEMS_XELPRV_01 | String Data Format  |
| >Description               | (0033,xx24) | GEMS_XELPRV_01 | Description   |
| >Internal SOPClassUID      | (0033,xx51) | GEMS_XELPRV_01 | PDO Private SOP Class UID   |
| >Internal Instance UID     | (0033,xx52) | GEMS_XELPRV_01 | PDO Instance UID; Internally generated  |
| ReviewTemplatesSequence    | (0033,xx60) | GEMS_XELPRV_01 | SQ with items encoding Private Review Templates Objects (RTO) attributes; May contain 0 or more items |
| >Object Type               | (0033,xx08) | GEMS_XELPRV_01 | Private object type. Contains String "REVIEW DATA"  |
| >Modified                  | (0033,xx10) | GEMS_XELPRV_01 | Modified Flag   |
| >Name                      | (0033,xx11) | GEMS_XELPRV_01 | Name of Database Object   |
| >StudyId                   | (0033,xx14) | GEMS_XELPRV_01 | Study Id  |
| >Database Object Unique ID | (0033,xx16) | GEMS_XELPRV_01 | Database UID of RTO contains value of RTO UID tag (0033,xx62) generated at time of object creation    |
| >Date                      | (0033,xx17) | GEMS_XELPRV_01 | Creation Date   |
| >Time                      | (0033,xx18) | GEMS_XELPRV_01 | Creation Time   |
| >RTName                    | (0033,xx28) | GEMS_XELPRV_01 | Review Template Name  |
| >RTSpecification           | (0033,xx29) | GEMS_XELPRV_01 | Review Template Specification   |
| >RTFlags                   | (0033,xx2A) | GEMS_XELPRV_01 | Review Templates Flags  |
| >DataValidationSpec        | (0033,xx2B) | GEMS_XELPRV_01 | Data Validation Spec  |

|                         |             |                |  |
|-------------------------|-------------|----------------|--|
| >Description            | (0033,xx2C) | GEMS_XELPRV_01 | Description                            |
| >IconDescription        | (0033,xx2D) | GEMS_XELPRV_01 | Icon Description                       |
| >Internal SOP Class UID | (0033,xx61) | GEMS_XELPRV_01 | RTO Private SOP Class UID              |
| >Internal InstanceUID   | (0033,xx62) | GEMS_XELPRV_01 | RTO Instance UID; Internally generated |

### 3.4.2.4 Standard Extended Study Module

**TABLE 3-8  
STANDARD EXTENDED STUDY MODULE ATTRIBUTES**

| Attribute Name | Tag         | Type | Attribute Description |
|----------------|-------------|------|-----------------------|
| Study Comments | (0032,4000) | 3    | Comments for Study    |

### 3.4.3 Series Entity Modules

#### 3.4.3.1 General Series Module

**TABLE 3-9  
GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name               | Tag         | Type | Attribute Description   |
|------------------------------|-------------|------|---|
| Modality                     | (0008,0060) | 1    | Type of equipment that originally acquired the data used to create the images in this Series.<br>Defined Terms used for data created on this system:<br>NM = Nuclear Medicine<br>OT = Other |
| Series Instance UID          | (0020,000E) | 1    | Unique identifier of the Series. Internally generated for locally created series or when any Series attribute is modified by user in Xeleris UI.  |
| Series Number                | (0020,0011) | 2    | A number that identifies this Series.<br>Internally generated.  |
| Laterality                   | (0020,0060) | 2C   | Laterality of (paired) body part examined. Enumerated Values:<br>R = right<br>L = left  |
| Series Date                  | (0008,0021) | 3    | Date the Series started.  |
| Series Time                  | (0008,0031) | 3    | Time the Series started.  |
| Protocol Name                | (0018,1030) | 3    | User-defined description of the conditions under which the Series was performed.  |
| Series Description           | (0008,103E) | 3    | Description of the Series   |
| Operators' Name              | (0008,1070) | 3    | Name(s) of the operator(s) supporting the Series.   |
| Body Part Examined           | (0018,0015) | 3    | Text description of the part of the body examined.  |
| Request Attributes Sequence  | (0040,0275) | 3    | Sequence that contains attributes from the Imaging Service Request. The sequence may have one or more Items.  |
| >Requested Procedure ID      | (0040,1001) | 1C   | Identifier that identifies the Requested Procedure in the Imaging Service Request. Required if procedure was scheduled. May be present otherwise.   |
| >Scheduled Procedure Step ID | (0040,0009) | 1C   | Identifier that identifies the Scheduled Procedure Step.  |



|                                       |             |   |   |
|---------------------------------------|-------------|---|---|
|                                       |             |   | Required if procedure was scheduled.  |
| >Scheduled Procedure Step Description | (0040,0007) | 3 | Institution-generated description or classification of the Scheduled Procedure Step to be performed.  |
| Performed Procedure Step ID           | (0040,0253) | 3 | User or equipment generated identifier of that part of a Procedure that has been carried out within this step.<br>Not sent for DERIVED NM Images. |

### 3.4.3.2 Private Series Module

**TABLE 3-10  
PRIVATE SERIES MODULE ATTRIBUTES**

| Attribute Name             | Tag         | Private Creator ID | Attribute Description  |
|----------------------------|-------------|--------------------|--|
| Series Flags               | (0009,xx21) | GEMS_GENIE_1       | Defines series information.  |
| Seriesdata Sequence        | (0033,xx70) | GEMS_XELPRV_01     | SQ with items encoding Series Data Object (SDO) attributes; May contain 0 or more items.             |
| >Object Type               | (0033,xx08) | GEMS_XELPRV_01     | Data Object Type. Contains string "SERIES DATA"  |
| >Modified                  | (0033,xx10) | GEMS_XELPRV_01     | Modified Flag  |
| >Name                      | (0033,xx11) | GEMS_XELPRV_01     | Name of Database Object  |
| >Database Object Unique ID | (0033,xx16) | GEMS_XELPRV_01     | Database UID of SDO; contains value of SDO UID tag (0033, xx72) generated at time of object creation |
| >Date                      | (0033,xx17) | GEMS_XELPRV_01     | SDO Creation Date  |
| >Time                      | (0033,xx18) | GEMS_XELPRV_01     | SDO Creation Time  |
| >SeriesDataFlags           | (0033,xx19) | GEMS_XELPRV_01     | Series Data Flags  |
| >ProtocolName              | (0033,xx1A) | GEMS_XELPRV_01     | Name of Protocol created SDO   |
| >RelevantDataUID           | (0033,xx1B) | GEMS_XELPRV_01     | UID of SOP Instance relative to SDO  |
| >BulkData                  | (0033,xx1C) | GEMS_XELPRV_01     | SDO parameter(s) stored as binary buffer(s)  |
| >IntData                   | (0033,xx1D) | GEMS_XELPRV_01     | List of SDO parameters stored as integers  |
| >DoubleData                | (0033,xx1E) | GEMS_XELPRV_01     | List of SDO parameters stored as doubles   |
| >StringData                | (0033,xx1F) | GEMS_XELPRV_01     | List of SDO parameters stored as list of strings   |
| >BulkDataFormat            | (0033,xx20) | GEMS_XELPRV_01     | Format of bulk parameters; contains information about name and size of bulk buffers                  |
| >IntDataFormat             | (0033,xx21) | GEMS_XELPRV_01     | Format of integer parameters; contains information about name and number of integers in list         |
| >DoubleDataFormat          | (0033,xx22) | GEMS_XELPRV_01     | Format of double parameters; contains information about name and number of doubles in list           |
| >StringDataFormat          | (0033,xx23) | GEMS_XELPRV_01     | Format of string parameters; contains information about name and number of strings in list           |
| >Description               | (0033,xx24) | GEMS_XELPRV_01     | User or equipment generated SDO description  |

|                                    |             |                |   |
|------------------------------------|-------------|----------------|---|
| >DoubleDataSQ                      | (0033,xx73) | GEMS_XELPRV_01 | Sequence of items to store SDO parameters as lists of doubles. May contain 0 or more items. |
| >>DoubleData                       | (0033,xx1E) | GEMS_XELPRV_01 | List of SDO parameters stored as doubles  |
| >Series Data Private SOP Class UID | (0033,xx71) | GEMS_XELPRV_01 | SDO Private SOP Class UID   |
| >Series Data Instance UID          | (0033,xx72) | GEMS_XELPRV_01 | SDO Instance UID; Internally generated in time of object creation                           |

### 3.4.3.3 Private NM Series Module

**TABLE 3-11  
PRIVATE NM SERIES MODULE ATTRIBUTES**

| <b>Attribute Name</b> | <b>Tag</b>   | <b>Private Creator ID</b> | <b>Attribute Description</b>  |
|-----------------------|--------------|---------------------------|---|
| Series Object Name    | (0009,xx20)  | GEMS_GENIE_1              | Name of the Database Series Object.   |
| User Orientation      | (0009,xx22)  | GEMS_GENIE_1              | User specified patient orientation.   |
| Initiation Type       | (0009,xx23)  | GEMS_GENIE_1              | Acquisition initiation type.<br>The Defined Terms are:<br>0 = started on count rate<br>1 = started after time delay<br>2 = started manually   |
| Initiation Delay      | (0009,xx24)  | GEMS_GENIE_1              | Acquisition start delay time.   |
| Initiation Count Rate | (0009,xx25)  | GEMS_GENIE_1              | Acquisition start count rate  |
| Number Energy Sets    | (0009,xx26)  | GEMS_GENIE_1              | Number of energy sets in this Series.   |
| Number Detectors      | (0009,xx27)  | GEMS_GENIE_1              | Number of detectors.  |
| Number R-R Windows    | (0009,xx28)  | GEMS_GENIE_1              | Number of R-R Interval Windows.   |
| Number MG Time Slots  | (0009,xx29)  | GEMS_GENIE_1              | Number of R-R Interval time bins.   |
| Number View Sets      | (0009,xx2A)  | GEMS_GENIE_1              | Number of view sets in this Series.   |
| Trigger History UID   | (0009,xx2B)  | GEMS_GENIE_1              | UID of Private Trigger Object relevant to the Series.   |
| Series Comments       | (0009,xx2C)  | GEMS_GENIE_1              | User-defined additional information about the series.   |
| Distance Prescribed   | (0009,xx2E)  | GEMS_GENIE_1              | User prescribed whole body scanning distance.   |
| Table Direction       | (0009, xx2F) | GEMS_GENIE_1              | Table Direction   |
| Series Type           | (0011,xx0A)  | GEMS_GENIE_1              | Defines type of series. The Defined Terms are:<br>0 = static<br>1 = whole body<br>2 =gated tomo<br>3 = multi-gated<br>6 = dynamic<br>8 = transaxial tomo<br>9 = tomographic<br>10 = transaxial gated tomo |

|                           |             |              |   |
|---------------------------|-------------|--------------|---|
|                           |             |              | 12= orthogonal reformat<br>15 = results<br>30 = dynamic tomo<br>31 = dynamic gated tomo<br>32 = transaxial dynamic tomo<br>33 = transaxial dynamic gated tomo<br>34 = cardiac oblique dynamic<br>35 = cardiac oblique dynamic gated<br>36 = orthogonal reformat dynamic |
| Effective Series Duration | (0011,xx0B) | GEMS_GENIE_1 | Calculated duration of series acquisition.  |
| Number Beats              | (0011,xx0C) | GEMS_GENIE_1 | Number of physiological triggers during acquisition.  |

### 3.4.3.4 Standard Extended Series Module

**TABLE 3-12  
STANDARD EXTENDED SERIES MODULE ATTRIBUTES**

| Attribute Name   | Tag         | Type | Attribute Description   |
|------------------|-------------|------|---|
| Patient Position | (0018,5100) | 3    | Patient position descriptor relative to the Equipment.<br>The Defined Terms are:<br>HFP = Head First-Prone<br>HFS = Head First-Supine<br>HFDR = Head First-Decubitus Right<br>HFDL = Head First-Decubitus Left<br>FFDR = Feet First-Decubitus Right<br>FFDL = Feet First-Decubitus Left<br>FFP = Feet First-Prone<br>FFS = Feet First-Supine<br>Attribute is copied from the input images. Not sent, if another Patient Position is used for acquisition. |

### 3.4.3.5 NM/PET Patient Orientation Module

**TABLE 3-13  
NM/PET PATIENT ORIENTATION MODULE ATTRIBUTES**

| Attribute Name                               | Tag         | Type | Attribute Description   |
|--|-------------|------|---|
| Patient Orientation Code Sequence            | (0054,0410) | 2    | Describes the orientation of the patient with respect to gravity. Zero or one item shall be present in the sequence.  |
| >Include Code Sequence Macro                 |             |      | See Table 3-14  |
| > Patient Orientation Modifier Code Sequence | (0054,0412) | 2C   | Patient Orientation Modifier. Required if needed to fully specify the orientation of the patient with respect to gravity. Zero or one item shall be present in the sequence. Always sent if Patient Orientation Code Sequence contains at least one item. |

|   |             |   |  |
|---|-------------|---|--|
| >>Include 'Code Sequence Macro'           |             |   | See Table 3-15   |
| Patient Gantry Relationship Code Sequence | (0054,0414) | 2 | Describes the orientation of the patient with respect to the gantry. Zero or one item shall be present in the sequence |
| >Include Code Sequence Macro              |             |   | See Table 3-16   |

**TABLE 3-14  
PATIENT ORIENTATION CODE SEQUENCE VALUES (BASELINE ID 19)**

| Code Value | Coding Scheme Designator | Code Meaning |
|------------|--------------------------|--------------|
| F-10440    | 99SDM                    | erect        |
| F-10450    | 99SDM                    | recumbent    |
| F-10460    | 99SDM                    | semi-erect   |

**TABLE 3-15  
PATIENT ORIENTATION MODIFIER CODE SEQUENCE VALUES (BASELINE ID 20)**

| Code Value | Coding Scheme Designator | Code Meaning            |
|------------|--------------------------|-------------------------|
| F-10310    | 99SDM                    | prone                   |
| F-10316    | 99SDM                    | semi-prone              |
| F-10317    | 99SDM                    | right lateral decubitus |
| F-10318    | 99SDM                    | lateral decubitus       |
| F-10319    | 99SDM                    | left lateral decubitus  |
| F-10320    | 99SDM                    | standing                |
| F-10326    | 99SDM                    | anatomical              |
| F-10330    | 99SDM                    | kneeling                |
| F-10336    | 99SDM                    | knee-chest              |
| F-10340    | 99SDM                    | supine                  |
| F-10346    | 99SDM                    | lithotomy               |
| F-10348    | 99SDM                    | Trendelenburg           |
| F-10349    | 99SDM                    | inverse Trendelenburg   |
| F-10380    | 99SDM                    | frog                    |
| F-10390    | 99SDM                    | stooped-over            |
| F-103A0    | 99SDM                    | sitting                 |
| F-10410    | 99SDM                    | curled-up               |

**TABLE 3-16  
PATIENT GANTRY RELATIONSHIP CODE SEQUENCE VALUES (BASELINE ID 21)**

| Code Value | Coding Scheme Designator | Code Meaning |
|------------|--------------------------|--------------|
| F-10470    | 99SDM                    | headfirst    |
| F-10480    | 99SDM                    | feet-first   |

|         |       |            |
|---------|-------|------------|
| R-10516 | 99SDM | oblique    |
| R-10515 | 99SDM | transverse |

### 3.4.4 Frame Of Reference Entity Modules

#### 3.4.4.1 Frame Of Reference Module

This section specifies the Attributes necessary to uniquely identify a Frame Of Reference which insures the spatial relationship of Images within a Series. It also allows Images across multiple Series to share the same Frame Of Reference. This Frame Of Reference (or coordinate system) shall be constant for all Images related to a specific Frame Of Reference.

Xeleris systems group spatially and/or temporally related Images in the same Series. Acquisition data created on other systems may be missing frame of reference information, and for these cases Xeleris fills this attribute with Series UID.

**TABLE 3-17**  
**FRAME OF REFERENCE MODULE ATTRIBUTES**

| Attribute Name               | Tag         | Type | Attribute Description   |
|------------------------------|-------------|------|---|
| Frame of Reference UID       | (0020,0052) | 1    | Uniquely identifies the frame of reference for a Series.                              |
| Position Reference Indicator | (0020,1040) | 2    | Part of the patient's anatomy used as a reference. Always sends as ZERO length value. |

### 3.4.5 Equipment Entity Modules

#### 3.4.5.1 General Equipment Module

**TABLE 3-18**  
**GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name            | Tag         | Type | Attribute Description   |
|---------------------------|-------------|------|---|
| Manufacturer              | (0008,0070) | 2    | Manufacturer of the equipment that produced the composite instances.<br>Possible Values:<br>"GE MEDICAL SYSTEMS"<br>"GE MEDICAL SYSTEMS, NUCLEAR" ( for NM IOD)<br>"GE MEDICAL SYSTEMS, PET " (for PET IOD)<br>"4D-MSPECT" (for 4DM-CompositeResults series only, NM IOD) |
| Institution Name          | (0008,0080) | 3    | Institution where the equipment that produced the composite instances is located.   |
| Station Name              | (0008,1010) | 3    | User defined name identifying the machine that produced the composite instances   |
| Manufacturer's Model Name | (0008,1090) | 3    | Manufacturer's model name of the equipment that produced the composite instances.   |
| Device Serial Number      | (0018,1000) | 3    | Manufacturer's serial number of the equipment that produced the composite instances.  |
| Software Versions         | (0018,1020) | 3    | Manufacturer's designation of software version of the equipment that produced the composite instances.  |

### 3.4.6 Image Entity Modules

#### 3.4.6.1 General Image Module

**TABLE 3-19  
GENERAL IMAGE MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Type | Attribute Description   |
|---------------------|-------------|------|---|
| Instance Number     | (0020,0013) | 2    | A number that identifies this image.  |
| Patient Orientation | (0020,0020) | 2C   | Not sent for NM (not required )   |
| Content Date        | (0008,0023) | 2C   | The date the image pixel data creation started.                                       |
| Content Time        | (0008,0033) | 2C   | The time the image pixel data creation started  |
| Image Type          | (0008,0008) | 3    | See 3.4.6.8.1.  |
| Acquisition Date    | (0008,0022) | 3    | The date the acquisition of data that resulted in this image started                  |
| Acquisition Time    | (0008,0032) | 3    | The time the acquisition of data that resulted in this image started                  |
| Image Comments      | (0020,4000) | 3    | User-defined comments about the image<br>Contains additional information about image. |

#### 3.4.6.2 Image Pixel Module

**TABLE 3-20  
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name             | Tag         | Type | Attribute Description  |
|----------------------------|-------------|------|--|
| Samples per Pixel          | (0028,0002) | 1    | See 3.4.6.4 for NM Images  |
| Photometric Interpretation | (0028,0004) | 1    | See 3.4.6.4 for NM Images  |
| Rows                       | (0028,0010) | 1    | Number of rows in the image.   |
| Columns                    | (0028,0011) | 1    | Number of columns in the image   |
| Bits Allocated             | (0028,0100) | 1    | See 3.4.6.4 for NM Images  |
| Bits Stored                | (0028,0101) | 1    | See 3.4.6.4 for NM Images  |
| High Bit                   | (0028,0102) | 1    | See 3.4.6.4 for NM Images  |
| Pixel Representation       | (0028,0103) | 1    | Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values used:<br>0000H = unsigned integer.<br>0001H=2's complement |
| Pixel Data                 | (7FE0,0010) | 1    | A data stream of the pixel samples that comprise the Image.  |
| Planar Configuration       | (0028,0006) | 1C   | Not Used (number of Samples per Pixel is always 1)   |
| Pixel Aspect Ratio         | (0028,0034) | 1C   | Not Used   |
| Smallest Image Pixel Value | (0028,0106) | 3    | The minimum actual pixel value encountered in this image.  |
| Largest Image Pixel Value  | (0028,0107) | 3    | The maximum actual pixel value encountered in this image.  |

### 3.4.6.3 Acquisition Context Module

**TABLE 3-21  
ACQUISITION CONTEXT MODULE ATTRIBUTES**

| Attribute Name                  | Tag         | Type | Attribute Description  |
|---------------------------------|-------------|------|--|
| Acquisition Context Sequence    | (0040,0555) | 2    | A sequence of Items that describes the conditions present during the acquisition of the data of the SOP Instance.<br><br>Zero or more items may be included in this sequence   |
| >Concept Name Code Sequence     | (0040,A043) | 1    | A concept that constrains the meaning of (i.e. defines the role of) the Observation Value. This sequence contains 1 item   |
| >>Include 'Code Sequence Macro' |             |      | (109054, DCM, "Patient State") is supported as defined in TID 3470   |
| >Concept Code Sequence          | (0040,A168) | 1C   | This is the Value component of a Name/Value pair when the Concept implied by Concept Name Code Sequence (0040,A043) is a Coded Value. This sequence contains 1 item  |
| >>Include 'Code Sequence Macro' |             |      | DCID (3101) NM Procedural State Values is supported as defined in TID 3470:<br>The following values are used: <ul style="list-style-type: none"> <li>• (F-01604 ,SRT , "Resting State")</li> <li>• (F-05019 ,SRT , "Cardiac Stress State")</li> <li>• (109092 ,DCM , "Reinjection State")</li> <li>• (109093 ,DCM , "Redistribution State")</li> <li>• (109094 ,DCM , "Delayed Redistribution State")</li> </ul> |

### 3.4.6.4 NM Image Pixel Module

This section specifies the Attributes that describe the pixel data of a NM image.

**TABLE 3-22  
NM IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name             | Tag         | Type | Attribute Description  |
|----------------------------|-------------|------|--|
| Samples per Pixel          | (0028,0002) | 1    | Number of samples (planes) in this image.<br>The value always set to 1.  |
| Photometric Interpretation | (0028,0004) | 1    | Specifies the intended interpretation of the pixel data<br>Enumerated Values supported :<br>MONOCHROME2  |
| Bits Allocated             | (0028,0100) | 1    | Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated.<br>Enumerated Values supported :<br>8, 16. |
| Bits Stored                | (0028,0101) | 1    | Number of bits stored for each pixel sample.<br>Value equal to Bit Allocated (0028,0100)   |

|               |             |   |   |
|---------------|-------------|---|---|
| High Bit      | (0028,0102) | 1 | Most significant bit for pixel sample data.<br>Value equal to Bit Stored (0028,0101) – 1  |
| Pixel Spacing | (0028,0030) | 2 | Physical distance in the patient between the center of each pixel, specified by a numeric pair – adjacent row spacing (delimiter) adjacent column spacing, in mm. |

### 3.4.6.5 Private Image Pixel Module

**TABLE 3-23  
PRIVATE IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Private Creator Id | Attribute Description                        |
|---------------------|-------------|--------------------|--|
| Picture Name        | (0011,xx30) | GEMS_GENIE_1       | Name of the database Picture Object          |
| Byte Order          | (0011,xx38) | GEMS_GENIE_1       | Defines pixel data byte order.               |
| Compression Type    | (0011,xx39) | GEMS_GENIE_1       | Compression information                      |
| Picture Format      | (0011,xx3A) | GEMS_GENIE_1       | Xeleris IAP image format                     |
| Pixel Scale         | (0011,xx3B) | GEMS_GENIE_1       | Internal Pixel Scale. Set to 1.0.            |
| Pixel Offset        | (0011,xx3C) | GEMS_GENIE_1       | Internal Pixel Offset. Set to 0.0.           |
| Viewing Name        | (0011,xx40) | GEMS_GENIE_1       | Name of the database Viewing Object          |
| Orientation Angle   | (0011,xx41) | GEMS_GENIE_1       | Orientation Angle                            |
| Rotation Angle      | (0011,xx42) | GEMS_GENIE_1       | Rotation Angle                               |
| Window Inverse Flag | (0011,xx43) | GEMS_GENIE_1       | Window Inverse Flag                          |
| Threshold Center    | (0011,xx44) | GEMS_GENIE_1       | Threshold Center                             |
| Threshold Width     | (0011,xx45) | GEMS_GENIE_1       | Threshold Width                              |
| Interpolation Type  | (0011,xx46) | GEMS_GENIE_1       | Interpolation Type                           |
| Where Name          | (0011,xx50) | GEMS_GENIE_1       | Name of the database Where Object            |
| FScalar             | (0013,xx15) | GEMS_GENIE_1       | Scaling Factor for Floating Point pixel data |

### 3.4.6.6 Multi-Frame Module

**TABLE 3-24  
MULTI-FRAME MODULE ATTRIBUTES**

| Attribute Name          | Tag         | Type | Attribute Description                     |
|-------------------------|-------------|------|---|
| Number of Frames        | (0028,0008) | 1    | Number of frames in a Multi-frame Image.  |
| Frame Increment Pointer | (0028,0009) | 1    | See 3.4.6.7.1 for further specialization. |

### 3.4.6.7 NM Multi-frame Module

**TABLE 3-25  
NM MULTI-FRAME MODULE ATTRIBUTES**

| Attribute Name          | Tag         | Type | Attribute Description  |
|-------------------------|-------------|------|--|
| Frame Increment Pointer | (0028,0009) | 1    | See 3.4.6.7.1 for further specialization.  |
| Energy Window Vector    | (0054,0010) | 1C   | Defines energy set window to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Energy Window Vector (0054,0010). |



|                          |             |    |   |
|--------------------------|-------------|----|---|
| Number of Energy Windows | (0054,0011) | 1  | Number of energy set windows in SOP Instance.<br>Possible values: 1, 2, 3 or 4.   |
| Detector Vector          | (0054,0020) | 1C | Defines detector to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Detector Vector (0054,0020).                          |
| Number of Detectors      | (0054,0021) | 1  | Number of detectors in SOP Instance.<br>Possible values: 1 or 2.  |
| Phase Vector             | (0054,0030) | 1C | Defines phase to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Phase Vector (0054,0030).                                |
| Number of Phases         | (0054,0031) | 1C | Number of phases in SOP Instance. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Phase Vector (0054,0030).<br>Supported values: 1, 2, 3, 4, 5      |
| Rotation Vector          | (0054,0050) | 1C | Defines rotation to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Rotation Vector (0054,0050).                          |
| Number of Rotations      | (0054,0051) | 1C | Number of Rotations in SOP Instance. Always set to 1. Sent if Image Type (0008,0008), Value 3 is TOMO ,GATED TOMO, RECON TOMO or RECON GATED TOMO.                                    |
| R-R Interval Vector      | (0054,0060) | 1C | Defines R-R Interval to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for R-R Interval Vector (0054,0060).                  |
| Number of R-R Intervals  | (0054,0061) | 1C | Number of R-R Intervals in SOP Instance. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for R-R Interval Vector (0054,0060).                           |
| Time Slot Vector         | (0054,0070) | 1C | Defines time slot, within cardiac cycle, to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Time Slot Vector (0054,0070). |
| Number of Time Slots     | (0054,0071) | 1C | Number of time slots in SOP Instance. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Time Slot Vector (0054,0070).                                 |
| Slice Vector             | (0054,0080) | 1C | An array which contains the spatial slice number for each frame. Required if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Slice Vector (0054,0080).      |
| Number of Slices         | (0054,0081) | 1C | Number of slices. Required if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Slice Vector (0054,0080)  |

|                     |             |    |   |
|---------------------|-------------|----|---|
| Angular View Vector | (0054,0090) | 1C | Defines angular view number to which each frame belongs. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Angular View Vector (0054,0090). |
| Time Slice Vector   | (0054,0100) | 1C | Defines frame numbers within each phase. Sent if the value of the Frame Increment Pointer (0028,0009) includes the Tag for Time Slice Vector (0054,0100).                   |

### 3.4.6.7.1 Frame Increment Pointer

The Frame Increment Pointer (0028,0009) defines which frame index vectors are present in the NM Image instance. The Frame Increment Pointer is supported per the DICOM specification for all image types defined in Table 3-26

**TABLE 3-26  
ENUMERATED VALUES FOR FRAME INCREMENT POINTER**

| Image Type (0008,0008), Value 3 | Frame Increment Pointer (0028,0009)   |
|---------------------------------|---|
| STATIC or WHOLE BODY            | 0054H 0010H \ 0054H 0020H<br>Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020).  |
| DYNAMIC                         | 0054H 0010H \ 0054H 0020H \ 0054H 0030H \ 0054H 0100H<br>Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Phase Vector (0054,0030), Time Slice Vector (0054,0100)  |
| GATED                           | 0054H 0010H \ 0054H 0020H \ 0054H 0060H \ 0054H 0070H<br>Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070)  |
| TOMO                            | 0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0090H<br>Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), Angular View Vector (0054,0090)   |
| GATED TOMO                      | 0054H 0010H \ 0054H 0020H \ 0054H 0050H \ 0054H 0060H \ 0054H 0070H \ 0054H 0090H<br>Sequencing is by Energy Window Vector (0054,0010), Detector Vector (0054,0020), Rotation Vector (0054,0050), R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070), Angular View Vector (0054,0090). |
| RECON TOMO                      | 0054H 0080H<br>Sequencing is by Slice Vector (0054,0080)  |
| RECON GATED TOMO                | 0054H 0060H \ 0054H 0070H \ 0054H 0080H<br>Sequencing is by R-R Interval Vector (0054,0060), Time Slot Vector (0054,0070), Slice Vector (0054,0080)   |

### 3.4.6.8 NM Image Module

**TABLE 3-27  
NM IMAGE MODULE ATTRIBUTES**

| Attribute Name | Tag         | Type | Attribute Description                         |
|----------------|-------------|------|---|
| Image Type     | (0008,0008) | 1    | See 3.4.6.8.1 for specialization.             |
| Image ID       | (0054,0400) | 3    | User or equipment generated Image identifier. |

|                                   |             |    |   |
|-----------------------------------|-------------|----|---|
| Counts Accumulated                | (0018,0070) | 2  | Sum of all gamma events for all frames in the image.  |
| Acquisition Termination Condition | (0018,0071) | 3  | Description of how the data collection was stopped.<br>Defined Terms are used:<br>CNTS = counts<br>DENS = density<br>MANU = manual<br>TIME = time<br>TRIG = physiological trigger   |
| Table Height                      | (0018,1130) | 3  | Table Height - Height of table at acquisition start.  |
| Table Traverse                    | (0018,1131) | 3  | Location of the patient table (or gantry relative to the table) in mm.  |
| Actual Frame Duration             | (0018,1242) | 1C | Elapsed time for one frame acquisition in msec.. Sent when the Image Type (0008,0008), Value 3, is equal to STATIC or WHOLE BODY.   |
| Count Rate                        | (0018,1243) | 3  | Maximum count rate achieved during the acquisition in counts/sec  |
| Corrected Image                   | (0028,0051) | 3  | Corrections are applied to all frames in the image. Sent for RECON TOMO and RECON GATED TOMO data only.<br>Defined Terms:<br>ATTN, ATT_MEASURED, ATT_CHANG0 = attenuation corrected<br>SCAT = scatter corrected   |
| Whole Body Technique              | (0018,1301) | 3  | The type of scan performed. Sent if Image Type (0008,0008), Value 3, contains the value WHOLE BODY.<br>Enumerated Values used:<br>1PS = one pass<br>2PS = two pass<br>PCN= patient contour following employed<br>MSP= multiple static frames collected into a whole body frame.   |
| Scan Velocity                     | (0018,1300) | 2C | The speed of the camera motion over the body in mm/sec. Sent as ZERO Length value if Image Type (0008,0008) Value 3 contains the value WHOLE BODY and the WHOLEBODY is acquired in the Step-and-Shoot technique, where the table does not move during acquisition.                |
| Scan Length                       | (0018,1302) | 2C | Size of the imaged area in the direction of scanning motion, in mm.<br>Sent as ZERO Length value if Image Type (0008,0008) Value 3 contains the value WHOLE BODY and the WHOLEBODY is acquired in the Step-and-Shoot technique, where the table does not move during acquisition. |
| Trigger Source or Type            | (0018,1061) | 3  | Text indicating trigger source  |

|  |  |  |                                      |
|--|--|--|--------------------------------------|
|  |  |  | Which Defined Terms are used:<br>EKG |
|--|--|--|--------------------------------------|

### 3.4.6.8.1 Image Type

The following values of Image Type (0008,0008) are sent :

Value 1 shall have the following Enumerated Values:

- ORIGINAL identifies an Original Image
- DERIVED identifies a Derived Image

Value 2 shall have the following Enumerated Value:

- PRIMARY identifies a Primary Image

The following Enumerated Values of Value 3 are created/supported:

- STATIC
- DYNAMIC
- GATED
- WHOLE BODY
- TOMO
- GATED TOMO
- RECON TOMO
- RECON GATED TOMO

The following Enumerated Values of Value 4 are created/supported:

- EMISSION
- TRANSMISSION

### 3.4.6.9 Private Image Module

**TABLE 3-28  
PRIVATE IMAGE MODULE ATTRIBUTES**

| Attribute Name                    | Tag          | Private Creator Id | Attribute Description   |
|-----------------------------------|--------------|--------------------|---|
| Workstation DICOM data Identifier | (0009,xx01)  | GEMS_GENIE_1       | Contains always "GEMS_GENIE"                                    |
| Dataset UID                       | (0009,xx1E)  | GEMS_GENIE_1       | Dataset UID. For NM ,PET and SC IODs.                           |
| Dataset Name                      | (0011,xx12)  | GEMS_GENIE_1       | Dataset Name. For NM ,PET and SC IODs.                          |
| Processing Parent UID             | (0011,xx32)  | GEMS_GENIE_1       | Processing Parent UID. For NM and PET IODs.                     |
| Source Translator                 | (0013,xx11)  | GEMS_GENIE_1       | Source Translator. Default value = 4. For NM ,SC and MFSC IODs. |
| Annotation Sequence               | (0019, xx5F) | GEMS_GENIE_1       | Annotations attached to image; May contain 0 or more Items      |
| >Modified                         | (0019, xx60) | GEMS_GENIE_1       | Modified Flag   |
| >Name                             | (0019, xx61) | GEMS_GENIE_1       | Name of Database Annotation Object                              |
| >Aid                              | (0019, xx62) | GEMS_GENIE_1       | Database Annotation Unique ID                                   |
| >DatabaseAnnotationMapping        | (0019, xx63) | GEMS_GENIE_1       | Database Annotation Mapping                                     |

|                         |              |              |  |
|-------------------------|--------------|--------------|--|
| >DatabaseObjectClassID  | (0019, xx64) | GEMS_GENIE_1 | Internal Database Annotation Object Class ID                                 |
| >DatabaseObjectUniqueID | (0019, xx65) | GEMS_GENIE_1 | Internal Database Annotation Object UID                                      |
| >TextFgColour           | (0019, xx66) | GEMS_GENIE_1 | Annotation Text Foreground Color   |
| >TextBgColour           | (0019, xx67) | GEMS_GENIE_1 | Annotation Text Background Color   |
| >MarkerColour           | (0019, xx68) | GEMS_GENIE_1 | Annotation Marker Color  |
| >LineColour             | (0019, xx69) | GEMS_GENIE_1 | Annotation Line Color  |
| >LineThickness          | (0019, xx6A) | GEMS_GENIE_1 | Annotation Line Thickness  |
| >Font                   | (0019, xx6B) | GEMS_GENIE_1 | Annotation Font  |
| >TextBackingMode        | (0019, xx6C) | GEMS_GENIE_1 | Annotation Text Backing Mode   |
| >TextJustification      | (0019, xx6D) | GEMS_GENIE_1 | Annotation Text Justification  |
| >TextShadowOffsetX      | (0019, xx6E) | GEMS_GENIE_1 | Annotation Text Shadow Offset X  |
| >TextShadowOffsetY      | (0019, xx6F) | GEMS_GENIE_1 | Annotation Text Shadow Offset Y  |
| >GeomColour             | (0019, xx70) | GEMS_GENIE_1 | Annotation Geometry Color  |
| >GeomThickness          | (0019, xx71) | GEMS_GENIE_1 | Annotation Geometry Thickness  |
| >GeomLineStyle          | (0019, xx72) | GEMS_GENIE_1 | Annotation Geometry Line Style   |
| >GeomDashLength         | (0019, xx73) | GEMS_GENIE_1 | Annotation Geometry Dash Length  |
| >GeomFillPattern        | (0019, xx74) | GEMS_GENIE_1 | Annotation Geometry Fill Pattern   |
| >MarkerSize             | (0019, xx75) | GEMS_GENIE_1 | Annotation Marker Size   |
| >Interactivity          | (0019, xx76) | GEMS_GENIE_1 | Annotation Interactivity   |
| >TextLoc                | (0019, xx77) | GEMS_GENIE_1 | Annotation Text Location   |
| >TextString             | (0019, xx78) | GEMS_GENIE_1 | Annotation Text String   |
| >TextAttachMode         | (0019, xx79) | GEMS_GENIE_1 | Annotation Text Attach Mode  |
| >TextCursorMode         | (0019, xx7A) | GEMS_GENIE_1 | Annotation Text Cursor Mode  |
| >LineCtrlSize           | (0019, xx7B) | GEMS_GENIE_1 | Annotation Line Ctrl Size  |
| >LineType               | (0019, xx7C) | GEMS_GENIE_1 | Annotation Line Type   |
| >LineStyle              | (0019, xx7D) | GEMS_GENIE_1 | Annotation Line Style  |
| >LineDashLength         | (0019, xx7E) | GEMS_GENIE_1 | Annotation Line Dash Length  |
| >LinePtCount            | (0019, xx7F) | GEMS_GENIE_1 | Annotation Line Points Count   |
| >LinePts                | (0019, xx80) | GEMS_GENIE_1 | Annotation Line Points List  |
| >LineAttachMode         | (0019, xx81) | GEMS_GENIE_1 | Annotation Line Attach Mode  |
| >MarkerType             | (0019, xx82) | GEMS_GENIE_1 | Annotation Marker Type   |
| >MarkerLoc              | (0019, xx83) | GEMS_GENIE_1 | Annotation Marker Location   |
| >MarkerAttachMode       | (0019, xx84) | GEMS_GENIE_1 | Annotation Line Marker Attach Mode   |
| >FrameNumber            | (0019, xx86) | GEMS_GENIE_1 | Annotation Frame Number  |
| OrigSOPInstance UID     | (0033,xx07)  | GEMS_GENIE_1 | List of SOP UIDs of Xeleris associated datasets encapsulated into the NM ,SC |

|                         |             |                |   |
|-------------------------|-------------|----------------|---|
|                         |             |                | and MFSC IODs.  |
| ROI Sequence            | (0057,xx01) | GEMS_XELPRV_01 | ROI created on image; may contain 0 or more items.                    |
| > ROIObjectSOPClassUID  | (0057,xx02) | GEMS_XELPRV_01 | ROI SOP Class UID, contains value "1.2.840.10008.5.1.4.1.1.9"         |
| > ROIObjectInstanceUID  | (0057,xx03) | GEMS_XELPRV_01 | ROI SOP Instance UID; internally generated.                           |
| >Index                  | (0057,xx10) | GEMS_XELPRV_01 | Index of ROI  |
| >Dimensions             | (0057,xx11) | GEMS_XELPRV_01 | ROI Dimensions. Contain value: 1                                      |
| >Points                 | (0057,xx12) | GEMS_XELPRV_01 | Number of Points  |
| >Type                   | (0057,xx13) | GEMS_XELPRV_01 | ROI Type  |
| >Description            | (0057,xx14) | GEMS_XELPRV_01 | ROI Description   |
| >DValueRepresentation   | (0057,xx15) | GEMS_XELPRV_01 | Data Value Representation; Contains value: 3                          |
| >ROI Label              | (0057,xx16) | GEMS_XELPRV_01 | ROI Label   |
| >Data                   | (0057,xx17) | GEMS_XELPRV_01 | List of ROI Shape points  |
| >Modified               | (0057,xx41) | GEMS_XELPRV_01 | Modified  |
| >DatabaseObjectName     | (0057,xx42) | GEMS_XELPRV_01 | Name of ROI Database Object   |
| >DatabaseObjectClass ID | (0057,xx45) | GEMS_XELPRV_01 | ROI Database Object Class   |
| >DatabaseObjectUID      | (0057,xx46) | GEMS_XELPRV_01 | ROI Object SOP Instance UID; internally generated                     |
| >Normal Colour          | (0057,xx47) | GEMS_XELPRV_01 | ROI Normal Color  |
| >NameFont               | (0057,xx48) | GEMS_XELPRV_01 | ROI Name Font   |
| >FillPattern            | (0057,xx49) | GEMS_XELPRV_01 | ROI Fill Pattern  |
| >LineStyle              | (0057,xx4A) | GEMS_XELPRV_01 | ROI Line Style  |
| >LineDashLength         | (0057,xx4B) | GEMS_XELPRV_01 | ROI Line Dash Length  |
| >LineThickness          | (0057,xx4C) | GEMS_XELPRV_01 | ROI Line Thickness  |
| >Interactivity          | (0057,xx4D) | GEMS_XELPRV_01 | ROI Interactivity Flag  |
| >Name Position          | (0057,xx4E) | GEMS_XELPRV_01 | ROI Name Position   |
| >NameDisplay            | (0057,xx4F) | GEMS_XELPRV_01 | ROI Name Display Flag   |
| >Label                  | (0057,xx50) | GEMS_XELPRV_01 | ROI Label; contains the same value as ROI Label attribute (0057,xx16) |
| >BpSeg                  | (0057,xx51) | GEMS_XELPRV_01 | ROI BpSeg   |
| >BpSegpairs             | (0057,xx52) | GEMS_XELPRV_01 | ROI BpSegpairs  |
| >SeedSpace              | (0057,xx53) | GEMS_XELPRV_01 | ROI Seed Space  |
| >Seeds                  | (0057,xx54) | GEMS_XELPRV_01 | ROI Seeds   |
| >Shape                  | (0057,xx55) | GEMS_XELPRV_01 | ROI Shape   |
| >ShapeTilt              | (0057,xx56) | GEMS_XELPRV_01 | ROI Shape Tilt  |
| >ShapePtsSpace          | (0057,xx59) | GEMS_XELPRV_01 | ROI Shape Points Space  |
| >ShapeCtrlPtsCount      | (0057,xx5A) | GEMS_XELPRV_01 | ROI Shape Control Points Count  |
| >Shap CtrlPts           | (0057,xx5B) | GEMS_XELPRV_01 | ROI Shape Control Points List   |
| >ShapeCPSpace           | (0057,xx5C) | GEMS_XELPRV_01 | ROI Shape Control Points Space  |

|                     |             |                |                     |
|---------------------|-------------|----------------|---------------------|
| >ROIFlags           | (0057,xx5D) | GEMS_XELPRV_01 | ROI Flags           |
| >FrameNumber        | (0057,xx5E) | GEMS_XELPRV_01 | ROI Frame Number    |
| >DatasetROI Mapping | (0057,xx60) | GEMS_XELPRV_01 | Dataset ROI Mapping |

### 3.4.6.10 Private NM Image Module

**TABLE 3-29  
PRIVATE NM IMAGE MODULE ATTRIBUTES**

| <b>Attribute Name</b>     | <b>Tag</b>  | <b>Private Creator Id</b> | <b>Attribute Description</b>  |
|---------------------------|-------------|---------------------------|---|
| Dataset UID List          | (0009,xx45) | GEMS_GENIE_1              | Dataset UID List  |
| Radio Nuclide Name        | (0011,xx0D) | GEMS_GENIE_1              | Name of radionuclide used.  |
| Database Object Name      | (0011,xx10) | GEMS_GENIE_1              | Name of the Database Dataset Object.  |
| Dataset Modified          | (0011,xx11) | GEMS_GENIE_1              | Dataset Modified Flag   |
| Dataset Type              | (0011,xx13) | GEMS_GENIE_1              | Defines type of dataset.<br><br>The Defined Terms are:<br>0 = static<br>2 = whole body<br>8 = dynamic<br>11 = multi-gated<br>12 = tomographic planar<br>13 = transaxial<br>14 = sagittal<br>15 = coronal<br>16 = oblique VLA<br>17 = oblique HLA<br>18 = oblique SA<br>22 = sinogram<br>43 = linogram |
| Completion Time           | (0011,xx14) | GEMS_GENIE_1              | Completion Time   |
| Detector Number           | (0011,xx15) | GEMS_GENIE_1              | Detector number image was acquired by.  |
| Energy Number             | (0011,xx16) | GEMS_GENIE_1              | Energy set number.  |
| RR Interval Window Number | (0011,xx17) | GEMS_GENIE_1              | R-R interval number.  |
| MG Bin Number             | (0011,xx18) | GEMS_GENIE_1              | Multi-gated time bin number.  |
| Radius Of Rotation        | (0011,xx19) | GEMS_GENIE_1              | Distance to the center of detector rotation.  |
| Detector Count Zone       | (0011,xx1A) | GEMS_GENIE_1              | FOV zone for count-based acquisition termination criteria.<br><br>The Defined Terms are:<br>0 = none specified<br>1 = total (all) counts<br>2 = counts in energy set<br>3 = counts inside an ROI  |

|                                   |             |              |  |
|-----------------------------------|-------------|--------------|--|
|                                   |             |              | 4 = counts outside an ROI  |
| Image Orientation                 | (0011,xx1F) | GEMS_GENIE_1 | Orientation of the image.<br>The Defined Terms are:<br>0 = no rotation, no mirroring<br>1 = no rotation, mirrored                  |
| Table Orientation                 | (0011,xx26) | GEMS_GENIE_1 | Orientation of the table for whole body acquisition.<br>The Defined Terms are:<br>0 = direction in/out<br>1 = direction left/right |
| ROI Top Left                      | (0011,xx27) | GEMS_GENIE_1 | Acquisition count zone ROI, top left coordinate.   |
| ROI Bottom Right                  | (0011,xx28) | GEMS_GENIE_1 | Acquisition count zone ROI, bottom right coordinate.   |
| View X Adjustment                 | (0011,xx2C) | GEMS_GENIE_1 | View X Adjustment  |
| View Y Adjustment                 | (0011,xx2D) | GEMS_GENIE_1 | View Y Adjustment  |
| Pixel Overflow Flag               | (0011,xx2E) | GEMS_GENIE_1 | Pixel Overflow Flag (Starcam)  |
| Pixel Overflow Level              | (0011,xx2F) | GEMS_GENIE_1 | Pixel Overflow Level   |
| Acquisition Parent UID            | (0011,xx31) | GEMS_GENIE_1 | Acquisition Parent UID   |
| Energy Correct Name               | (0011,xx33) | GEMS_GENIE_1 | Name of applied energy correction.   |
| Spatial Correct Name              | (0011,xx34) | GEMS_GENIE_1 | Name of applied spatial correction.  |
| Tuning Calib Name                 | (0011,xx35) | GEMS_GENIE_1 | Name of applied tuning calibration data.   |
| Uniformity Correct Name           | (0011,xx36) | GEMS_GENIE_1 | Name of associated uniformity correction.  |
| Acquisition Specific Correct Name | (0011,xx37) | GEMS_GENIE_1 | Name(s) of associated acquisition specific correction(s).  |
| Dataset Flags                     | (0011,xx3F) | GEMS_GENIE_1 | Defines dataset information.   |
| Period                            | (0011,xx55) | GEMS_GENIE_1 | Period   |
| Elapsed Time                      | (0011,xx56) | GEMS_GENIE_1 | Elapsed Time   |
| FOV                               | (0011,xx57) | GEMS_GENIE_1 | FOV  |
| Digital FOV                       | (0013,xx10) | GEMS_GENIE_1 | Digital FOV  |
| RAL Flags                         | (0013,xx12) | GEMS_GENIE_1 | RAL Flags  |
| Xeleris Frame Sequence            | (0055,xx65) | GEMS_GENIE_1 | Xeleris Frame Sequence. Present for historical reasons. Always contains 0 items.   |
| Trigger History Modified Flag     | (0033,xx30) | GEMS_GENIE_1 | Triggers Modification Flag   |
| Database Object Name              | (0033,xx31) | GEMS_GENIE_1 | Name of Database Trigger History Object  |
| Trigger History Software Version  | (0033,xx32) | GEMS_GENIE_1 | Trigger History Software Version   |
| Number of Triggers                | (0033,xx33) | GEMS_GENIE_1 | Number of Triggers   |
| Trigger Size                      | (0033,xx34) | GEMS_GENIE_1 | Size of one Trigger data slot  |
| Trigger Data Size                 | (0033,xx35) | GEMS_GENIE_1 | Size of Trigger Data Size  |



|                                      |             |              |  |
|--------------------------------------|-------------|--------------|--|
| Trigger Data                         | (0033,xx36) | GEMS_GENIE_1 | Buffer with trigger data information   |
| Trigger History Description          | (0033,xx37) | GEMS_GENIE_1 | Trigger History Description  |
| Trigger History Flags                | (0033,xx38) | GEMS_GENIE_1 | Trigger History Flags  |
| Trigger History Private Instance UID | (0033,xx39) | GEMS_GENIE_1 | Trigger History Object identifier. Internally Generated                                  |
| Trigger History SOP Class UID        | (0033,xx3A) | GEMS_GENIE_1 | Internal SOP Class UID value, set to "1.2.840.10008.5.1.4.1.1.20" for historical reasons |

### 3.4.6.11 NM Isotope Module

This section contains Attributes that describe the isotope administered for the acquisition.

**TABLE 3-30  
NM ISOTOPE MODULE ATTRIBUTES**

| Attribute Name                           | Tag         | Type | Attribute Description  |
|--|-------------|------|--|
| Energy Window Information Sequence       | (0054,0012) | 2    | Sequence of Items that describe the energy window groups used. May contain 0 or more items. The number of items shall be equal to Number of Energy Windows (0054,0011) |
| > Energy Window Name                     | (0054,0018) | 3    | A user defined name which describes this Energy Window.  |
| >Energy Window Range Sequence            | (0054,0013) | 3    | Sequence describing window energy limits. May contain up to 4 items.   |
| >> Energy Window Lower Limit             | (0054,0014) | 3    | The lower limit of the energy window in KeV.   |
| >> Energy Window Upper Limit             | (0054,0015) | 3    | The upper limit of the energy window in KeV.   |
| Radiopharmaceutical Information Sequence | (0054,0016) | 2    | Information on radiopharmaceutical(s) used. May contains 0 or more items   |
| > Radionuclide Code Sequence             | (0054,0300) | 2    | Sequence that identifies the radionuclide. May contain 0 or more items.  |
| >> Include 'Code Sequence Macro'         |             |      | See Table 3-31   |
| > Radiopharmaceutical Volume             | (0018,1071) | 3    | Volume of injection in cubic cm.   |
| > Radionuclide Total Dose                | (0018,1074) | 3    | Total amount of radionuclide injected in MBq.  |
| > Radiopharmaceutical                    | (0018,0031) | 3    | Name of the radiopharmaceutical  |
| > Radiopharmaceutical Code Sequence      | (0054,0304) | 3    | Sequence that identifies the radiopharmaceutical. If presented, this sequence contains exactly one item.   |
| >> Include 'Code Sequence Macro'         |             |      | See Table 3-32   |

**TABLE 3-31  
RADIONUCLIDE CODE SEQUENCE VALUES (BASELINE ID 18)**

| Code Value | Coding Scheme Designator | Code Meaning             |
|------------|--------------------------|--------------------------|
| C-105A1    | 99SDM                    | <sup>11</sup> C Carbon   |
| C-107A1    | 99SDM                    | <sup>13</sup> N Nitrogen |
| C-111A1    | 99SDM                    | <sup>18</sup> F Fluorine |

|         |         |                           |
|---------|---------|---------------------------|
| C-114A4 | 99SDM   | <sup>123</sup> Iodine     |
| C-114A6 | 99SDM   | <sup>125</sup> Iodine     |
| C-114B1 | 99SDM   | <sup>131</sup> Iodine     |
| C-122A5 | 99SDM   | <sup>133</sup> Barium     |
| C-128A2 | 99SDM   | <sup>68</sup> Germanium   |
| C-131A2 | 99SDM   | <sup>67</sup> Gallium     |
| C-138A9 | 99SDM   | <sup>201</sup> Thallium   |
| C-144A3 | 99SDM   | <sup>57</sup> Cobalt      |
| C-145A4 | 99SDM   | <sup>111</sup> Indium     |
| C-155A1 | 99SDM   | <sup>22</sup> Sodium      |
| C-159A2 | 99SDM   | <sup>82</sup> Rubidium    |
| C-163A8 | 99SDM   | <sup>99m</sup> Technetium |
| C-172A8 | 99SDM   | <sup>133</sup> Xenon      |
| C-173A7 | 99SDM   | <sup>85</sup> Krypton     |
| C-178A8 | 99SDM   | <sup>153</sup> Gadolinium |
| X-Y1728 | SNM3(*) | Ammonia N <sup>13</sup>   |

*Note:* (\*) Only for processing results of modality “OT”. Code scheme designator remains “SMN3” for compatibility with input PET Images.

**TABLE 3-32  
RADIOPHARMACEUTICAL CODE SEQUENCE VALUES (BASELINE ID 25)**

| Code Value | Coding Scheme Designator | Code Meaning                       |
|------------|--------------------------|------------------------------------|
| C-B1000    | SRT                      | Diagnostic radioisotope            |
| C-B1010    | SRT                      | Therapeutic radioisotope           |
| C-B1011    | SRT                      | Sodium chromate Cr <sup>51</sup>   |
| C-B1012    | SRT                      | Chromium <sup>51</sup> albumin     |
| C-B1013    | SRT                      | Chromium <sup>51</sup> chloride    |
| C-B1016    | SRT                      | Copper <sup>64</sup> versenate     |
| C-B1017    | SRT                      | Copper <sup>64</sup> acetate       |
| C-B1018    | SRT                      | Copper <sup>67</sup> ceruloplasmin |
| C-B1021    | SRT                      | Cyanocobalamin Co <sup>57</sup>    |
| C-B1022    | SRT                      | Cyanocobalamin Co <sup>58</sup>    |
| C-B1023    | SRT                      | Cyanocobalamin Co <sup>60</sup>    |
| C-B1031    | SRT                      | Fluorodeoxyglucose F <sup>18</sup> |
| C-B1032    | SRT                      | Sodium fluoride F <sup>18</sup>    |
| C-B1037    | SRT                      | Rubidium chloride Rb <sup>82</sup> |
| C-B103C    | SRT                      | Ammonia N <sup>13</sup>            |

|         |     |  |
|---------|-----|--|
| C-B1041 | SRT | Gallium <sup>67</sup> citrate                      |
| C-B1051 | SRT | Colloidal gold Au <sup>198</sup>                   |
| C-B1061 | SRT | Indium <sup>111</sup> pentetate                    |
| C-B1062 | SRT | Disodium indium <sup>111</sup>                     |
| C-B1063 | SRT | Colloidal Indium <sup>111</sup>                    |
| C-B1065 | SRT | Indium <sup>111</sup> -Fe(OH) <sub>3</sub>         |
| C-B1066 | SRT | Indium <sup>111</sup> red cell label               |
| C-B1067 | SRT | Indium <sup>111</sup> transferrin                  |
| C-B1068 | SRT | Indium <sup>113</sup> bleomycin                    |
| C-B1069 | SRT | Indium <sup>113</sup> chloride                     |
| C-B1070 | SRT | Indium <sup>113</sup> pentetate                    |
| C-B1071 | SRT | Indium <sup>113</sup> oxoquinoline WBC label       |
| C-B1072 | SRT | Indium <sup>113</sup> oxoquinoline platelet label  |
| C-B1073 | SRT | Indium <sup>113</sup> oxoquinoline RBC label       |
| C-B1081 | SRT | Sodium iodide I <sup>123</sup>                     |
| C-B1082 | SRT | Fibrinogen I <sup>123</sup>                        |
| C-B1083 | SRT | Oleic acid I <sup>125</sup>                        |
| C-B1084 | SRT | Iodinated I <sup>125</sup> albumin                 |
| C-B1085 | SRT | Rose Bengal sodium I <sup>131</sup>                |
| C-B1086 | SRT | Sodium iodide I <sup>131</sup>                     |
| C-B1087 | SRT | Iodocholesterol I <sup>131</sup>                   |
| C-B1088 | SRT | Iothalamate sodium I <sup>125</sup>                |
| C-B1089 | SRT | Iodinated I <sup>131</sup> albumin                 |
| C-B1090 | SRT | Iodinated I <sup>131</sup> aggregated albumin      |
| C-B1091 | SRT | Iodohippurate I <sup>131</sup> sodium              |
| C-B1092 | SRT | Diiodofluorecein I <sup>131</sup>                  |
| C-B1093 | SRT | Iodinated I <sup>125</sup> oleic acid and triolein |
| C-B1094 | SRT | Iodinated I <sup>125</sup> levothyroxine           |
| C-B1095 | SRT | Iodohippurate I <sup>123</sup> sodium              |
| C-B1096 | SRT | Iodinated I <sup>125</sup> povidone                |
| C-B1097 | SRT | Iodinated I <sup>125</sup> Rose Bengal             |
| C-B1098 | SRT | Iodinated I <sup>125</sup> sealed source           |
| C-B1099 | SRT | Iodinated I <sup>125</sup> sodium iodine           |
| C-B1100 | SRT | Iodinated I <sup>125</sup> human serum albumin     |
| C-B1105 | SRT | Iodohippurate I <sup>125</sup> sodium              |
| C-B1108 | SRT | Iofetamine I <sup>123</sup> hydrochloride          |
| C-B1109 | SRT | Iodine <sup>131</sup> polyvinylpyrrolidone         |

|         |     |  |
|---------|-----|--|
| C-B1111 | SRT | Iodinated I <sup>131</sup> gamma globulin            |
| C-B1121 | SRT | Ferrous citrate Fe <sup>59</sup>                     |
| C-B1122 | SRT | Ferrous chloride Fe <sup>59</sup>                    |
| C-B1123 | SRT | Ferrous sulfate Fe <sup>59</sup>                     |
| C-B1124 | SRT | Iron Fe <sup>59</sup> labeled dextran                |
| C-B1140 | SRT | Chromic phosphate P <sup>32</sup>                    |
| C-B1142 | SRT | Sodium phosphate P <sup>32</sup>                     |
| C-B1150 | SRT | Potassium chloride K <sup>43</sup>                   |
| C-B1151 | SRT | Potassium carbonate K <sup>42</sup>                  |
| C-B1152 | SRT | Potassium chloride K <sup>42</sup>                   |
| C-B1171 | SRT | Selenomethionione Se <sup>75</sup>                   |
| C-B1172 | SRT | Selenium <sup>75</sup> HCAT                          |
| C-B1175 | SRT | Sodium chloride Na <sup>24</sup>                     |
| C-B1176 | SRT | Sodium chloride Na <sup>22</sup>                     |
| C-B1180 | SRT | Strontium chloride Sr <sup>85</sup>                  |
| C-B1181 | SRT | Strontium chloride Sr <sup>87</sup>                  |
| C-B1182 | SRT | Strontium nitrate Sr <sup>85</sup>                   |
| C-B1183 | SRT | Strontium nitrate Sr <sup>87</sup>                   |
| C-B1200 | SRT | Technetium Tc <sup>99m</sup> aggregated albumin      |
| C-B1203 | SRT | Technetium Tc <sup>99m</sup> microaggregated albumin |
| C-B1204 | SRT | Technetium Tc <sup>99m</sup> albumin colloid         |
| C-B1205 | SRT | Technetium Tc <sup>99m</sup> albumin microspheres    |
| C-B1206 | SRT | Sodium pertechnetate Tc <sup>99m</sup>               |
| C-B1207 | SRT | Technetium Tc <sup>99m</sup> disofenin               |
| C-B1208 | SRT | Technetium Tc <sup>99m</sup> mebrofenin              |
| C-B1209 | SRT | Technetium Tc <sup>99m</sup> lidofenin               |
| C-B1210 | SRT | Technetium Tc <sup>99m</sup> iron ascorbate          |
| C-B1211 | SRT | Technetium Tc <sup>99m</sup> stannous etidronate     |
| C-B1212 | SRT | Technetium Tc <sup>99m</sup> medronate               |
| C-B1213 | SRT | Technetium Tc <sup>99m</sup> oxidronate              |
| C-B1214 | SRT | Technetium Tc <sup>99m</sup> pentetate               |
| C-B1215 | SRT | Technetium Tc <sup>99m</sup> pyro and polyphosphates |
| C-B1216 | SRT | Technetium Tc <sup>99m</sup> serum albumin           |
| C-B1220 | SRT | Technetium Tc <sup>99m</sup> sodium glucoheptonate   |
| C-B1221 | SRT | Technetium Tc <sup>99m</sup> succimer                |
| C-B1222 | SRT | Technetium Tc <sup>99m</sup> sulfur colloid          |

|            |          |   |
|------------|----------|---|
| C-B1223    | SRT      | Technetium Tc <sup>99m</sup> exametazine                  |
| C-B1224    | SRT      | Technetium Tc <sup>99m</sup> tagged red cells             |
| C-B1225    | SRT      | Technetium Tc <sup>99m</sup> N-substituted iminodiacetate |
| C-B1231    | SRT      | Thallos chloride Tl <sup>201</sup>                        |
| C-B1251    | SRT      | Pentetate calcium trisodium Yb <sup>169</sup>             |
| C-B1300    | SRT      | Carbon <sup>14</sup> triolein                             |
| C-B1302    | SRT      | Carbon <sup>14</sup> D-xylose                             |
| C-B1304    | SRT      | Cholyl-carbon <sup>14</sup> glycine                       |
| Y-X1743    | SRT      | FDG -- fluorodeoxyglucose                                 |
| Y-X1744    | SRT      | FDOPA -- fluoroDOPA                                       |
| Y-X1745    | SRT      | F- -- Fluorine  |
| Y-X1746    | SRT      | NH3 -- Ammonia  |
| Y-X1747    | SRT      | H2O --water   |
| Y-X1748    | SRT      | O2 -- Oxygen  |
| Y-X1749    | SRT      | [150]CO -- carbon monoxide                                |
| Y-X1750    | SRT      | [150]CO2 -- carbon dioxide                                |
| Y-X1751    | SRT      | OAc -- Acetate  |
| Y-X1752    | SRT      | Palmitate   |
| Y-X1753    | SRT      | [11C]CO -- carbon monoxide                                |
| Y-X1754    | SRT      | [11C]CO2 -- carbon dioxide                                |
| Y-X1755    | SRT      | Rubidium cation   |
| Y-X1756    | SRT      | FluoroSpiperone   |
| Y-X1757    | SRT      | L-2-Fluorotyrosine  |
| Y-X1758    | SRT      | Misonidazole  |
| Y-X1759    | SRT      | [11C]Butanol  |
| Y-X1760    | SRT      | Deoxyglucose  |
| Y-X1761    | SRT      | Glucose   |
| Y-X1762    | SRT      | Methionine  |
| Y-X1763    | SRT      | N-MethylSpiperone   |
| Y-X1764    | SRT      | Raclopride  |
| Y-X1765    | SRT      | Thymidine   |
| Y-X1766    | SRT      | L-1-Tyrosine  |
| Y-X1767    | SRT      | [150]Butanol  |
| Y-X1768    | SRT      | EDTA  |
| Y-X1769    | SRT      | PTSM  |
| PHRM-MIBI  | CSMC-AIM | Technetium Tc <sup>99m</sup> sestamibi                    |
| PHRM-TETRO | CSMC-AIM | Technetium Tc <sup>99m</sup> tetrafosmin                  |

### 3.4.6.12 Private Isotope Module

**TABLE 3-33  
PRIVATE ISOTOPE MODULE ATTRIBUTES**

| Attribute Name                             | Tag         | Private Creator Id | Attribute Description   |
|--|-------------|--------------------|---|
| Xeleris Energy Window Information Sequence | (0055,xx12) | GEMS_GENIE_1       | Private Energy Sequence.<br>The number of items in the Xeleris Energy Window sequence is the same as tag value of tag (0054,0011)                                       |
| >Xeleris Energy Window Range Sequence      | (0055,xx13) | GEMS_GENIE_1       | May contain from 0 to 4 items.  |
| >>Energy Offset                            | (0011,xx1C) | GEMS_GENIE_1       | Energy window offset as a percentage of the energy peak.  |
| >>Energy Range                             | (0011,xx1D) | GEMS_GENIE_1       | Energy Range<br>The Defined Terms are:<br>0 = low energy range, X-series detector<br>1 = high energy range, X-series detector<br>2 = GE 511 Camera Range<br>3 = Unknown |
| >>AutoTrack Peak                           | (0013,xx16) | GEMS_GENIE_1       | Optima Auto Track energy peak.  |
| >>AutoTrack Width                          | (0013,xx17) | GEMS_GENIE_1       | Optima Auto Track energy width.   |

### 3.4.6.13 NM Detector Module

**TABLE 3-34  
NM DETECTOR MODULE ATTRIBUTES**

| Attribute Name                | Tag         | Type | Attribute Description   |
|-------------------------------|-------------|------|---|
| Detector Information Sequence | (0054,0022) | 2    | Sequence of Items that describe the detectors used. Zero or more Items may be included in this sequence. The number of items is equal to Number of Detectors (0054,0021).   |
| > Collimator/Grid Name        | (0018,1180) | 3    | Label describing the collimator used, e.g. LEGP LEHR, etc.  |
| > Collimator Type             | (0018,1181) | 2    | Collimator type. Defined Terms:<br>PARA = Parallel (default)<br>PINH = Pinhole<br>FANB = Fan-beam<br>CONE = Cone-beam<br>SLNT = Slant hole<br>ASTG = Astigmatic<br>DIVG = Diverging<br>NONE = No collimator<br>UNKN = Unknown |
| > Field of View Shape         | (0018,1147) | 3    | Defined Terms used:<br>RECTANGLE<br>ROUND   |
| > Field of View Dimension(s)  | (0018,1149) | 3    | Dimensions of the field of view in mm.  |

|                                 |             |    |   |
|---------------------------------|-------------|----|---|
| > Focal Distance                | (0018,1182) | 2  | Focal distance, in mm. Default value is 0.  |
| > X Focus Center                | (0018,1183) | 3  | Center of focus along a row.  |
| > Y Focus Center                | (0018,1184) | 3  | Center of focus along a column.   |
| > Zoom Center                   | (0028,0032) | 3  | The amount of offset from (0, 0) applied to each pixel in the image before application of the zoom factor, specified by a numeric pair (in mm).   |
| > Zoom Factor                   | (0028,0031) | 3  | The amount of magnification applied to each pixel in the image.<br>Typical Range 1.0 to 4.0   |
| > Center of Rotation Offset     | (0018,1145) | 3  | Offset between detector center and mechanical center  |
| > Gantry/Detector Tilt          | (0018,1120) | 3  | Angle of tilt in degrees of the detector.   |
| > Distance Source to Detector   | (0018,1110) | 2C | Distance in mm from transmission source to the detector face. Sent if Image Type (0008,0008) Value 4 is TRANSMISSION and Value 3 is not any of:<br>TOMO,<br>GATED TOMO,<br>RECON TOMO or<br>RECON GATED TOMO. |
| > Start Angle                   | (0054,0200) | 3  | Position of the detector about the patient for the start of the acquisition, in degrees.<br><br>Sent if Image Type (0008,0008), Value 3, is other than TOMO, GATED TOMO, RECON TOMO or RECON GATED TOMO       |
| > Radial Position               | (0018,1142) | 3  | Not sent  |
| > Image Orientation (Patient)   | (0020,0037) | 2C | The direction cosines of the first row and the first column with respect to the patient. Set for first frame in dataset   |
| > Image Position (Patient)      | (0020,0032) | 2C | The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm. Set for first frame in dataset.  |
| > View Code Sequence            | (0054,0220) | 3  | Sequence that describes the projection of the anatomic region of interest on the image receptor. May contain 0 or 1 item  |
| >>Include 'Code Sequence Macro' |             |    | See Table 3-35  |

**TABLE 3-35  
VIEW CODE SEQUENCE VALUES (BASELINE ID 26)**

| <b>Code Value</b> | <b>Coding Scheme Designator</b> | <b>Code Meaning</b>     |
|-------------------|---------------------------------|-------------------------|
| G-5206            | SRT                             | Right anterior oblique  |
| G-5207            | SRT                             | Left anterior oblique   |
| G-5208            | SRT                             | Right posterior oblique |
| G-5209            | SRT                             | Left posterior oblique  |
| G-5210            | SRT                             | Oblique axial           |

|        |     |                          |
|--------|-----|--------------------------|
| G-5212 | SRT | Sagittal-oblique axial   |
| G-5215 | SRT | Anterior projection      |
| G-5216 | SRT | Posterior projection     |
| G-5220 | SRT | Medial-lateral           |
| G-5221 | SRT | Lateral-medial           |
| G-5222 | SRT | Right lateral projection |
| G-5223 | SRT | Left lateral projection  |
| G-5224 | SRT | Medial-lateral oblique   |
| G-5225 | SRT | Latero-medial oblique    |
| G-A104 | SRT | Lateral                  |
| G-A117 | SRT | Transverse               |
| G-A138 | SRT | Coronal                  |
| G-A145 | SRT | Sagittal                 |
| G-A147 | SRT | Axial                    |
| G-A186 | SRT | Short Axis               |
| G-A18A | SRT | Vertical Long Axis       |
| G-A18B | SRT | Horizontal Long Axis     |

### 3.4.6.14 Private Detector Module

**TABLE 3-36  
PRIVATE DETECTOR MODULE ATTRIBUTES**

| <b>Attribute Name</b>                 | <b>Tag</b>  | <b>Private Creator Id</b> | <b>Attribute Description</b>   |
|---------------------------------------|-------------|---------------------------|--|
| Xeleris Detector Information Sequence | (0055,xx22) | GEMS_GENIE_1              | Xeleris detector information. May contain one or more items.   |
| >Use FOV Mask                         | (0011,xx23) | GEMS_GENIE_1              | Flag shows whether FOV mask used during image acquisition.<br>The Defined Terms are:<br>0 = no mask used<br>1 = FOV mask used                              |
| >FOV Mask Y Cutoff Distance           | (0011,xx24) | GEMS_GENIE_1              | Hexagonal FOV mask Y cutoff angle.   |
| >FOV Mask Cutoff Angle                | (0011,xx25) | GEMS_GENIE_1              | Hexagonal FOV mask cutoff angle.   |
| >Uniformity Mean                      | (0011,xx29) | GEMS_GENIE_1              | Uniformity Mean value  |
| >FOV Shape                            | (0011,xx3E) | GEMS_GENIE_1              | GEHC NM system detector type. The Defined Terms are:<br>0 = Undefined<br>1 = 400AC<br>6 = Optima<br>7 = MAXXUS<br>8 = Millennium MPS<br>9 = Millennium MPR |



|                              |             |              |   |
|------------------------------|-------------|--------------|---|
|                              |             |              | 10 = Millennium MG<br>12 = Other<br>13 = VARICAM<br>14 = DST<br>21 = Optima V3.0<br>22 = MAXXUS V3.0<br>23 = Millennium MPS V3.0<br>24= Millennium MPR V3.0<br>25 = Millennium MG V3.0<br>27 = Discovery NM530c |
| >Transmission Scan Time      | (0013,xx18) | GEMS_GENIE_1 | Attenuation correction transmission scan duration.  |
| >Transmission Mask Width     | (0013,xx19) | GEMS_GENIE_1 | Attenuation correction transmission scan mask width.  |
| >Copper Attenuator Thickness | (0013,xx1A) | GEMS_GENIE_1 | Thickness of transmission scan copper attenuator.   |
| >Tomo View Offset            | (0013,xx1E) | GEMS_GENIE_1 | Tomo view detector offset (vector)  |
| >Start Angle                 | (0035,xx01) | GEMS_GENIE_1 | Detector start angle  |

### 3.4.6.15 NM Tomo Acquisition Module

Describe the conditions under which this module is present in this implementation. Module applies to a TOMO Multi-frame Image. This module is present when the Image Type (0008,0008) Value 3, is equal to TOMO, GATED TOMO, RECON TOMO, or RECON GATED TOMO.

**TABLE 3-37  
NM TOMO ACQUISITION MODULE ATTRIBUTES**

| Attribute Name                | Tag         | Type | Attribute Description  |
|-------------------------------|-------------|------|--|
| Rotation Information Sequence | (0054,0052) | 2    | Sequence of Items that describe TOMO rotational groups. Contain only 1 item.   |
| > Start Angle                 | (0054,0200) | 1    | Position of the detector about the patient for the start of the acquisition, in degrees.   |
| > Angular Step                | (0018,1144) | 1    | The angular scan arc step between views of the TOMO acquisition, in degrees  |
| > Rotation Direction          | (0018,1140) | 1    | Direction of rotation of the detector about the patient. Enumerated Values:<br>CW = clockwise (decreasing angle)<br>CC = counter-clockwise (increasing angle). |
| > Scan Arc                    | (0018,1143) | 1    | The effective angular range of the scan data in degrees.   |
| > Actual Frame Duration       | (0018,1242) | 1    | Nominal acquisition time per angular position, in msec.  |
| > Radial Position             | (0018,1142) | 3    | Radial distance of the detector from the center of rotation, in mm. Sent as a single value which is an average value for this rotation.                        |
| > Distance Source to Detector | (0018,1110) | 2C   | Distance in mm from transmission source to the detector face. Sent if Image Type (0008,0008)   |

|                                |             |   |  |
|--------------------------------|-------------|---|--|
|                                |             |   | Value 4 is TRANSMISSION.   |
| > Number of Frames in Rotation | (0054,0053) | 1 | Number of angular views in this rotation.  |
| > Table Traverse               | (0018,1131) | 3 | Table longitudinal position at acquisition start .in mm.   |
| > Table Height                 | (0018,1130) | 3 | The distance in mm of the top of the patient table to the center of rotation.  |
| Type of Detector Motion        | (0054,0202) | 3 | Describes the detector motion during acquisition.<br>Enumerated Values used:<br><br>STEP AND SHOOT = Interrupted motion, acquire only while stationary. Used as Default for data arrived to Xeleris without this attribute or with empty value.<br><br>CONTINUOUS = Gantry motion and acquisition are simultaneous and continuous.<br><br>ACQ DURING STEP = Interrupted motion, acquisition is continuous. |

### 3.4.6.16 Private Tomo Acquisition Module

**TABLE 3-38  
PRIVATE TOMO ACQUISITION MODULE ATTRIBUTES**

| Attribute Name                        | Tag         | Private Creator Id | Attribute Description   |
|---------------------------------------|-------------|--------------------|---|
| Rotational Continuous Speed           | (0009,xx33) | GEMS_GENIE_1       | Rotational Continuous Speed   |
| Gantry Locus Type                     | (0009,xx35) | GEMS_GENIE_1       | Locus type of gantry motion during acquisition.<br><br>The Defined Terms are:<br>0 = circular<br>1 = elliptical |
| Num ECT Phases                        | (0015,xx12) | GEMS_GENIE_1       | Number of ECT Phases  |
| Num WB Scans                          | (0015,xx13) | GEMS_GENIE_1       | Number of WB Scans  |
| Det Ang Separation                    | (0013,xx1B) | GEMS_GENIE_1       | Detector Ang Separation   |
| Xeleris Rotation Information Sequence | (0055,xx52) | GEMS_GENIE_1       | May contain one or more items.  |
| >ECT Phase Num                        | (0015,xx14) | GEMS_GENIE_1       | ECT Phase Number  |
| >WB Scan Num                          | (0015,xx15) | GEMS_GENIE_1       | WB Scan Number  |
| >Comb Head Number                     | (0015,xx16) | GEMS_GENIE_1       | Comb Head Number  |
| >Axial Acceptance Angle               | (0013,xx1C) | GEMS_GENIE_1       | Axial Acceptance Angle  |
| >Theta Acceptance Value               | (0013,xx1D) | GEMS_GENIE_1       | Theta Acceptance Value  |

### 3.4.6.17 NM Multi-gated Acquisition Module

Describe the conditions under which this module is present in this implementation Module applies to a GATED Multi-frame Image. This module is present when the Image Type (0008,0008) Value 3, is equal to GATED, GATED TOMO, or RECON GATED TOMO.

**TABLE 3-39  
NM MULTI-GATED ACQUISITION MODULE ATTRIBUTES**

| <b>Attribute Name</b>             | <b>Tag</b>  | <b>Type</b> | <b>Attribute Description</b>   |
|-----------------------------------|-------------|-------------|--|
| Beat Rejection Flag               | (0018,1080) | 3           | Heart beat duration sorting has been applied.<br>Enumerated Values:<br>Y = yes<br>N = no   |
| Skip Beats                        | (0018,1086) | 3           | Number of beats skipped after a detected arrhythmia  |
| Heart Rate                        | (0018,1088) | 3           | Average number of heart beats per minute for the collection period for these frames  |
| Gated Information Sequence        | (0054,0062) | 2C          | Sequence of Items that describe R-R intervals. Sent if the Frame Increment Pointer (0028,0009) contains the Tag for R-R Interval Vector (0054,0060)<br>May contain 0 or more items.<br>The number of items shall be equal to Number of R-R Intervals (0054,0061).      |
| > Data Information Sequence       | (0054,0063) | 2           | Sequence of Items that describe gating criteria. May contain 0 or 1 item.  |
| >> Frame Time                     | (0018,1063) | 1           | Nominal time per individual frame in msec  |
| >> Low R-R Value                  | (0018,1081) | 3           | R-R interval lower limit for beat rejection, in msec   |
| >> High R-R Value                 | (0018,1082) | 3           | R-R interval upper limit for beat rejection, in msec   |
| >> Intervals Acquired             | (0018,1083) | 3           | Number of heartbeats that fall within Low R-R Value (0018,1081) and High R-R Value (0018,1082), and were therefore accepted and contribute gamma events to this R-R Interval.  |
| >> Intervals Rejected             | (0018,1084) | 3           | Number of heartbeats that fall outside Low R-R (0018,1081) and High R-R Value (0018,1082), and do not contribute gamma events to this R-R Interval.  |
| >> Time Slot Information Sequence | (0054,0072) | 2C          | Sequence of Items that describe Time Slot Information. Sent if the Frame Increment Pointer (0028,0009) contains the Tag for Time Slot vector (0054,0070)<br>Contains 1 or more items if it presents, the number of items is equal to Number of Time Slots (0054,0071). |
| >>> Time Slot Time                | (0054,0073) | 3           | The total amount of time, in msec, that the acquisition accumulates gamma events into this frame.  |

**3.4.6.18 Private Multi-gated Acquisition Module**

**TABLE 3-40  
PRIVATE MULTI-GATED ACQUISITION MODULE ATTRIBUTES**

| <b>Attribute Name</b> | <b>Tag</b>  | <b>Private Creator Id</b> | <b>Attribute Description</b>        |
|-----------------------|-------------|---------------------------|-------------------------------------|
| Starting Heart Rate   | (0009,xx37) | GEMS_GENIE_1              | Heart rate at start of acquisition. |

|                                    |             |                |   |
|------------------------------------|-------------|----------------|---|
| Track Beat Average                 | (0009,xx2D) | GEMS_GENIE_1   | Heart rate tracking used during acquisition.          |
| Percent Cycle Imaged               | (0009,xx3A) | GEMS_GENIE_1   | Percent Cycle Imaged                                  |
| Preceding Beat                     | (0015,xx17) | GEMS_GENIE_1   | Preceding Beat  |
| Series Average Heart Rate          | (0017,xx01) | GEMS_XELPRV_01 | Series Average Heart Rate                             |
| Image AverageHeartRate             | (0017,xx02) | GEMS_XELPRV_01 | Image Average Heart Rate                              |
| Series AcceptedBeats               | (0017,xx03) | GEMS_XELPRV_01 | Series Accepted Beats                                 |
| Image AcceptedBeats                | (0017,xx04) | GEMS_XELPRV_01 | Image Accepted Beats                                  |
| Series RejectedBeats               | (0017,xx05) | GEMS_XELPRV_01 | Series Rejected Beats                                 |
| Image RejectedBeats                | (0017,xx06) | GEMS_XELPRV_01 | Image Rejected Beats                                  |
| Xeleris Gated Information Sequence | (0055,xx62) | GEMS_GENIE_1   | May contain 0 or more items.                          |
| >Xeleris Data Information Sequence | (0055,xx63) | GEMS_GENIE_1   | May contain 0 or more items.                          |
| >>RR Window Width                  | (0009,xx38) | GEMS_GENIE_1   | Width of RR acceptance window as percentage of rate.  |
| >>RR Window Offset                 | (0009,xx39) | GEMS_GENIE_1   | Offset of RR acceptance window as percentage of rate. |
| >>Accepted Beat Time               | (0013,xx20) | GEMS_GENIE_1   | Accepted Beat Time                                    |

#### 3.4.6.19 NM Phase Module

This section contains Attributes that describe dynamic phases of a dynamic acquisition image performed on the patient. This module is present when the Image Type (0008,0008) Value 3, is equal to DYNAMIC.

**TABLE 3-41**  
**NM PHASE MODULE ATTRIBUTES**

| Attribute Name               | Tag         | Type | Attribute Description  |
|------------------------------|-------------|------|--|
| Phase Information Sequence   | (0054,0032) | 2C   | Sequence of Items that describes each dynamic phase. Sent if the Frame Increment Pointer (0028,0009) contains the Tag for Phase Vector (0054,0030).<br>May contains up to 4 items. |
| > Phase Delay                | (0054,0036) | 1    | Time paused between the last frame of the previous phase and the first frame of this phase, in msec.   |
| > Actual Frame Duration      | (0018,1242) | 1    | Nominal time of acquisition per individual frame, in msec.   |
| > Pause Between Frames       | (0054,0038) | 1    | Time paused between each frame of this phase (in msec).  |
| > Number of Frames in Phase  | (0054,0033) | 1    | Number of frames in this phase.  |
| >Trigger Vector              | (0054,0210) | 3    | An array of trigger times when gating information is acquired simultaneously with the dynamic image data.  |
| >Number of Triggers in Phase | (0054,0211) | 1C   | The number of entries in the Trigger Vector (0054,0210) for this phase. Required if Trigger Vector (0054,0210) is present.   |

### 3.4.6.20 NM Reconstruction Module

This section contains Attributes that describe Nuclear Medicine reconstructed volumes. Reconstructed volumes are created by applying a transformation (reconstruction) process to the acquired TOMO frames. This module is present only when the Image Type (0008,0008), Value 3, is equal to RECON TOMO or RECON GATED TOMO.

**TABLE 3-42  
NM RECONSTRUCTION MODULE ATTRIBUTES**

| Attribute Name              | Tag         | Type | Attribute Description   |
|-----------------------------|-------------|------|---|
| Spacing Between Slices      | (0018,0088) | 2    | Spacing between slices, in mm, measured from center-to-center of each slice along the normal to the first image.  |
| Slice Thickness             | (0018,0050) | 2    | Nominal slice thickness, in mm.   |
| Slice Progression Direction | (0054,0500) | 3    | Describes the anatomical direction that slices are progressing as the slices are considered in order (as defined by the Slice Vector (0054,0080)).<br><br>Meaningful only for cardiac images.<br><br>When View Code Sequence (0054,0220) indicates a short axis view, then Enumerated Values are:<br><br>APEX_TO_BASE<br><br>BASE_TO_APEX |

### 3.4.6.21 Private SPECT Reconstruction Module

**TABLE 3-43  
PRIVATE SPECT RECONSTRUCTION MODULE ATTRIBUTES**

| Attribute Name            | Tag         | Private Creator Id | Attribute Description     |
|---------------------------|-------------|--------------------|---------------------------|
| Image Size                | (0011,xx61) | GEMS_GENIE_1       | Image Size                |
| Linear FOV                | (0011,xx62) | GEMS_GENIE_1       | Linear FOV                |
| Spatial Offset            | (0011,xx63) | GEMS_GENIE_1       | Spatial Offset            |
| Spatial Orientation       | (0011,xx64) | GEMS_GENIE_1       | Spatial Orientation       |
| ReferenceDatasetUID       | (0011,xx65) | GEMS_GENIE_1       | Reference Dataset UID     |
| Starcam Reference Dataset | (0011,xx66) | GEMS_GENIE_1       | Starcam Reference Dataset |
| Reference Frame Number    | (0011,xx67) | GEMS_GENIE_1       | Reference Frame Number    |
| Cursor Length             | (0011,xx68) | GEMS_GENIE_1       | Cursor Length             |
| Number of Cursors         | (0011,xx69) | GEMS_GENIE_1       | Number of Cursors         |
| Cursor Coordinates        | (0011,xx6A) | GEMS_GENIE_1       | Cursor Coordinates        |
| Recon Options Flag        | (0011,xx6B) | GEMS_GENIE_1       | Recon Options Flag        |
| Motion Threshold          | (0011,xx6C) | GEMS_GENIE_1       | Motion Threshold          |
| Motion Curve UID          | (0011,xx6D) | GEMS_GENIE_1       | Motion Curve UID          |
| UnifDateTime              | (0013,xx23) | GEMS_GENIE_1       | Unif Date Time            |

### 3.4.6.22 Private SPECT Backprojection Module

**TABLE 3-44  
PRIVATE SPECT BACKPROJECTION MODULE ATTRIBUTES**

| Attribute Name | Tag | Private Creator Id | Attribute Description |
|----------------|-----|--------------------|-----------------------|
|----------------|-----|--------------------|-----------------------|

|                          |             |              |                          |
|--------------------------|-------------|--------------|--------------------------|
| Recon Type               | (0011,xx6E) | GEMS_GENIE_1 | Recon Type               |
| Pre Filter Type          | (0011,xx6F) | GEMS_GENIE_1 | Pre Filter Type          |
| Back Proj Filter Type    | (0011,xx71) | GEMS_GENIE_1 | Back Proj Filter Type    |
| Recon Arc                | (0011,xx72) | GEMS_GENIE_1 | Recon Arc                |
| Recon Pan AP Offset      | (0011,xx73) | GEMS_GENIE_1 | Recon Pan AP Offset      |
| Recon Pan LR Offset      | (0011,xx74) | GEMS_GENIE_1 | Recon Pan LR Offset      |
| Recon Area               | (0011,xx75) | GEMS_GENIE_1 | Recon Area               |
| Start View               | (0011,xx76) | GEMS_GENIE_1 | Start View               |
| Attenuation Type         | (0011,xx77) | GEMS_GENIE_1 | Attenuation Type         |
| Dual Energy Processing   | (0011,xx78) | GEMS_GENIE_1 | Dual Energy Processing   |
| Pre Filter Param         | (0011,xx79) | GEMS_GENIE_1 | Pre Filter Param         |
| Pre Filter Param 2       | (0011,xx7A) | GEMS_GENIE_1 | Pre Filter Param 2       |
| BackProjFilterParam      | (0011,xx7B) | GEMS_GENIE_1 | Back Proj Filter Param   |
| Back Proj Filter Param 2 | (0011,xx7C) | GEMS_GENIE_1 | Back Proj Filter Param 2 |
| Attenuation Coef         | (0011,xx7D) | GEMS_GENIE_1 | Attenuation Coef         |
| Ref Slice Width          | (0011,xx7E) | GEMS_GENIE_1 | Ref Slice Width          |
| Ref Trans Pixel Volume   | (0011,xx7F) | GEMS_GENIE_1 | Ref Trans Pixel Volume   |
| Attenuation Threshold    | (0011,xx81) | GEMS_GENIE_1 | Attenuation Threshold    |
| Interpolation Distance   | (0011,xx82) | GEMS_GENIE_1 | Interpolation Distance   |
| Interpolation Center X   | (0011,xx83) | GEMS_GENIE_1 | Interpolation Center X   |
| Interpolation Center Y   | (0011,xx84) | GEMS_GENIE_1 | Interpolation Center Y   |
| Quant Filter Flag        | (0011,xx85) | GEMS_GENIE_1 | Quant Filter Flag        |
| Head Conversion          | (0011,xx86) | GEMS_GENIE_1 | Head Conversion          |
| Slice Width Pixels       | (0011,xx87) | GEMS_GENIE_1 | Slice Width Pixels       |

### 3.4.6.23 Private SPECT Oblique Reformat Module

**TABLE 3-45  
PRIVATE SPECT OBLIQUE REFORMAT MODULE ATTRIBUTES**

| <b>Attribute Name</b> | <b>Tag</b>  | <b>Private Creator Id</b> | <b>Attribute Description</b> |
|-----------------------|-------------|---------------------------|------------------------------|
| Rfmtr Trans Ref       | (0011,xx88) | GEMS_GENIE_1              | Rfmtr Trans Ref              |
| Rfmtr Trans Ref mm    | (0011,xx89) | GEMS_GENIE_1              | Rfmtr Trans Ref mm           |
| Two Line Trans Ref    | (0011,xx8A) | GEMS_GENIE_1              | Two Line Trans Ref           |
| Three-D Zero          | (0011,xx8B) | GEMS_GENIE_1              | Three-D Zero                 |
| Three-D Zero Length   | (0011,xx8C) | GEMS_GENIE_1              | Three-D Zero Length          |
| Three-D Zero In       | (0011,xx8D) | GEMS_GENIE_1              | Three-D Zero In              |
| Threshold             | (0013,xx21) | GEMS_GENIE_1              | Threshold                    |
| LinearDepth           | (0013,xx22) | GEMS_GENIE_1              | Linear Depth                 |

### 3.4.6.24 VOI LUT Module

**TABLE 3-46  
VOI LUT MODULE ATTRIBUTES**

| Attribute Name | Tag         | Type | Attribute Description  |
|----------------|-------------|------|--|
| Window Center  | (0028,1050) | 1C   | Window Center for display. Only single value is present. Calculated from actually acquired maximal and minimal pixel values. Always sent |
| Window Width   | (0028,1051) | 1C   | Window Width for display. Only single value is present. Calculated from actually acquired maximal and minimal pixel values. Always sent. |

### 3.4.6.25 SOP Common Module

**TABLE 3-47  
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Type | Attribute Description  |
|------------------------|-------------|------|--|
| SOP Class UID          | (0008,0016) | 1    | Uniquely identifies the SOP Class.<br>Always set to "1.2.840.10008.5.1.4.1.1.20"   |
| SOP Instance UID       | (0008,0018) | 1    | Uniquely identifies the SOP Instance.<br>Internally generated.   |
| Specific Character Set | (0008,0005) | 1C   | Not used when the default character set (ISO 646) is used. Set to ISO_IR 100 = Latin Alphabet No. 1 when extended character sets are used. |
| Instance Creation Date | (0008,0012) | 3    | Date of instance creation.   |
| Instance Creation Time | (0008,0013) | 3    | Time of instance creation.   |
| Instance Creator UID   | (0008,0014) | 3    | Set to the Implementation UID (see Section 2.3.1.1.4)  |
| Instance Number        | (0020,0013) | 3    | A number that identifies this Composite object instance.   |

## 3.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard Extended and Private Attributes defined in the following sections in Standard Extended NM SOP Instances as Type 3 data elements.

### 3.5.1 Standard Extended Attributes

The Product supports the following attributes, not specified in the NM IOD, in SOP Instances as Type 3 data elements.

**TABLE 3-48**  
**STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name   | Tag         | Use  |
|-------------------------|------------------|-------------|--|
| Study                   | Study Comments   | (0032,4000) | User-defined Study notes                               |
| Series                  | Patient Position | (0018,5100) | Patient position descriptor relative to the Equipment. |

### 3.5.2 Private Group GEMS\_GENIE\_1

**TABLE 3-49**  
**PRIVATE GROUP GEMS\_GENIE\_1**

| Attribute Name                    | Tag         | VR | VM | Attribute Description and Use                         |
|-----------------------------------|-------------|----|----|---|
| Private Creator Identification    | (0009,00xx) | LO | 1  | GEMS_GENIE_1  |
| Workstation DICOM data Identifier | (0009,xx01) | SH | 1  | Contains always "GEMS_GENIE"                          |
| Study Name                        | (0009,xx10) | LO | 1  | Name of the Database Study Object                     |
| Study Flags                       | (0009,xx11) | SL | 1  | Defines study information.                            |
| Study Type                        | (0009,xx12) | SL | 1  | Defines type of study.                                |
| Dataset UID                       | (0009,xx1E) | UI | 1  | Dataset UID   |
| Series Object Name                | (0009,xx20) | LO | 1  | Name of the Database Series Object.                   |
| Series Flags                      | (0009,xx21) | SL | 1  | Defines series information.                           |
| User Orientation                  | (0009,xx22) | SH | 1  | User specified patient orientation.                   |
| Initiation Type                   | (0009,xx23) | SL | 1  | Acquisition initiation type.                          |
| Initiation Delay                  | (0009,xx24) | SL | 1  | Acquisition start delay time.                         |
| Initiation Count Rate             | (0009,xx25) | SL | 1  | Acquisition start count rate                          |
| Number Energy Sets                | (0009,xx26) | SL | 1  | Number of energy sets in this Series.                 |
| Number Detectors                  | (0009,xx27) | SL | 1  | Number of detectors.                                  |
| Number RR Windows                 | (0009,xx28) | SL | 1  | Number of R-R Interval Windows.                       |
| Number MG Time Slots              | (0009,xx29) | SL | 1  | Number of R-R Interval time bins.                     |
| Number View Sets                  | (0009,xx2A) | SL | 1  | Number of view sets in this Series.                   |
| Trigger History UID               | (0009,xx2B) | LO | 1  | UID of Private Trigger Object relevant to the Series. |
| Series Comments                   | (0009,xx2C) | LO | 1  | User-defined additional information about the series. |
| Track Beat Average                | (0009,xx2D) | SL | 1  | Heart rate tracking used during acquisition.          |
| Distance Prescribed               | (0009,xx2E) | FD | 1  | User prescribed whole body scanning distance.         |
| Table Direction                   | (0009,xx2F) | SL | 1  | Table Direction                                       |
| Rotational Continuous Speed       | (0009,xx33) | FD | 1  | Rotational Continuous Speed                           |
| Gantry Locus Type                 | (0009,xx35) | UL | 1  | Locus type of gantry motion during acquisition.       |
| Starting Heart Rate               | (0009,xx37) | SL | 1  | Heart rate at start of acquisition.                   |
| RR Window Width                   | (0009,xx38) | SL | 1  | Width of RR acceptance window as percentage of rate.  |
| RR Window Offset                  | (0009,xx39) | SL | 1  | Offset of RR acceptance window as percentage of rate. |
| Percent Cycle Imaged              | (0009,xx3A) | SL | 1  | Percent Cycle Imaged                                  |
| Patient Object Name               | (0009,xx40) | PN | 1  | Name of the Database Patient Object                   |
| Patient Flags                     | (0009,xx41) | SL | 1  | Defines patient information.                          |
| Patient Creation Date             | (0009,xx42) | DA | 1  | Date of Patient Entity creation                       |
| Patient Creation Time             | (0009,xx43) | TM | 1  | Time of Patient Entity creation                       |
| Dataset UID List                  | (0009,xx45) | LT | 1  | Dataset UID List                                      |
| Private Creator Identification    | (0011,00xx) | LO | 1  | GEMS_GENIE_1  |



|                                      |             |    |     |  |
|--------------------------------------|-------------|----|-----|--|
| Series Type                          | (0011,xx0A) | SL | 1   | Defines type of series.                                    |
| Effective Series Duration            | (0011,xx0B) | SL | 1   | Calculated duration of series acquisition.                 |
| Num Beats                            | (0011,xx0C) | SL | 1   | Number of physiological triggers during acquisition.       |
| Radio Nuclide Name                   | (0011,xx0D) | LO | 1   | Name of radionuclide used.                                 |
| Database Object Name                 | (0011,xx10) | LO | 1-n | Name of the Database Dataset Object.                       |
| Dataset Modified                     | (0011,xx11) | SL | 1-n | Dataset Modified Flag                                      |
| Dataset Name                         | (0011,xx12) | LO | 1-n | Dataset Name   |
| Dataset Type                         | (0011,xx13) | SL | 1   | Defines type of dataset.                                   |
| Completion Time                      | (0011,xx14) | LO | 1   | Completion Time  |
| Detector Number                      | (0011,xx15) | SL | 1-n | Detector number image was acquired by.                     |
| Energy Number                        | (0011,xx16) | SL | 1-n | Energy set number.   |
| RR Interval Window Number            | (0011,xx17) | SL | 1-n | R-R interval number.                                       |
| MG Bin Number                        | (0011,xx18) | SL | 1-n | Multi-gated time bin number.                               |
| Radius Of Rotation                   | (0011,xx19) | FD | 1-n | Distance to the center of detector rotation.               |
| Detector Count Zone                  | (0011,xx1A) | SL | 1-n | FOV zone for count-based acquisition termination criteria  |
| Energy Offset                        | (0011,xx1C) | SL | 1   | Energy window offset as a percentage of the energy peak.   |
| Energy Range                         | (0011,xx1D) | SL | 1   | Energy Range   |
| Image Orientation                    | (0011,xx1F) | SL | 1-n | Orientation of the image.                                  |
| Use FOV Mask                         | (0011,xx23) | SL | 1   | Flag shows whether FOV mask used during image acquisition. |
| FOV Mask Y Cutoff Distance           | (0011,xx24) | SL | 1   | Hexagonal FOV mask Y cutoff angle.                         |
| FOV Mask Cutoff Angle                | (0011,xx25) | SL | 1   | Hexagonal FOV mask cutoff angle.                           |
| Table Orientation                    | (0011,xx26) | SL | 1-n | Orientation of the table for whole body acquisition.       |
| ROI Top Left                         | (0011,xx27) | SL | 1-n | Acquisition count zone ROI, top left coordinate.           |
| ROI Bottom Right                     | (0011,xx28) | SL | 1-n | Acquisition count zone ROI, bottom right coordinate.       |
| Uniformity Mean                      | (0011,xx29) | SL | 1   | Uniformity Mean value                                      |
| View X Adjustment                    | (0011,xx2C) | FD | 1-n | View X Adjustment  |
| View Y Adjustment                    | (0011,xx2D) | FD | 1-n | View Y Adjustment  |
| Pixel Overflow Flag                  | (0011,xx2E) | SL | 1-n | Pixel Overflow Flag (Starcam)                              |
| Pixel Overflow Level                 | (0011,xx2F) | SL | 1-n | Pixel Overflow Level                                       |
| Picture Object Name                  | (0011,xx30) | LO | 1-n | Name of the database Picture Object                        |
| Acquisition Parent UID               | (0011,xx31) | LO | 1-n | Acquisition Parent UID                                     |
| Processing Parent UID                | (0011,xx32) | LO | 1-n | Processing Parent UID                                      |
| Energy Correct Name                  | (0011,xx33) | LO | 1-n | Name of applied energy correction.                         |
| Spatial Correct Name                 | (0011,xx34) | LO | 1-n | Name of applied spatial correction.                        |
| Tuning Calib Name                    | (0011,xx35) | LO | 1-n | Name of applied tuning calibration data.                   |
| Uniformity Correct Name              | (0011,xx36) | LO | 1-n | Name of associated uniformity correction.                  |
| Acquisition Specific Correction Name | (0011,xx37) | LT | 1   | Name(s) of associated acquisition specific correction(s).  |
| Byte Order                           | (0011,xx38) | SL | 1-n | Defines pixel data byte order.                             |
| Compression Type                     | (0011,xx39) | SL | 1-n | Compression information                                    |
| Picture Format                       | (0011,xx3A) | SL | 1-n | Xeleris IAP image format                                   |
| Pixel Scale                          | (0011,xx3B) | FD | 1-n | Internal Pixel Scale. Set to 1.0.                          |
| Pixel Offset                         | (0011,xx3C) | FD | 1-n | Internal Pixel Offset. Set to 0.0.                         |
| FOV Shape                            | (0011,xx3E) | SL | 1   | GEHC NM system detector type.                              |
| Dataset Flags                        | (0011,xx3F) | SL | 1-n | Defines dataset information.                               |
| Viewing Object Name                  | (0011,xx40) | LO | 1-n | Name of the database Viewing Object                        |
| Orientation Angle                    | (0011,xx41) | SL | 1-n | Orientation Angle  |

|                                |             |    |     |                                   |
|--------------------------------|-------------|----|-----|-----------------------------------|
| Rotation Angle                 | (0011,xx42) | FD | 1-n | Rotation Angle                    |
| Window Inverse Flag            | (0011,xx43) | SL | 1-n | Window Inverse Flag               |
| Threshold Center               | (0011,xx44) | FD | 1-n | Threshold Center                  |
| Threshold Width                | (0011,xx45) | FD | 1-n | Threshold Width                   |
| Interpolation Type             | (0011,xx46) | SL | 1-n | Interpolation Type                |
| Where Object Name              | (0011,xx50) | LO | 1-n | Name of the database Where Object |
| Period                         | (0011,xx55) | FD | 1-n | Period                            |
| Elapsed Time                   | (0011,xx56) | FD | 1-n | Elapsed Time                      |
| FOV                            | (0011,xx57) | FD | 1-n | FOV                               |
| Image Size                     | (0011,xx61) | SL | 1-n | Image Size                        |
| Linear FOV                     | (0011,xx62) | FD | 1-n | Linear FOV                        |
| Spatial Offset                 | (0011,xx63) | FD | 1-n | Spatial Offset                    |
| Spatial Orientation            | (0011,xx64) | FD | 1-n | Spatial Orientation               |
| Reference Dataset UID          | (0011,xx65) | LO | 1-n | Reference Dataset UID             |
| Starcam Reference Dataset      | (0011,xx66) | LO | 1-n | Starcam Reference Dataset         |
| Reference Frame Number         | (0011,xx67) | SL | 1-n | Reference Frame Number            |
| Cursor Length                  | (0011,xx68) | SL | 1-n | Cursor Length                     |
| Number of Cursors              | (0011,xx69) | SL | 1-n | Number of Cursors                 |
| Cursor Coordinates             | (0011,xx6A) | SL | 1-n | Cursor Coordinates                |
| Recon Options Flag             | (0011,xx6B) | SL | 1-n | Recon Options Flag                |
| Motion Threshold               | (0011,xx6C) | FD | 1-n | Motion Threshold                  |
| Motion Curve UID               | (0011,xx6D) | UI | 1-n | Motion Curve UID                  |
| Recon Type                     | (0011,xx6E) | SL | 1-n | Recon Type                        |
| Pre Filter Type                | (0011,xx6F) | SL | 1-n | Pre Filter Type                   |
| Back Proj Filter Type          | (0011,xx71) | SL | 1-n | Back Proj Filter Type             |
| Recon Arc                      | (0011,xx72) | SL | 1-n | Recon Arc                         |
| Recon Pan AP Offset            | (0011,xx73) | FD | 1-n | Recon Pan AP Offset               |
| Recon Pan LR Offset            | (0011,xx74) | FD | 1-n | Recon Pan LR Offset               |
| Recon Area                     | (0011,xx75) | FD | 1-n | Recon Area                        |
| Start View                     | (0011,xx76) | SL | 1-n | Start View                        |
| Attenuation Type               | (0011,xx77) | SL | 1-n | Attenuation Type                  |
| Dual Energy Processing         | (0011,xx78) | SL | 1-n | Dual Energy Processing            |
| Pre Filter Param               | (0011,xx79) | SH | 1-n | Pre Filter Param                  |
| Pre Filter Param 2             | (0011,xx7A) | SH | 1-n | Pre Filter Param 2                |
| Back Proj Filter Param         | (0011,xx7B) | SH | 1-n | Back Proj Filter Param            |
| Back Proj Filter Param 2       | (0011,xx7C) | SH | 1-n | Back Proj Filter Param 2          |
| Attenuation Coef               | (0011,xx7D) | SH | 1-n | Attenuation Coef                  |
| Ref Slice Width                | (0011,xx7E) | SL | 1-n | Ref Slice Width                   |
| Ref Trans Pixel Volume         | (0011,xx7F) | FD | 1-n | Ref Trans Pixel Volume            |
| Attenuation Threshold          | (0011,xx81) | SH | 1-n | Attenuation Threshold             |
| Interpolation Distance         | (0011,xx82) | FD | 1-n | Interpolation Distance            |
| Interpolation Center X         | (0011,xx83) | FD | 1-n | Interpolation Center X            |
| Interpolation Center Y         | (0011,xx84) | FD | 1-n | Interpolation Center Y            |
| Quant Filter Flag              | (0011,xx85) | SL | 1-n | Quant Filter Flag                 |
| Head Conversion                | (0011,xx86) | SL | 1-n | Head Conversion                   |
| Slice Width Pixels             | (0011,xx87) | SL | 1-n | Slice Width Pixels                |
| Rfmtr Trans Ref                | (0011,xx88) | SL | 1-n | Rfmtr Trans Ref                   |
| Rfmtr Trans Ref mm             | (0011,xx89) | FD | 1-n | Rfmtr Trans Ref mm                |
| Two Line Trans Ref             | (0011,xx8A) | SL | 1-n | Two Line Trans Ref                |
| Three-D Zero                   | (0011,xx8B) | SL | 1-n | Three-D Zero                      |
| Three-D Zero Length            | (0011,xx8C) | SL | 1-n | Three-D Zero Length               |
| Three-D Zero In                | (0011,xx8D) | SL | 1-n | Three-D Zero In                   |
| Private Creator Identification | (0013,00xx) | LO | 1   | GEMS_GENIE_1                      |
| Digital FOV                    | (0013,xx10) | FD | 1-n | Digital FOV                       |

|                                |             |    |     |  |
|--------------------------------|-------------|----|-----|--|
| Source Translator              | (0013,xx11) | SL | 1   | Source Translator. Default value = 4.                      |
| RAL Flags                      | (0013,xx12) | SL | 1-n | RAL Flags  |
| Fscalar                        | (0013,xx15) | FD | 1-n | Scaling Factor for Floating Point pixel data               |
| AutoTrack Peak                 | (0013,xx16) | SL | 1   | Optima Auto Track energy peak.                             |
| AutoTrack Width                | (0013,xx17) | SL | 1   | Optima Auto Track energy width.                            |
| Transmission Scan Time         | (0013,xx18) | FD | 1   | Attenuation correction transmission scan duration.         |
| Transmission Mask Width        | (0013,xx19) | FD | 1   | Attenuation correction transmission scan mask width.       |
| Copper Attenuator Thickness    | (0013,xx1A) | FD | 1   | Thickness of transmission scan copper attenuator.          |
| Det Ang Separation             | (0013,xx1B) | FD | 1   | Detector Ang Separation                                    |
| Axial Acceptance Angle         | (0013,xx1C) | SL | 1   | Axial Acceptance Angle                                     |
| Theta Acceptance Value         | (0013,xx1D) | SL | 1   | Theta Acceptance Value                                     |
| Tomo View Offset               | (0013,xx1E) | FD | 1-n | Tomo view detector offset (vector)                         |
| Accepted Beats Time            | (0013,xx20) | SL | 1   | Accepted Beat Time   |
| Threshold                      | (0013,xx21) | FD | 1-n | Threshold  |
| Linear Depth                   | (0013,xx22) | FD | 1-n | Linear Depth   |
| Unif Date Time                 | (0013,xx23) | LO | 1-n | Unif Date Time   |
| Study Comments                 | (0013,xx26) | LT | 1   | User-defined additional information about the study.       |
| Private Creator Identification | (0015,00xx) | LO | 1   | GEMS_GENIE_1   |
| Num ECT Phases                 | (0015,xx12) | SL | 1   | Number of ECT Phases                                       |
| Num WB Scans                   | (0015,xx13) | SL | 1   | Number of WB Scans   |
| ECT Phase Num                  | (0015,xx14) | SL | 1   | ECT Phase Number   |
| WB Scan Num                    | (0015,xx15) | SL | 1   | WB Scan Number   |
| Comb Head Number               | (0015,xx16) | SL | 1   | Comb Head Number   |
| Preceding Beat                 | (0015,xx17) | UL | 1   | Preceding Beat   |
| Private Creator Identification | (0019,00xx) | LO | 1   | GEMS_GENIE_1   |
| Annotation Sequence            | (0019,xx5F) | SQ | 1   | Annotations attached to image; May contain 0 or more Items |
| Modified                       | (0019,xx60) | SL | 1   | Modified Flag  |
| Name                           | (0019,xx61) | LO | 1   | Name of Database Annotation Object                         |
| Aid                            | (0019,xx62) | LO | 1   | Database Annotation Unique ID                              |
| DatasetAnnotationMapping       | (0019,xx63) | LO | 1-n | Database Annotation Mapping                                |
| DatabaseObjectClassID          | (0019,xx64) | LO | 1   | Internal Database Annotation Object Class ID               |
| DatabaseObjectUniqueID         | (0019,xx65) | LO | 1   | Internal Database Annotation Object UID                    |
| TextFgColour                   | (0019,xx66) | LO | 1   | Annotation Text Foreground Color                           |
| TextBgColour                   | (0019,xx67) | LO | 1   | Annotation Text Background Color                           |
| MarkerColour                   | (0019,xx68) | LO | 1   | Annotation Marker Color                                    |
| LineColour                     | (0019,xx69) | LO | 1   | Annotation Line Color                                      |
| LineThickness                  | (0019,xx6A) | SL | 1   | Annotation Line Thickness                                  |
| Font                           | (0019,xx6B) | LT | 1   | Annotation Font  |
| TextBackingMode                | (0019,xx6C) | SL | 1   | Annotation Text Backing Mode                               |
| TextJustification              | (0019,xx6D) | SL | 1   | Annotation Text Justification                              |
| TextShadowOffsetX              | (0019,xx6E) | SL | 1   | Annotation Text Shadow Offset X                            |
| TextShadowOffsetY              | (0019,xx6F) | SL | 1   | Annotation Text Shadow Offset Y                            |
| GeomColour                     | (0019,xx70) | LT | 1   | Annotation Geometry Color                                  |
| GeomThickness                  | (0019,xx71) | SL | 1   | Annotation Geometry Thickness                              |
| GeomLineStyle                  | (0019,xx72) | SL | 1   | Annotation Geometry Line Style                             |
| GeomDashLength                 | (0019,xx73) | SL | 1   | Annotation Geometry Dash Length                            |
| GeomFillPattern                | (0019,xx74) | SL | 1   | Annotation Geometry Fill Pattern                           |

|  |             |    |     |  |
|--|-------------|----|-----|--|
| MarkerSize                                 | (0019,xx75) | SL | 1   | Annotation Marker Size   |
| Interactivity                              | (0019,xx76) | SL | 1   | Annotation Interactivity   |
| TextLoc                                    | (0019,xx77) | FD | 1-n | Annotation Text Location   |
| TextString                                 | (0019,xx78) | LT | 1   | Annotation Text String   |
| TextAttachMode                             | (0019,xx79) | SL | 1-n | Annotation Text Attach Mode  |
| TextCursorMode                             | (0019,xx7A) | SL | 1-n | Annotation Text Cursor Mode  |
| LineCtrlSize                               | (0019,xx7B) | SL | 1   | Annotation Line Ctrl Size  |
| LineType                                   | (0019,xx7C) | SL | 1-n | Annotation Line Type   |
| LineStyle                                  | (0019,xx7D) | SL | 1   | Annotation Line Style  |
| LineDashLength                             | (0019,xx7E) | SL | 1   | Annotation Line Dash Length  |
| LinePtCount                                | (0019,xx7F) | SL | 1-n | Annotation Line Points Count   |
| LinePts                                    | (0019,xx80) | FD | 1-n | Annotation Line Points List  |
| LineAttachMode                             | (0019,xx81) | SL | 1-n | Annotation Line Attach Mode  |
| MarkerType                                 | (0019,xx82) | SL | 1-n | Annotation Marker Type   |
| MarkerLoc                                  | (0019,xx83) | FD | 1-n | Annotation Marker Location   |
| MarkerAttachMode                           | (0019,xx84) | SL | 1-n | Annotation Marker Attach Mode  |
| FrameNumber                                | (0019,xx86) | UL | 1   | Annotation Frame Number  |
| Private Creator Identification             | (0033,00xx) | LO | 1   | GEMS_GENIE_1   |
| Orig SOP Instance UID                      | (0033,xx07) | LO | 1-n | List of SOP UIDs of Xeleris associated datasets encapsulated into the DICOM NM Information Image.                              |
| Trigger History Modified Flag              | (0033,xx30) | SL | 1   | Triggers Modification Flag   |
| Database Object Name                       | (0033,xx31) | LO | 1   | Name of Database Trigger History Object  |
| Trigger History Software Version           | (0033,xx32) | LO | 1   | Trigger History Software Version   |
| Number of Triggers                         | (0033,xx33) | SL | 1   | Number of Triggers   |
| Trigger Size                               | (0033,xx34) | SL | 1   | Size of one Trigger data slot  |
| Trigger Data Size                          | (0033,xx35) | SL | 1   | Size of Trigger Data Size  |
| Trigger Data                               | (0033,xx36) | OB | 1   | Buffer with trigger data information   |
| Trigger History Description                | (0033,xx37) | LO | 1   | Trigger History Description  |
| Trigger History Flags                      | (0033,xx38) | SL | 1   | Trigger History Flags  |
| Trigger History Private Instance UID       | (0033,xx39) | LO | 1   | Trigger History Object identifier. Internally Generated  |
| Trigger History SOP Class UID              | (0033,xx3A) | LO | 1   | Internal SOP Class UID value, set to "1.2.840.10008.5.1.4.1.1.20" for historical reasons                                       |
| Private Creator Identification             | (0035,00xx) | LO | 1   | GEMS_GENIE_1   |
| Start Angle                                | (0035,xx01) | FD | 1   | Detector start angle   |
| Private Creator Identification             | (0055,00xx) | LO | 1   | GEMS_GENIE_1   |
| Xeleris Energy Window Information Sequence | (0055,xx12) | SQ | 1   | Private Energy Sequence. The number of items in the Xeleris Energy Window sequence is the same as tag value of tag (0054,0011) |
| Xeleris Energy Window Range Sequence       | (0055,xx13) | SQ | 1   | Private Energy Window Range Sequence. May contain from 0 to 4 items.   |
| Xeleris Detector Information Sequence      | (0055,xx22) | SQ | 1   | Xeleris detector information Sequence. May contain one or more items.  |
| Xeleris Rotation Information Sequence      | (0055,xx52) | SQ | 1   | Xeleris Rotation Information Sequence. May contain one or more items.  |
| Xeleris Gated Information Sequence         | (0055,xx62) | SQ | 1   | Xeleris Gated Information Sequence. May contain 0 or more items.   |
| Xeleris Data Information Sequence          | (0055,xx63) | SQ | 1   | Xeleris Data Information Sequence. May contain 0 or more items.  |
| Frame Sequence                             | (0055,xx65) | SQ | 1   | Xeleris Frame Sequence. Present for historical reasons. Always contains 0 items.   |

### 3.5.3 Private Group GEMS\_XELPRV\_01

**TABLE 3-50  
PRIVATE GROUP GEMS\_XELPRV\_01**

| Attribute Name                 | Tag         | VR | VM  | Attribute Description and Use  |
|--------------------------------|-------------|----|-----|--|
| Private Creator Identification | (0017,00xx) | LO | 1   | GEMS_XELPRV_01   |
| Series AverageHeartRate        | (0017,xx01) | IS | 1   | Series Average Heart Rate  |
| Image AverageHeartRate         | (0017,xx02) | IS | 1   | Image Average Heart Rate   |
| Series AcceptedBeats           | (0017,xx03) | IS | 1   | Series Accepted Beats  |
| Image AcceptedBeats            | (0017,xx04) | IS | 1   | Image Accepted Beats   |
| Series RejectedBeats           | (0017,xx05) | IS | 1   | Series Rejected Beats  |
| Image RejectedBeats            | (0017,xx06) | IS | 1   | Image Rejected Beats   |
| Private Creator Identification | (0033,00xx) | LO | 1   | GEMS_XELPRV_01   |
| Object Type                    | (0033,xx08) | CS | 1   | Private object type.<br>Possible values:<br>"PROTOCOL DATA" (PDO)<br>"REVIEW DATA" (RTO)<br>"SERIES DATA" (SDO)  |
| Modified Flag                  | (0033,xx10) | SL | 1   | Modified Flag; Default value is 0, not modified (PDO, RTO, SDO).   |
| Name                           | (0033,xx11) | LO | 1   | Name of Database Object (PDO, RTO, SDO)  |
| StudyId                        | (0033,xx14) | LO | 1   | Parent Study Id (RTO)  |
| Database Object Unique ID      | (0033,xx16) | LO | 1   | Database UID of private Object; <ul style="list-style-type: none"> <li>• PDO - contains value of PDO UID tag (0033,xx52) generated at time of object creation.</li> <li>• RTO - contains value of RTO UID tag (0033,xx62) generated at time of object creation</li> <li>• SDO - contains value of SDO UID tag (0033, xx72) generated at time of object creation</li> </ul> |
| Date                           | (0033,xx17) | SH | 1   | Private Object Creation Date (PDO, RTO, SDO)   |
| Time                           | (0033,xx18) | SH | 1   | Private Object Creation Time (PDO, RTO, SDO)   |
| Object Flags                   | (0033,xx19) | UL | 1   | Private Object Flags (PDO, SDO)  |
| ProtocolName                   | (0033,xx1A) | LO | 1   | Name of Protocol created Private Object (PDO, SDO)   |
| Relevant Data UID              | (0033,xx1B) | LO | 1   | Identifier of the Parent Database Object <ul style="list-style-type: none"> <li>• PDO – contains Study Id</li> <li>• SDO - contains SOP Instance UID of relative object</li> </ul>   |
| BulkData                       | (0033,xx1C) | OB | 1   | Private Object parameter(s) stored as binary buffer(s) (PDO, SDO)  |
| IntData                        | (0033,xx1D) | SL | 1-n | List of Private Object parameters stored as integers (PDO, SDO)  |
| DoubleData                     | (0033,xx1E) | FD | 1-n | List of Private Object parameters stored as doubles (PDO, SDO)   |
| StringData                     | (0033,xx1F) | OB | 1   | List of Private Object parameters stored as list of strings (PDO, SDO)   |
| BulkDataFormat                 | (0033,xx20) | OB | 1   | Format of bulk parameters; contains information about name and size of bulk buffers (PDO, SDO)   |

|                                      |             |    |   |  |
|--------------------------------------|-------------|----|---|--|
| IntDataFormat                        | (0033,xx21) | OB | 1 | Format of integer parameters; contains information about name and number of integers in list (PDO, SDO)      |
| DoubleDataFormat                     | (0033,xx22) | OB | 1 | Format of double parameters; contains information about name and number of doubles in list (PDO, SDO)        |
| StringDataFormat                     | (0033,xx23) | OB | 1 | Format of string parameters; contains information about name and number of strings in list (PDO, SDO)        |
| Description                          | (0033,xx24) | LT | 1 | User or equipment generated Private Object description (PDO, SDO)  |
| RTName                               | (0033,xx28) | LO | 1 | Review Template Name (RTO)   |
| RTSpecification                      | (0033,xx29) | LT | 1 | Review Template Specification (RTO)  |
| RTFlags                              | (0033,xx2A) | UL | 1 | Review Templates Flags (RTO)   |
| DataValidationSpec                   | (0033,xx2B) | LT | 1 | Data Validation Spec (RTO)   |
| Description                          | (0033,xx2C) | LT | 1 | Review Template Description (RTO)  |
| Icon Description                     | (0033,xx2D) | LT | 1 | Icon Description (RTO)   |
| ProtocolDataSequence                 | (0033,xx50) | SQ | 1 | SQ with items encoding Private Protocol data Object (PDO) attributes; ; May contain 0 or more items          |
| Internal Protocol Data SOPClassUID   | (0033,xx51) | UI | 1 | PDO Private SOP Class UID  |
| Internal Protocol Data Instance UID  | (0033,xx52) | UI | 1 | PDO Instance UID; Internally generated   |
| ReviewTemplateSequence               | (0033,xx60) | SQ | 1 | SQ with items encoding Private Review Templates Objects (RTO) attributes; May contain 0 or more items        |
| Internal Review Template SOPClassUID | (0033,xx61) | UI | 1 | RTO Private SOP Class UID  |
| Internal Review Template InstanceUID | (0033,xx62) | UI | 1 | RTO Instance UID; Internally generated   |
| Series Data Sequence                 | (0033,xx70) | SQ | 1 | SQ with items encoding Private Series Data Object (SDO) attributes; May contain 0 or more items.             |
| Internal Seriesdata SOPClassUID      | (0033,xx71) | UI | 1 | SDO Private SOP Class UID  |
| Internal Seriesdata InstanceUID      | (0033,xx72) | UI | 1 | SDO Instance UID; Internally generated in time of object creation  |
| Double Data SQ                       | (0033,xx73) | SQ | 1 | Sequence of items to store Private Object parameters as lists of doubles (SDO). May contain 0 or more items. |
| Private Creator Identification       | (0057,00xx) | LO | 1 | GEMS_XELPRV_01   |
| ROI Sequence                         | (0057,xx01) | SQ | 1 | ROI created on image; may contain 0 or more items.   |
| ROIObjectSOPClassUID                 | (0057,xx02) | UI | 1 | ROI SOP Class UID, contains value "1.2.840.10008.5.1.4.1.1.9"  |
| ROIObjectInstanceUID                 | (0057,xx03) | UI | 1 | ROI SOP Instance UID; internally generated.  |
| Index                                | (0057,xx10) | IS | 1 | Index of ROI   |
| Dimensions                           | (0057,xx11) | US | 1 | ROI Dimensions. Contain value: 1   |
| ShapePtsCount                        | (0057,xx12) | US | 1 | Number of Points   |
| TypeOfData                           | (0057,xx13) | CS | 1 | ROI Type   |
| Description                          | (0057,xx14) | LO | 1 | ROI Description  |
| DValueRepresentation                 | (0057,xx15) | US | 1 | Data Value Representation; Contains value: 3   |
| ROILabel                             | (0057,xx16) | LO | 1 | ROI Label  |
| Data                                 | (0057,xx17) | OW | 1 | List of ROI Shape points   |
| Modified                             | (0057,xx41) | SL | 1 | Modified   |

|                               |             |    |     |   |
|-------------------------------|-------------|----|-----|---|
| Database Object Name          | (0057,xx42) | LO | 1   | Name of ROI Database Object   |
| Database Object Name Class ID | (0057,xx45) | LO | 1   | ROI Database Object Class   |
| Database Object UID           | (0057,xx46) | LO | 1   | ROI Object SOP Instance UID; internally generated                     |
| Normal Colour                 | (0057,xx47) | LO | 1   | ROI Normal Color  |
| Name Font                     | (0057,xx48) | LT | 1   | ROI Name Font   |
| Fill Pattern                  | (0057,xx49) | SL | 1   | ROI Fill Pattern  |
| Line Style                    | (0057,xx4A) | SL | 1   | ROI Line Style  |
| Line Dash Length              | (0057,xx4B) | SL | 1   | ROI Line Dash Length  |
| LineThickness                 | (0057,xx4C) | SL | 1   | ROI Line Thickness  |
| Interactivity                 | (0057,xx4D) | SL | 1   | ROI Interactivity Flag  |
| NamePos                       | (0057,xx4E) | SL | 1   | ROI Name Position   |
| NameDisplay                   | (0057,xx4F) | SL | 1   | ROI Name Display Flag   |
| Label                         | (0057,xx50) | LO | 1   | ROI Label; contains the same value as ROI Label attribute (0057,xx16) |
| BpSeq                         | (0057,xx51) | SL | 1-n | ROI BpSeq   |
| BpSeqPairs                    | (0057,xx52) | US | 1-n | ROI BpSeqpairs  |
| SeedSpace                     | (0057,xx53) | SL | 1   | ROI Seed Space  |
| Seeds                         | (0057,xx54) | FD | 1-n | ROI Seeds   |
| Shapes                        | (0057,xx55) | SL | 1-n | ROI Shape   |
| ShapeTilt                     | (0057,xx56) | FD | 1-n | ROI Shape Tilt  |
| ShapePtsSpace                 | (0057,xx59) | SL | 1-n | ROI Shape Points Space  |
| ShapeCtrlPtsCount             | (0057,xx5A) | SL | 1   | ROI Shape Control Points Count  |
| ShapeCtrlPts                  | (0057,xx5B) | FD | 1-n | ROI Shape Control Points List   |
| ShapeCPSpace                  | (0057,xx5C) | SL | 1   | ROI Shape Control Points Space  |
| ROIFlags                      | (0057,xx5D) | UL | 1   | ROI Flags   |
| FrameNumber                   | (0057,xx5E) | UL | 1   | ROI Frame Number  |
| DatasetROIMapping             | (0057,xx60) | LO | 1-n | Dataset ROI Mapping   |

### 3.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris WS does not support any coded terminology

## 4. PET INFORMATION OBJECT IMPLEMENTATION

### 4.1 INTRODUCTION

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

### 4.2 XELERIS WS MAPPING OF DICOM ENTITIES

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

**TABLE 4-1**  
**MAPPING OF DICOM ENTITIES TO XELERIS WS ENTITIES**

| DICOM IE | Xeleris WS Entity |
|----------|-------------------|
| Patient  | Patient           |
| Study    | Study             |
| Series   | Series            |
| Image    | Dataset           |

### 4.3 IOD MODULE TABLE

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

**TABLE 4-2**  
**PET IMAGE IOD MODULES**

| Entity Name                | Module Name                           | Usage                                 | Reference |
|----------------------------|---------------------------------------|---------------------------------------|-----------|
| Patient                    | Patient                               | Used (same description as for NM IOD) | 3.4.1.1   |
|                            | Clinical Trial Subject                | Not Used                              | N/A       |
|                            | Private Patient                       | Used (same description as for NM IOD) | 3.4.1.2   |
| Study                      | General Study                         | Used (same description as for NM IOD) | 3.4.2.1   |
|                            | Patient Study                         | Used (same description as for NM IOD) | 3.4.2.2   |
|                            | Private Study                         | Used (same description as for NM IOD) | 3.4.2.3   |
|                            | Standard Extended Study               | Used (same description as for NM IOD) | 3.4.2.4   |
|                            | Clinical Trial Study                  | Not Used                              | N/A       |
| Series                     | General Series                        | Used (same description as for NM IOD) | 3.4.3.1   |
|                            | Clinical Trial Series                 | Not Used                              | N/A       |
|                            | Standard Extended Series              | Used (same description as for NM IOD) | 3.4.3.4   |
|                            | PET Series                            | Used                                  | 4.4.1.1   |
|                            | PET Isotope                           | Used                                  | 4.4.1.2   |
|                            | Private Series                        | Used (same description as for NM IOD) | 3.4.3.2   |
|                            | Private PET Series                    | Used                                  | 4.4.1.3   |
|                            | PET Multi-gated Acquisition           | Not Used                              | N/A       |
| NM/PET Patient Orientation | Used (same description as for NM IOD) | 3.4.3.5                               |           |
| Frame of Reference         | Frame of Reference                    | Used                                  | 4.4.2.1   |
| Equipment                  | General Equipment                     | Used (same description as for NM IOD) | 3.4.5.1   |
| Image                      | General Image                         | Used                                  | 4.4.3.1   |
|                            | Image Plane                           | Used                                  | 4.4.3.2   |



|                         |                                       |         |
|-------------------------|---------------------------------------|---------|
| Image Pixel             | Used                                  | 4.4.3.3 |
| Standard Extended Image | Used                                  | 4.4.3.4 |
| Device                  | Not Used                              | N/A     |
| PET Image               | Used                                  | 4.4.3.5 |
| Overlay Plane           | Not Used                              | N/A     |
| VOI LUT                 | Used                                  | 4.4.3.6 |
| Acquisition Context     | Used (same description as for NM IOD) | 3.4.6.3 |
| SOP Common              | Used                                  | 4.4.3.7 |
| Private Image           | Used (same description as for NM IOD) | 3.4.6.9 |
| Private PET Image       | Used                                  | 4.4.3.8 |

#### 4.4 INFORMATION MODULE DEFINITIONS

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

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

##### 4.4.1 Series Entity Modules

##### 4.4.1.1 PET Series Module

**TABLE 4-3  
PET SERIES MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Type | Attribute Description  |
|---------------------|-------------|------|--|
| Series Date         | (0008,0021) | 1    | Date the Series started.   |
| Series Time         | (0008,0031) | 1    | Time the Series started.   |
| Units               | (0054,1001) | 1    | Pixel value units.<br>Defined Terms:<br>CNTS, NONE, CM2, PCNT, CPS, BQML,<br>MGMINML, UMOLMINML, MLMING, MLG,<br>1CM, UMOLML, PROPCNTS, PROPCPS,<br>MLMINML, MLML, GML, STDDEV |
| Counts Source       | (0054,1002) | 1    | The primary source of counts.<br>Enumerated Values:<br>EMISSION<br>TRANSMISSION  |
| Series Type         | (0054,1000) | 1    | A multi-valued indicator of the type of Series.<br>See 4.4.1.1.1 for specialization.   |
| Reprojection Method | (0054,1004) | 2C   | Method for projecting volumetric data onto planar projection. Required if Series Type (0054,1000), Value 2 is REPROJECTION.<br>Defined Terms:<br>SUM<br>MAX PIXEL              |
| SUV Type            | (0054,1006) | 3    | Type of Standardized Uptake Value (SUV).<br>Enumerated Values used:<br>BSA - body surface area   |

|  |             |    |   |
|--|-------------|----|---|
|  |             |    | BW - body weight<br>LBM - lean body mass by James method  |
| Number of R-R Intervals                | (0054,0061) | 1C | The maximum number of R-R Intervals that may exist in this Series.<br>Not Used (creation of data with Series Type = GATED is not supported) |
| Number of Time Slots                   | (0054,0071) | 1C | The maximum number of Time Slots that may exist in this Series.<br>Not Used (creation of data with Series Type = GATED is not supported)    |
| Number of Time Slices                  | (0054,0101) | 1C | The maximum number of Time Slices that may exist in this Series.<br>Not Used (creation of data with Series Type = DYNAMIC is not supported) |
| Number of Slices                       | (0054,0081) | 1  | The maximum number of Slices that may exist in this Series.   |
| Corrected Image                        | (0028,0051) | 2  | One or more values that indicate which, if any, corrections have been applied to the images in this series.                                 |
| Randoms Correction Method              | (0054,1100) | 3  | Type of randoms correction processing.  |
| Attenuation Correction Method          | (0054,1101) | 3  | A textual description of the attenuation correction processing.   |
| Scatter Correction Method              | (0054,1105) | 3  | A textual description of the scatter correction processing.   |
| Decay Correction                       | (0054,1102) | 1  | The real-world event to which images in this Series were decay corrected.   |
| Reconstruction Diameter                | (0018,1100) | 3  | Diameter, in mm, of the region within which the data was used in creating the reconstruction of the image.                                  |
| Convolution Kernel                     | (0018,1210) | 3  | Textual description of the convolution kernel(s) used to reconstruct the data   |
| Reconstruction Method                  | (0054,1103) | 3  | Textual description of reconstruction Processing.   |
| Acquisition Start Condition            | (0018,0073) | 3  | Description of how the data collection was started  |
| Acquisition Start Condition Data       | (0018,0074) | 3  | Count density, change in count density, or physiological triggers causing data collection to start.   |
| Acquisition Termination Condition      | (0018,0071) | 3  | Description of how the data collection for the series was stopped.  |
| Acquisition Termination Condition Data | (0018,0075) | 3  | Number of counts, count density, change in count density, or physiological triggers causing the termination.                                |
| Field of View Shape                    | (0018,1147) | 3  | Shape of the field of view of the PET camera.   |
| Field of View Dimensions               | (0018,1149) | 3  | Dimensions of the field of view, in mm. Transverse detector diameter followed by axial width.   |
| Gantry/Detector Tilt                   | (0018,1120) | 3  | Angle of tilt in degrees of the gantry.   |
| Type of Detector Motion                | (0054,0202) | 3  | Describes the detector motion during acquisition.   |
| Collimator Type                        | (0018,1181) | 2  | Collimator Type   |
| Axial Mash                             | (0054,1201) | 3  | Number of adjacent axial lines of response mashed together.   |

|                          |             |   |  |
|--------------------------|-------------|---|--|
| Transverse Mash          | (0054,1202) | 3 | Number of adjacent transverse lines of response mashed together. |
| Coincidence Window Width | (0054,1210) | 3 | The width of the coincidence timing window, in nsec.             |

#### 4.4.1.1.1 Series Type

The following values of Series Type (0054,1000) are generated:

Value 1 Enumerated Values:

- STATIC
- WHOLE BODY

Value 2 Enumerated Values:

- IMAGE
- REPROJECTION

#### 4.4.1.2 PET Isotope Module

TABLE 4-4  
PET ISOTOPE MODULE ATTRIBUTES

| Attribute Name                           | Tag         | Type | Attribute Usage   |
|--|-------------|------|---|
| Radiopharmaceutical Information Sequence | (0054,0016) | 2    | Information on radiopharmaceutical(s) used. Contains only 1 item.   |
| > Radionuclide Code Sequence             | (0054,0300) | 2    | Sequence that identifies the radionuclide. May contain 0 or 1 item.   |
| >> Include 'Code Sequence Macro'         |             |      | Baseline Context ID is 4020   |
| > Radiopharmaceutical Volume             | (0018,1071) | 3    | Volume of injection in cubic cm.  |
| > Radiopharmaceutical Start Time         | (0018,1072) | 3    | Time of start of injection.   |
| > Radiopharmaceutical Stop Time          | (0018,1073) | 3    | Time of end of injection.   |
| > Radionuclide Total Dose                | (0018,1074) | 3    | The radiopharmaceutical dose administered to the patient measured in Becquerels (Bq) at the Radiopharmaceutical Start Time (0018,1072). |
| > Radiopharmaceutical                    | (0018,0031) | 3    | Name of the radiopharmaceutical.  |
| > Radiopharmaceutical Code Sequence      | (0054,0304) | 3    | Sequence that identifies the radiopharmaceutical. May contain 0 or 1 item   |
| >> Include 'Code Sequence Macro'         |             |      | Baseline Context ID is 4021   |

#### 4.4.1.3 Private PET Series Module

TABLE 4-5  
PRIVATE PET SERIES MODULE ATTRIBUTES

| Attribute Name | Tag         | Private Creator ID | Attribute Description   |
|----------------|-------------|--------------------|---|
| Series Type    | (0011,xx0A) | GEMS_GENIE_1       | Defines type of series.<br>The Defined Terms are:<br>8 = Transaxial Tomo<br>12 = Orthogonal Reformat<br>13 = Oblique 3P Reformat<br>14 = Oblique 2L Reformat<br>15 = Results<br>24 = Reprojection |

#### 4.4.2 Frame Of Reference Entity Modules

##### 4.4.2.1 Frame Of Reference Module

This section specifies the Attributes necessary to uniquely identify a Frame Of Reference which insures the spatial relationship of Images within a Series. It also allows Images across multiple Series to share the same Frame Of Reference. This Frame Of Reference (or coordinate system) shall be constant for all Images related to a specific

Frame Of Reference.

A hybrid PT/CT (PT/MR) scan is composed of a single NM scan partnered with one or more CT (MR )scans. The two modalities share the same imaging space and the body imaged by the two modalities is represented, in most of the cases, by spatially aligned images. There are situations for which optimal PT imaging and optimal CT(MR) imaging impose changing the table height during the hybrid scan. In this case, the imaging space of both modalities remains the same, but the PT and CT(MR) images of the body are no longer spatially aligned. In order to prevent accidental fusion of such images, the same Frame Of Reference UID value shared by two series of different modalities will show that the images are spatially related and that the imaged body was scanned spatially aligned between the two images.

**TABLE 4-6  
FRAME OF REFERENCE MODULE ATTRIBUTES**

| Attribute Name               | Tag         | Type | Attribute Description                                    |
|------------------------------|-------------|------|--|
| Frame of Reference UID       | (0020,0052) | 1    | Uniquely identifies the frame of reference for a Series. |
| Position Reference Indicator | (0020,1040) | 2    | Part of the patient's anatomy used as a reference.       |

#### 4.4.3 Image Entity Modules

##### 4.4.3.1 General Image Module

**TABLE 4-7  
GENERAL IMAGE MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Type | Attribute Usage                                 |
|---------------------|-------------|------|---|
| Instance Number     | (0020,0013) | 2    | A number that identifies this image.            |
| Patient Orientation | (0020,0020) | 2C   | Patient Orientation                             |
| Content Date        | (0008,0023) | 2C   | The date the image pixel data creation started. |
| Content Time        | (0008,0033) | 2C   | The time the image pixel data creation started  |
| Image Type          | (0008,0008) | 3    | See 4.4.3.5 for PET Images                      |
| Acquisition Date    | (0008,0022) | 3    | See 4.4.3.5 for PET Images                      |
| Acquisition Time    | (0008,0032) | 3    | See 4.4.3.5 for PET Images                      |
| Image Comments      | (0020,4000) | 3    | Contains additional information about image.    |

##### 4.4.3.2 Image Plane Module

**TABLE 4-8  
IMAGE PLANE MODULE ATTRIBUTES**

| Attribute Name              | Tag          | Type | Attribute Usage  |
|-----------------------------|--------------|------|--|
| Pixel Spacing               | (0028,0030)  | 1    | Physical distance in the patient between the center of each pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. |
| Image Orientation (Patient) | (0020 ,0037) | 1    | The direction cosines of the first row and the first column with respect to the patient.   |
| Image Position (Patient)    | (0020,0032)  | 1    | The x, y, and z coordinates of the upper left hand corner (center of the first voxel transmitted) of the image, in mm  |
| Slice Thickness             | (0018,0050)  | 2    | Nominal slice thickness, in mm   |

|                |             |   |   |
|----------------|-------------|---|---|
| Slice Location | (0020,1041) | 3 | Relative position of the image plane expressed in mm. |
|----------------|-------------|---|---|

#### 4.4.3.3 Image Pixel Module

**TABLE 4-9  
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name             | Tag          | Type | Attribute Usage  |
|----------------------------|--------------|------|--|
| Samples per Pixel          | (0028,0002)  | 1    | See 4.4.3.5 for PET Images   |
| Photometric Interpretation | (0028,0004)  | 1    | See 4.4.3.5 for PET Images   |
| Rows                       | (0028,0010)  | 1    | Number of rows in the image  |
| Columns                    | (0028,0011)  | 1    | Number of columns in the image   |
| Bits Allocated             | (0028,0100)  | 1    | See 4.4.3.5 for PET Images   |
| Bits Stored                | (0028,0101)  | 1    | See 4.4.3.5 for PET Images   |
| High Bit                   | (0028,0102)  | 1    | See 4.4.3.5 for PET Images   |
| Pixel Representation       | (0028,0103)  | 1    | Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values used:<br>0000H = unsigned integer.<br>0001H = 2's complement |
| Pixel Data                 | (7FE0, 0010) | 1    | A data stream of the pixel samples that comprise the Image.  |
| Planar Configuration       | (0028,0006)  | 1C   | Not Used (number of Samples per Pixel is always 1)   |
| Pixel Aspect Ratio         | (0028,0034)  | 1C   | Not Used   |
| Smallest Image Pixel Value | (0028,0106)  | 3    | The minimum actual pixel value encountered in this image.  |
| Largest Image Pixel Value  | (0028,0107)  | 3    | The maximum actual pixel value encountered in this image.  |

#### 4.4.3.4 Standard Extended Image Module

**TABLE 4-10  
STANDARD EXTENDED IMAGE MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Type | Attribute Description   |
|------------------------|-------------|------|---|
| Image ID               | (0054,0400) | 3    | User or equipment generated Image identifier.   |
| Spacing Between Slices | (0018,0088) | 3    | Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice. |
| Table Height           | (0018,1130) | 3    | The distance in mm of the top of the patient table to the center of rotation.                   |

#### 4.4.3.5 PET Image Module

**TABLE 4-11  
PET IMAGE MODULE ATTRIBUTES**

| Attribute Name             | Tag         | Type | Attribute Description  |
|----------------------------|-------------|------|--|
| Image Type                 | (0008,0008) | 1    | See 4.4.3.5.1  |
| Samples per Pixel          | (0028,0002) | 1    | Always set to 1.   |
| Photometric Interpretation | (0028,0004) | 1    | Always set to MONOCHROME2  |
| Bits Allocated             | (0028,0100) | 1    | Shall be 16.   |
| Bits Stored                | (0028,0101) | 1    | Shall be 16.   |
| High Bit                   | (0028,0102) | 1    | Shall have only the Enumerated Value of one less than the value sent in Bits Stored. |

|                          |             |    |   |
|--------------------------|-------------|----|---|
| Rescale Intercept        | (0028,1052) | 1  | The value <i>b</i> in relationship between stored values (SV) and pixel value units (U) defined in Units (0054,1001): $U = m \cdot SV + b$ . Always set to 0.   |
| Rescale Slope            | (0028,1053) | 1  | The value <i>m</i> in the equation specified in Rescale Intercept (0028,1052).  |
| Frame Reference Time     | (0054,1300) | 1  | The time that the pixel values in the image occurred.   |
| Trigger Time             | (0018,1060) | 1C | Time interval, in msec, from the start of the trigger to the<br>Not Used (creation of data with Series Type = GATED is not supported)   |
| Frame Time               | (0018,1063) | 1C | Nominal duration per individual frame, in msec.<br>Not Used (creation of data with Series Type = GATED is not supported)  |
| Low R-R Value            | (0018,1081) | 1C | R-R interval lower limit for beat rejection, in msec.<br>Not Used (creation of data with Series Type = GATED is not supported)  |
| High R-R Value           | (0018,1082) | 1C | R-R interval upper limit for beat rejection, in msec.<br>Not Used (creation of data with Series Type = GATED is not supported)  |
| Intervals Acquired       | (0018,1083) | 3  | Number of heartbeats that fall within Low R-R Value (0018,1081) and High R-R Value (0018,1082), and were therefore accepted and contribute coincidence events to this R-R Interval.   |
| Intervals Rejected       | (0018,1084) | 3  | Number of heartbeats that fall outside Low R-R Value (0018,1081) and High R-R Value (0018,1082), and do not contribute coincidence events to this R-R Interval. However, they may contribute coincidence events to other R-R Intervals. |
| Lossy Image Compression  | (0028,2110) | 1C | Specifies whether an Image has undergone lossy compression.   |
| Image Index              | (0054,1330) | 1  | An index identifying the position of this image within a PET Series.  |
| Acquisition Date         | (0008,0022) | 2  | The date the acquisition of data that resulted in this image started  |
| Acquisition Time         | (0008,0032) | 2  | The time the acquisition of data that resulted in this image started  |
| Actual Frame Duration    | (0018,1242) | 2  | Elapsed time of the data acquisition for this image, in msec.   |
| Slice Sensitivity Factor | (0054,1320) | 3  | The slice-to-slice sensitivity correction factor that was used to correct this image.   |
| Decay Factor             | (0054,1321) | 1C | The decay factor that was used to scale image. Required if Decay Correction (0054,1102) is other than NONE.   |
| Dose Calibration Factor  | (0054,1322) | 3  | Factor that was used to scale this image from counts/sec to Bq/ml using a dose calibrator.  |

#### 4.4.3.5.1 Image Type

The following values of Image Type (0008,0008) are generated:

Value 1 Enumerated Values:

- DERIVED identifies a Derived Image

Value 2 Enumerated:

- PRIMARY identifies a Primary Image

#### 4.4.3.6 VOI LUT module

**TABLE 4-12**  
**VOI LUT MODULE ATTRIBUTES**

| Attribute Name   | Tag         | Type | Attribute Description   |
|------------------|-------------|------|---|
| VOI LUT Sequence | (0028,3010) | 1C   | Not Used  |
| Window Center    | (0028,1050) | 1C   | Window Center for display. Only single value is present. Required if VOI LUT Sequence (0028,3010) is not present. |
| Window Width     | (0028,1051) | 1C   | Window Width for display. Only single value is present. Required if Window Center (0028,1050) is sent.            |

#### 4.4.3.7 SOP Common Module

**TABLE 4-13**  
**SOP COMMON MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Type | Attribute Description  |
|------------------------|-------------|------|--|
| SOP Class UID          | (0008,0016) | 1    | Uniquely identifies the SOP Class. "1.2.840.10008.5.1.4.1.1.128"   |
| SOP Instance UID       | (0008,0018) | 1    | Uniquely identifies the SOP Instance.  |
| Specific Character Set | (0008,0005) | 1C   | Not used when the default character set (ISO 646) is used. Set to ISO_IR 100 = Latin Alphabet No. 1 when extended character sets are used. |
| Instance Creation Date | (0008,0012) | 3    | Date of instance creation.   |
| Instance Creation Time | (0008,0013) | 3    | Time of instance creation.   |
| Instance Creator UID   | (0008,0014) | 3    | Set to the Implementation UID (see Section 2.3.1.1.4)  |
| Instance Number        | (0020,0013) | 3    | See 4.4.3.1 for more specialization  |

#### 4.4.3.8 Private PET Image Module

**TABLE 4-14**  
**PRIVATE PET IMAGE MODULE ATTRIBUTES**

| Attribute Name               | Tag         | Private Creator | Attribute Description   |
|------------------------------|-------------|-----------------|---|
| RadioPharmaceuticalTotalDose | (0009,xx38) | GEMS_PETD_01    | RadioPharmaceuticalTotalDose  |
| MeasuredDateTime             | (0009,xx39) | GEMS_PETD_01    | MeasuredDateTime  |
| AdminDateTime                | (0009,xx3B) | GEMS_PETD_01    | AdminDateTime   |
| PostInjectionActivity        | (0009,xx3C) | GEMS_PETD_01    | PostInjectionActivity   |
| PostInjectionDateTime        | (0009,xx3D) | GEMS_PETD_01    | PostInjectionDateTime   |
| Reference coordinates        | (0009,xx7F) | GEMS_PETD_01    | Reference coordinates   |
| Recon left                   | (0009,xx91) | GEMS_PETD_01    | Recon left  |
| Recon posterior              | (0009,xx92) | GEMS_PETD_01    | Recon posterior   |
| Imageset UID                 | (0009,xx46) | GEMS_GENIE_1    | Unique Identifier of PET Imageset   |
| Dataset Type                 | (0011,xx13) | GEMS_GENIE_1    | Defines type of dataset.<br>The Defined Terms are:<br>13 = Transaxial<br>14 = Coronal |

|  |  |  |  |
|--|--|--|--|
|  |  |  | 15 = Sagittal<br>28 = Oblique<br>44= MIP_3D<br>45 = SUM Reprojection |
|--|--|--|--|

#### 4.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended PET SOP Instances as Type 3 data elements.

##### 4.5.1 Standard Expended Attributes

The Product supports the following attributes, not specified in the PET IOD, in SOP Instances as Type 3 data elements.

**TABLE 4-15  
STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name         | Tag         | Use   |
|-------------------------|------------------------|-------------|---|
| Image                   | Image ID               | (0054,0400) | User or equipment generated Image identifier.   |
|                         | Table Height           | (0018,1130) | The distance in mm of the top of the patient table to the center of rotation.                   |
|                         | Spacing Between Slices | (0018,0088) | Spacing between slices, in mm. The spacing is measured from the center-to-center of each slice. |

##### 4.5.2 Private Group GEMS\_GENIE\_1

**TABLE 4-16  
PRIVATE GROUP GEMS\_GENIE\_1**

| Attribute Name                 | Tag         | VR | VM | Attribute Description             |
|--------------------------------|-------------|----|----|-----------------------------------|
| Private Creator Identification | (0009,00xx) | LO | 1  | GEMS_GENIE_1                      |
| Imageset UID                   | (0009,xx46) | UI | 1  | Unique Identifier of PET Imageset |
| Private Creator Identification | (0011,00xx) | LO | 1  | GEMS_GENIE_1                      |
| Series Type                    | (0011,xx0A) | SL | 1  | Defines type of series.           |
| Dataset Type                   | (0011,xx13) | SL | 1  | Defines type of dataset.          |

##### 4.5.3 Private Group GEMS\_PETD\_01

**TABLE 4-17  
PRIVATE GROUP GEMS\_PETD\_01**

| Attribute Name                 | Tag         | VR | VM | Attribute Description        |
|--------------------------------|-------------|----|----|------------------------------|
| Private Creator Identification | (0009,00xx) | LO | 1  | GEMS_PETD_01                 |
| RadioPharmaceuticalTotalDose   | (0009,xx38) | FL | 1  | RadioPharmaceuticalTotalDose |
| MeasuredDateTime               | (0009,xx39) | DT | 1  | MeasuredDateTime             |
| AdminDateTime                  | (0009,xx3B) | DT | 1  | AdminDateTime                |
| PostInjectionActivity          | (0009,xx3C) | FL | 1  | PostInjectionActivity        |
| PostInjectionDateTime          | (0009,xx3D) | DT | 1  | PostInjectionDateTime        |
| Reference coordinates          | (0009,xx7F) | DS | 3  | Reference coordinates        |
| Recon bp center left           | (0009,xx91) | FL | 1  | Recon bp center left         |
| Recon bp center posterior      | (0009,xx92) | FL | 1  | Recon bp center posterior    |

#### 4.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris WS does not support any coded terminology



## 5. SECONDARY CAPTURE INFORMATION OBJECT IMPLEMENTATION

### 5.1 INTRODUCTION

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

Screen Save images created on the Xeleris WS system are stored as DICOM Secondary Capture images and Multi-frame Secondary Capture images.

The creation of the following secondary captures IODs is supported:

- Single frame secondary Capture Image IOD
- Multi-frame Grayscale Byte Secondary Capture Image IOD
- Multi-frame True Color Secondary Capture Image IOD

### 5.2 XELERIS WS MAPPING OF DICOM ENTITIES

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

**TABLE 5-1  
MAPPING OF DICOM ENTITIES TO XELERIS WS ENTITIES**

| DICOM IE  | Xeleris WS Entity |
|-----------|-------------------|
| Patient   | Patient           |
| Study     | Study             |
| Series    | Series            |
| Equipment | Series            |
| Image     | Dataset           |

### 5.3 IOD MODULE TABLE

The Secondary Capture Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 5.4.3.11 .

**TABLE 5-2  
SC IMAGE IOD MODULES**

| Entity Name | Module Name              | Usage                                 | Reference |
|-------------|--------------------------|---------------------------------------|-----------|
| Patient     | Patient                  | Used (same description as for NM IOD) | 3.4.1.1   |
|             | Clinical Trial Subject   | Not Used                              | N/A       |
|             | Private Patient          | Used (same description as for NM IOD) | 3.4.1.2   |
| Study       | General Study            | Used (same description as for NM IOD) | 3.4.2.1   |
|             | Patient Study            | Used (same description as for NM IOD) | 3.4.2.2   |
|             | Private Study            | Used (same description as for NM IOD) | 3.4.2.3   |
|             | Standard Extended Study  | Used (same description as for NM IOD) | 3.4.2.4   |
|             | Clinical Trial Study     | Not Used                              | N/A       |
| Series      | General Series           | Used                                  | 5.4.1.1   |
|             | Clinical Trial Series    | Not Used                              | N/A       |
|             | Standard Extended Series | Used (for SC IOD only)                | 5.4.1.2   |
|             | Private Series           | Used (same description as for NM IOD) | 3.4.3.2   |

|                  |   |                                       |          |
|------------------|---|---------------------------------------|----------|
|                  | Private SC Series   | Used                                  | 5.4.1.3  |
| Equipment        | General Equipment   | Used                                  | 5.4.2.1  |
|                  | SC Equipment  | Used                                  | 5.4.2.2  |
| Image            | General Image   | Used                                  | 5.4.3.1  |
|                  | Image Pixel   | Used                                  | 5.4.3.2  |
|                  | Device  | Not Used                              | N/A      |
|                  | Specimen  | Not Used                              | N/A      |
|                  | SC Image  | Used                                  | 5.4.3.3  |
|                  | Overlay Plane   | Not Used                              | N/A      |
|                  | Modality LUT  | Not Used                              | N/A      |
|                  | VOI LUT   | Not Used                              | N/A      |
|                  | SOP Common  | Used                                  | 5.4.3.4  |
|                  | Cine  | Used (for MFSC IOD only)              | 5.4.3.5  |
|                  | Multi-Frame   | Used (for MFSC IOD only)              | 5.4.3.6  |
|                  | SC Multi-Frame Image  | Used (for MFSC IOD only)              | 5.4.3.7  |
|                  | SC Multi-Frame Vector   | Used (for MFSC IOD only)              | 5.4.3.8  |
|                  | Private Image   | Used (same description as for NM IOD) | 3.4.6.9  |
|                  | Private Common SC Image   | Used                                  | 5.4.3.11 |
|                  | Private SC Image  | Used (for SC IOD only)                | 5.4.3.9  |
| Private 4DMSpect | Used (for SC IOD only created by 4DM SPECT Processing Protocol) | 5.4.3.10                              |          |

## 5.4 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes generated by Xeleris WS at time of object creation. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

### 5.4.1 Series Entity Modules

#### 5.4.1.1 General Series Module

**TABLE 5-3  
GENERAL SERIES MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Type | Attribute Description  |
|---------------------|-------------|------|--|
| Modality            | (0008,0060) | 1    | For specification, see SC Equipment Module (Section 5.4.2.2)                     |
| Series Instance UID | (0020,000E) | 1    | Unique identifier of the Series.   |
| Series Number       | (0020,0011) | 2    | Series Number  |
| Laterality          | (0020,0060) | 2C   | Laterality. Always set to ZERO-LENGTH value.                                     |
| Series Date         | (0008,0021) | 3    | Date the Series started.   |
| Series Time         | (0008,0031) | 3    | Time the Series started.   |
| Protocol Name       | (0018,1030) | 3    | User-defined description of the conditions under which the Series was performed. |
| Series Description  | (0008,103E) | 3    | Description of the Series.   |

|                             |             |   |   |
|-----------------------------|-------------|---|---|
| Performing Physicians' Name | (0008,1050) | 3 | Name of the physician(s) administering this Series. |
| Operators' Name             | (0008,1070) | 3 | Name(s) of the operator(s) supporting the Series.   |
| Body Part Examined          | (0018,0015) | 3 | Body Part Examined                                  |

#### 5.4.1.2 Standard Extended Series Module

**TABLE 5-4  
STANDARD EXTENDED SERIES MODULE ATTRIBUTES**

| Attribute Name   | Tag         | Type | Attribute Description  |
|------------------|-------------|------|--|
| Patient Position | (0018,5100) | 3    | Patient position descriptor relative to the equipment.<br>Always set to ZERO LENGTH Value. |

#### 5.4.1.3 Private SC Series Module

**TABLE 5-5  
PRIVATE SC SERIES MODULE ATTRIBUTES**

| Attribute Name     | Tag         | Private Creator ID | Attribute Description   |
|--------------------|-------------|--------------------|---|
| Series Object Name | (0009,xx20) | GEMS_GENIE_1       | Name of the Database Series Object.<br>For SC IOD only  |
| Series Flags       | (0009,xx21) | GEMS_GENIE_1       | Defines series information<br>For SC IOD only.  |
| Series Type        | (0011,xx0A) | GEMS_GENIE_1       | Defines type of series.<br>The Defined Terms are:<br>0 = SC Series<br>25 = MFSC Series<br>15= Results |

### 5.4.2 Equipment Entity Modules

#### 5.4.2.1 General Equipment Module

This module is used to describe information of the equipment generating the current derived instance

**TABLE 5-6  
GENERAL EQUIPMENT MODULE ATTRIBUTES**

| Attribute Name            | Tag         | Type | Attribute Description  |
|---------------------------|-------------|------|--|
| Manufacturer              | (0008,0070) | 2    | Manufacturer of the equipment that produced the SC instances.<br>Values used :<br>"GE MEDICAL SYSTEMS, NUCLEAR"<br>" GE MEDICAL SYSTEMS, CT"<br>" GE MEDICAL SYSTEMS, PET"<br>" GE MEDICAL SYSTEMS, MRI" |
| Institution Name          | (0008,0080) | 3    | Institution where the equipment that produced the composite instances is located.  |
| Station Name              | (0008,1010) | 3    | User defined name identifying the machine that produced the composite instances.   |
| Manufacturer's Model Name | (0008,1090) | 3    | Manufacturer's model name of the equipment that produced the composite instances.  |
| Device Serial Number      | (0018,1000) | 3    | Manufacturer's serial number of the equipment that produced the composite instances.   |
| Software Version(s)       | (0018,1020) | 3    | Manufacturer's designation of software version of the equipment that produced the composite instances.   |

### 5.4.2.2 SC Equipment Module

**TABLE 5-7  
SC EQUIPMENT MODULE ATTRIBUTES**

| <b>Attribute Name</b>                              | <b>Tag</b>  | <b>Type</b> | <b>Attribute Description</b>   |
|--|-------------|-------------|--|
| Conversion Type                                    | (0008,0064) | 1           | Defined Terms used:<br>WSD = Workstation image conversion  |
| Modality   | (0008,0060) | 3           | SC Images created by Volumetrix generally have this attribute set to the value found in the original image.<br>Defined Terms:<br>NM = Nuclear Medicine<br>CT = Computed Tomography<br>PT = Positron emission tomography (PET)<br>MR = Magnetic Resonance<br>OT = Other |
| Secondary Capture Device ID                        | (0018,1010) | 3           | Secondary Capture Device ID  |
| Secondary Capture Device Manufacturer              | (0018,1016) | 3           | Secondary Capture Device Manufacturer  |
| Secondary Capture Device Manufacturer's Model Name | (0018,1018) | 3           | Secondary Capture Device Manufacturer's Model Name   |
| Secondary Capture Device Software Version          | (0018,1019) | 3           | Secondary Capture Device Software Version  |

### 5.4.3 Image Entity Modules

#### 5.4.3.1 General Image Module

**TABLE 5-8  
GENERAL IMAGE MODULE ATTRIBUTES**

| <b>Attribute Name</b>  | <b>Tag</b>   | <b>Type</b> | <b>Attribute Description</b>  |
|------------------------|--------------|-------------|---|
| Instance Number        | (0020,0013)  | 2           | A number that identifies this image.  |
| Patient Orientation    | (0020,0020)  | 2C          | Patient direction of the rows and columns of the image.<br>Always sent as ZERO LENGTH.  |
| Content Date           | (0008,0023)  | 2C          | The date the image pixel data creation started.<br>Send for MFSC IOD only.  |
| Content Time           | (0008,0033)  | 2C          | The time the image pixel data creation started.<br>Send for MFSC IOD only.  |
| Acquisition Date       | (0008,0022)  | 3           | The date the creation of data that resulted in this image started.  |
| Acquisition Time       | (0008,0032)  | 3           | The time the creation of data that resulted in this image started.  |
| Derivation Description | (0008,2111)  | 3           | A text description of how this image was derived. Composed of two parts separated by "\$\$. First part is specific description generated by user and the second part is a description of the nature of the results and/or processing that generated the secondary capture object. |
| Burned In Annotation   | (0028, 0301) | 3           | Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired.<br>Enumerated Values :<br>YES<br>NO  |
| Image Comments         | (0020,4000)  | 3           | User-defined comments about the image.  |
| Image Type             | (0008,0008)  | 3           | See 5.4.3.1.1   |

### 5.4.3.1.1 Image Type

The following Enumerated Value of Value 1 is created:

- DERIVED identifies a Derived Image

The following Enumerated Value of Value 2 is created:

- SECONDARY identifies a Secondary Image

### 5.4.3.2 Image Pixel Module

**TABLE 5-9  
IMAGE PIXEL MODULE ATTRIBUTES**

| Attribute Name             | Tag         | Type | Attribute Description  |
|----------------------------|-------------|------|--|
| Samples per Pixel          | (0028,0002) | 1    | Number of samples (planes) in this image.<br>Set to 1 if Photometric Interpretation (0028,0004) is MONOCHROME2<br>Set to 3 if Photometric Interpretation (0028,0004) is RGB  |
| Photometric Interpretation | (0028,0004) | 1    | Specifies the intended interpretation of the pixel data<br>Defined Terms supported: <ul style="list-style-type: none"> <li>• MONOCHROME2 - used for Single frame secondary Capture Image IOD and Multi-frame Grayscale Byte Secondary Capture Image IOD</li> <li>• RGB - used for Single frame secondary Capture Image IOD and Multi-frame True Color Secondary Capture Image IOD</li> </ul> |
| Rows                       | (0028,0010) | 1    | Number of rows in the image.   |
| Columns                    | (0028,0011) | 1    | Number of columns in the image.  |
| Bits Allocated             | (0028,0100) | 1    | Number of bits allocated for each pixel sample. Each sample shall have the same number of bits allocated.<br>Enumerated Values supported :<br>8  |
| Bits Stored                | (0028,0101) | 1    | Number of bits stored for each pixel sample.<br>Value equal to Bit Allocated (0028,0100)   |
| High Bit                   | (0028,0102) | 1    | Most significant bit for pixel sample data.<br>Value equal to Bit Stored (0028,0101) - 1   |
| Pixel Representation       | (0028,0103) | 1    | Data representation of the pixel samples. Each sample shall have the same pixel representation. Enumerated Values:<br>0000H = unsigned integer.  |
| Pixel Data                 | (7FE0,0010) | 1    | A data stream of the pixel samples that comprise the Image.  |
| Planar Configuration       | (0028,0006) | 1C   | Indicates whether the pixel data are sent color-by-plane or color-by-pixel. For RGB data.<br>Enumerated Values:<br>0000H = color-by-pixel  |
| Smallest Image Pixel Value | (0028,0106) | 3    | The minimum actual pixel value encountered in this image.<br>Always set to 0.  |
| Largest Image Pixel Value  | (0028,0107) | 3    | The maximum actual pixel value encountered in this image.<br>Always set to 255.  |

### 5.4.3.3 SC Image Module

**TABLE 5-10  
SC IMAGE MODULE ATTRIBUTES**

| Attribute Name            | Tag         | Type | Attribute Description  |
|---------------------------|-------------|------|--|
| Pixel Spacing             | (0028,0030) | 1C   | Not sent. Secondary Capture images created by product are not calibrated images. |
| Date of Secondary Capture | (0018,1012) | 3    | The date the Secondary Capture Image was captured.                               |
| Time of Secondary Capture | (0018,1014) | 3    | The time the Secondary Capture Image was captured.                               |

#### 5.4.3.4 SOP Common Module

**TABLE 5-11  
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Type | Attribute Description   |
|------------------------|-------------|------|---|
| SOP Class UID          | (0008,0016) | 1    | Uniquely identifies the SOP Class.<br>Possible values:<br>"1.2.840.10008.5.1.4.1.1.7"<br>"1.2.840.10008.5.1.4.1.1.7.2"<br>"1.2.840.10008.5.1.4.1.1.7.4" |
| SOP Instance UID       | (0008,0018) | 1    | Uniquely identifies the SOP Instance. Internally generated.   |
| Specific Character Set | (0008,0005) | 1C   | Not used when the default character set (ISO 646) is used. Set to "ISO_IR 100" when extended character sets are used.                                   |
| Instance Creation Date | (0008,0012) | 3    | Date the SOP Instance was created.  |
| Instance Creation Time | (0008,0013) | 3    | Time the SOP Instance was created.  |
| Instance Creator UID   | (0008,0014) | 3    | Set to the Implementation UID (see Section 2.3.1.1.4)   |
| Instance Number        | (0020,0013) | 3    | A number that identifies this Composite object instance   |

#### 5.4.3.5 Cine Module

**TABLE 5-12  
CINE MODULE ATTRIBUTES**

| Attribute Name                 | Tag         | Type | Attribute Description  |
|--------------------------------|-------------|------|--|
| Preferred Playback Sequencing  | (0018,1244) | 3    | Describes the preferred playback sequencing for a multi-frame image. Enumerated Values:<br>0 = Looping (1,2,...n,1,2,...n,1,2,...n,...)<br>1 = Sweeping (1,2,...n,n-1,...2,1,2,...n,...) |
| Frame Time                     | (0018,1063) | 1C   | Nominal time (in msec) per individual frame. Required if Frame Increment Pointer (0028,0009) points to Frame Time.   |
| Recommended Display Frame Rate | (0008,2144) | 3    | Recommended rate at which the frames of a Multi-frame image should be displayed in frames/second.  |
| Cine Rate                      | (0018,0040) | 3    | Number of frames per second.   |

#### 5.4.3.6 Multi-Frame Module

**TABLE 5-13  
MULTI-FRAME MODULE ATTRIBUTES**

| Attribute Name          | Tag         | Type | Attribute Description   |
|-------------------------|-------------|------|---|
| Number of Frames        | (0028,0008) | 1    | Number of frames in a Multi-frame Image.  |
| Frame Increment Pointer | (0028,0009) | 1    | Contains the Data Element Tags of one or more frame index vectors. See 5.4.3.7 for specialization |

#### 5.4.3.7 SC Multi-Frame Image Module

**TABLE 5-14  
SC MULTI-FRAME IMAGE MODULE ATTRIBUTES**

| Attribute Name       | Tag         | Type | Attribute Description  |
|----------------------|-------------|------|--|
| Burned in Annotation | (0028,0301) | 1    | Indicates whether or not image contains sufficient burned in annotation to identify the patient and date the image was acquired.<br>Enumerated Values :<br>YES<br>NO |

|                         |             |    |   |
|-------------------------|-------------|----|---|
| Presentation LUT Shape  | (2050,0020) | 1C | Specifies an identity transformation for the Presentation LUT, such that the output of all grayscale transformations defined in the IOD containing this Module are defined to be P-Values. Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1. Enumerated Value: IDENTITY - output is in P-Values. |
| Rescale Intercept       | (0028,1052) | 1C | The value b in the relationship between stored values (SV) in Pixel Data (7FE0,0010) and the output units specified in Rescale Type (0028,1054). Output units = m*SV + b. Enumerated Value: 0<br>Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.   |
| Rescale Slope           | (0028,1053) | 1C | The value m in the equation specified in Rescale Intercept (0028,1052). Enumerated Value: 1.<br>Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.  |
| Rescale Type            | (0028,1054) | 1C | Specifies the output units of Rescale Slope (0028,1053) and Rescale Intercept (0028,1052). Enumerated Value: US = Unspecified.<br>Required if Photometric Interpretation (0028,0004) is MONOCHROME2, and BitsStored (0028,0101) is greater than 1.  |
| Frame Increment Pointer | (0028,0009) | 1C | Contains the Data Element Tag of the attribute which is used as the frame increment in Multi-frame pixel data - Frame Time (0018, 1063).  |

#### 5.4.3.8 SC Multi-Frame Vector Module

This section specifies the IOD Attributes that may be the target of the Frame Increment Pointer (0028,0009) for SC Multi-frame images.

Attributes of this module are not included into MFSC Images created by Xeleris WS , because Frame Increment Pointer (0028,0009) always points to Frame Time attribute (0018, 1063), which is used as the frame increment in Multi-frame pixel data.

#### 5.4.3.9 Private SC Image Module

**TABLE 5-15  
PRIVATE SC IMAGE MODULE ATTRIBUTES**

| Attribute Name     | Tag         | Private Creator | Attribute Description  |
|--------------------|-------------|-----------------|--|
| Dataset Modified   | (0011,xx11) | GEMS_GENIE_1    | Dataset Modified Flag .  |
| Dataset Type       | (0011,xx13) | GEMS_GENIE_1    | Defines type of dataset. The Defined Terms are:<br>6 = Grayscale SC<br>30 = RGB SC |
| Dataset Flags      | (0011,xx3F) | GEMS_GENIE_1    | Defines dataset information.   |
| Threshold Center   | (0011,xx44) | GEMS_GENIE_1    | Default Value: 2048.0  |
| Threshold Width    | (0011,xx45) | GEMS_GENIE_1    | Default Value: 4096.0  |
| Interpolation Type | (0011,xx46) | GEMS_GENIE_1    | Default value: 2   |
| FOV                | (0011,xx57) | GEMS_GENIE_1    | FOV  |

### 5.4.3.10 Private 4DMSpect Results Module

**TABLE 5-16  
PRIVATE 4DMSPECT RESULTS MODULE ATTRIBUTES**

| Attribute Name     | Tag         | Private Creator | Attribute Description                      |
|--------------------|-------------|-----------------|--|
| Invia Results Bulk | (1817,xx01) | INVIA_RESULTS   | 4DM SPECT Protocol results stored as bulk. |

### 5.4.3.11 Private Common SC Image Module

**TABLE 5-17  
PRIVATE COMMON SC IMAGE MODULE ATTRIBUTES**

| Attribute Name       | Tag         | Private Creator | Attribute Description                |
|----------------------|-------------|-----------------|--------------------------------------|
| Database Object Name | (0011,xx10) | GEMS_GENIE_1    | Name of the Database Dataset Object. |

## 5.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended SC SOP Instances as Type 3 data elements.

### 5.5.1 Standard Extended Attributes

The Product supports the following attributes, not specified in the SC IOD, in SOP Instances as Type 3 data elements.

**TABLE 5-18  
STANDARD EXTENDED ATTRIBUTES**

| Information Entity Name | Attribute Name   | Tag         | Use  |
|-------------------------|------------------|-------------|--|
| Series                  | Patient Position | (0018,5100) | Patient position descriptor relative to the Equipment. |

### 5.5.2 Private Group GEMS\_GENIE\_1

**TABLE 5-19  
PRIVATE GROUP GEMS\_GENIE\_1**

| Attribute Name                 | Tag         | VR | VM  | Attribute Description  |
|--------------------------------|-------------|----|-----|--|
| Private Creator Identification | (0009,00xx) | LO | 1   | GEMS_GENIE_1   |
| Series Object Name             | (0009,xx20) | LO | 1   | Name of the Database Series Object.  |
| Series Flags                   | (0009,xx21) | SL | 1   | Defines series information.  |
| Private Creator Identification | (0011,00xx) | LO | 1   | GEMS_GENIE_1   |
| Series Type                    | (0011,xx0A) | SL | 1   | Defines type of series.  |
| Database Object Name           | (0011,xx10) | LO | 1-n | Name of the Database Dataset Object.   |
| Dataset Modified               | (0011,xx11) | SL | 1-n | Dataset Modified Flag  |
| Dataset Type                   | (0011,xx13) | SL | 1   | Defines type of dataset.<br>The Defined Terms are:<br>6 = Grayscale SC<br>30 = RGB SC<br>For SC IOD only |
| Dataset Flags                  | (0011,xx3F) | SL | 1-n | Defines dataset information.   |
| Threshold Center               | (0011,xx44) | FD | 1-n |  |
| Threshold Width                | (0011,xx45) | FD | 1-n |  |
| Interpolation Type             | (0011,xx46) | SL | 1-n |  |
| FOV                            | (0011,xx57) | FD | 1-n | FOV  |



### 5.5.3 Private Group INVIA\_RESULTS

**TABLE 5-20**  
**PRIVATE GROUP INVIA\_RESULTS**

| <b>Attribute Name</b>          | <b>Tag</b>  | <b>VR</b> | <b>VM</b> | <b>Attribute Description and Use</b>       |
|--------------------------------|-------------|-----------|-----------|--|
| Private Creator Identification | (1817,0010) | LO        | 1         | INVIA_RESULTS                              |
| InviaResultsBulk               | (1817,xx01) | OB        | 1         | 4DM SPECT Protocol results stored as bulk. |

### 5.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris WS does not support any coded terminology

## 6. STANDALONE CURVE INFORMATION OBJECT IMPLEMENTATION

### 6.1 INTRODUCTION

This section specifies the use of the DICOM Standalone Curve IOD to represent the information included in Curve data produced by this implementation. Xeleris WS Curve objects include time activity curves, image profile histograms, and acquisition energy spectrum histograms. Corresponding attributes are conveyed using the module construct.

### 6.2 XELERIS WS MAPPING OF DICOM ENTITIES

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

**TABLE 6-1  
MAPPING OF DICOM ENTITIES TO XELERIS WS ENTITIES**

| DICOM IE | Xeleris WS Entity |
|----------|-------------------|
| Patient  | Patient           |
| Study    | Study             |
| Series   | Series            |
| Curve    | Dataset           |

### 6.3 IOD MODULE TABLE

The Standalone Curve Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 6.5.

**TABLE 6-2  
STANDALONE CURVE IOD MODULES**

| Entity Name | Module Name             | Usage                                 | Reference |
|-------------|-------------------------|---------------------------------------|-----------|
| Patient     | Patient                 | Used (same description as for NM IOD) | 3.4.1.1   |
|             | Clinical Trial Subject  | Not Used                              | N/A       |
|             | Private Patient         | Used (same description as for NM IOD) | 3.4.1.2   |
| Study       | General Study           | Used (same description as for NM IOD) | 3.4.2.1   |
|             | Patient Study           | Used (same description as for NM IOD) | 3.4.2.2   |
|             | Private Study           | Used (same description as for NM IOD) | 3.4.2.3   |
|             | Standard Extended Study | Used (same description as for NM IOD) | 3.4.2.4   |
|             | Clinical Trial Study    | Not Used                              | N/A       |
| Series      | General Series          | Used (same description as for NM IOD) | 3.4.3.1   |
|             | Clinical Trial Series   | Not Used                              | N/A       |
|             | Private Series          | Used (same description as for NM IOD) | 3.4.3.2   |
| Equipment   | General Equipment       | Used (same description as for NM IOD) | 3.4.5.1   |
| Curve       | Curve Identification    | Used                                  | 6.4.1.1   |
|             | Standard Curve          | Used                                  | 6.4.1.2   |
|             | Private Curve           | Used                                  | 6.4.1.3   |
|             | SOP Common              | Used                                  | 6.4.1.4   |

## 6.4 INFORMATION MODULE DEFINITIONS

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

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

### 6.4.1 Curve Entity Modules

#### 6.4.1.1 Curve Identification Module

**TABLE 6-3**  
**CURVE IDENTIFICATION MODULE ATTRIBUTES**

| Attribute Name | Tag         | Type | Attribute Description |
|----------------|-------------|------|-----------------------|
| Curve Number   | (0020,0024) | 2    | Curve Index.          |
| Curve Date     | (0008,0025) | 3    | Creation date         |
| Curve Time     | (0008,0035) | 3    | Creation time         |

#### 6.4.1.2 Standard Curve Module

**TABLE 6-4**  
**STANDARD CURVE MODULE ATTRIBUTES**

| Attribute Name            | Tag         | Type | Attribute Description  |
|---------------------------|-------------|------|--|
| Curve Dimensions          | (5000,0005) | 1    | Curve Dimensions   |
| Number of Points          | (5000,0010) | 1    | Number of Points   |
| Type of Data              | (5000,0020) | 1    | Type of Data: <ul style="list-style-type: none"> <li>TAC - for discrete interval plots</li> <li>HIST for discrete interval bar graphs</li> <li>PROF for image profile plots</li> <li>ROI - for ROI objects</li> </ul>                                      |
| Data Value Representation | (5000,0103) | 1    | Data Value Representation:<br>set to 0003H = Floating Point Double (DICOM type FD)   |
| Curve Data                | (5000,3000) | 1    | Curve Data   |
| Curve Description         | (5000,0022) | 3    | Curve Legend or Curve Name   |
| Axis Units                | (5000,0030) | 3    | Units of measure for the axes; one value for each dimension. The order for the units is the same order as the dimensions for the curve data in Curve Data (50xx,3000) - (x-units/y-units).<br>Defined Terms Used:<br>SEC<br>CNTS<br>BPM<br>DEG<br>GM<br>M2 |
| Axis Labels               | (5000,0040) | 3    | Set to defaults for export. Not used for import.   |
| Minimum Coordinate Value  | (5000,0104) | 3    | value 1 = x, value 2 = y   |
| Maximum Coordinate Value  | (5000,0105) | 3    | value 1 = x, value 2 = y   |

|             |             |   |  |
|-------------|-------------|---|--|
| Curve Label | (5000,2500) | 3 | Curve Label (Curve Legend or Curve Name) |
|-------------|-------------|---|--|

### 6.4.1.3 Private Curve Module

**TABLE 6-5  
PRIVATE CURVE MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Private Creator | Attribute Description         |
|---------------------|-------------|-----------------|-------------------------------|
| Modified            | (5001,xx01) | GEMS_GENIE_1    | Modified                      |
| Name                | (5001,xx02) | GEMS_GENIE_1    | Name                          |
| Cid                 | (5001,xx03) | GEMS_GENIE_1    | Cid                           |
| Srid                | (5001,xx04) | GEMS_GENIE_1    | Srid                          |
| CurveSOPClassUID    | (5001,xx05) | GEMS_GENIE_1    | Internal Curve SOP Class UID. |
| CurveInstanceUID    | (5001,xx06) | GEMS_GENIE_1    | Internally Generated          |
| CurveType           | (5001,xx07) | GEMS_GENIE_1    | CurveType                     |
| GraphType           | (5001,xx08) | GEMS_GENIE_1    | GraphType                     |
| Legend              | (5001,xx09) | GEMS_GENIE_1    | Legend                        |
| XUnits              | (5001,xx0A) | GEMS_GENIE_1    | XUnits                        |
| YUnits              | (5001,xx0B) | GEMS_GENIE_1    | YUnits                        |
| Edit                | (5001,xx0C) | GEMS_GENIE_1    | Edit                          |
| Suspend             | (5001,xx0D) | GEMS_GENIE_1    | Suspend                       |
| StyleLine           | (5001,xx0E) | GEMS_GENIE_1    | StyleLine                     |
| StyleFill           | (5001,xx0F) | GEMS_GENIE_1    | StyleFill                     |
| StyleColour         | (5001,xx10) | GEMS_GENIE_1    | StyleColour                   |
| StyleWidth          | (5001,xx11) | GEMS_GENIE_1    | StyleWidth                    |
| StylePoint          | (5001,xx12) | GEMS_GENIE_1    | StylePoint                    |
| StylePColour        | (5001,xx13) | GEMS_GENIE_1    | StylePColour                  |
| StylePSize          | (5001,xx14) | GEMS_GENIE_1    | StylePSize                    |
| Segments            | (5001,xx15) | GEMS_GENIE_1    | Segments                      |
| SegType             | (5001,xx16) | GEMS_GENIE_1    | SegType                       |
| SegStart            | (5001,xx17) | GEMS_GENIE_1    | SegStart                      |
| SegEnd              | (5001,xx18) | GEMS_GENIE_1    | SegEnd                        |
| SegStyleLine        | (5001,xx19) | GEMS_GENIE_1    | SegStyleLine                  |
| SegStyleFill        | (5001,xx1A) | GEMS_GENIE_1    | SegStyleFill                  |
| SegStyleColour      | (5001,xx1B) | GEMS_GENIE_1    | SegStyleColour                |
| SegStyleWidth       | (5001,xx1C) | GEMS_GENIE_1    | SegStyleWidth                 |
| SegStylePoint       | (5001,xx1D) | GEMS_GENIE_1    | SegStylePoint                 |
| SegStylePColour     | (5001,xx1E) | GEMS_GENIE_1    | SegStylePColour               |
| SegStylePSize       | (5001,xx1F) | GEMS_GENIE_1    | SegStylePSize                 |
| SegName             | (5001,xx20) | GEMS_GENIE_1    | SegName                       |
| SegAllowDirInt      | (5001,xx21) | GEMS_GENIE_1    | SegAllowDirInt                |
| TextAnnots          | (5001,xx22) | GEMS_GENIE_1    | TextAnnots                    |
| TxtX                | (5001,xx23) | GEMS_GENIE_1    | TxtX                          |
| TxtY                | (5001,xx24) | GEMS_GENIE_1    | TxtY                          |
| TxtText             | (5001,xx25) | GEMS_GENIE_1    | TxtText                       |
| TxtName             | (5001,xx26) | GEMS_GENIE_1    | TxtName                       |
| ROIName             | (5001,xx30) | GEMS_GENIE_1    | ROIName                       |
| DerivedFromImageUID | (5001,xx31) | GEMS_GENIE_1    | DerivedFromImageUID           |
| DerivedFromImages   | (5001,xx32) | GEMS_GENIE_1    | DerivedFromImages             |
| CurveFlags          | (5001,xx33) | GEMS_GENIE_1    | CurveFlags                    |
| CurveName           | (5001,xx34) | GEMS_GENIE_1    | CurveName                     |
| DatasetName         | (5001,xx35) | GEMS_GENIE_1    | DatasetName                   |
| CurveUID            | (5001,xx36) | GEMS_GENIE_1    | CurveUID                      |
| ROIArea             | (5001,xx37) | GEMS_GENIE_1    | ROIArea                       |

#### 6.4.1.4 SOP Common Module

**TABLE 6-6  
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Type | Attribute Description   |
|------------------------|-------------|------|---|
| SOP Class UID          | (0008,0016) | 1    | Uniquely identifies the SOP Class. Always "1.2.840.10008.5.1.4.1.1.9"   |
| SOP Instance UID       | (0008,0018) | 1    | Uniquely identifies the SOP Instance. Internally generated.   |
| Specific Character Set | (0008,0005) | 1C   | Not used when the default character set (ISO 646) is used. Set to "ISO_IR 100" when extended character sets are used. |
| Instance Creation Date | (0008,0012) | 3    | Date the SOP Instance was created.  |
| Instance Creation Time | (0008,0013) | 3    | Time the SOP Instance was created.  |
| Instance Creator UID   | (0008,0014) | 3    | Uniquely identifies device which created the SOP Instance. Set to the Implementation UID (see Section 2.3.1.1.4)      |
| Instance Number        | (0020,0013) | 3    | A number that identifies this Composite object instance   |

#### 6.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Private Attributes defined in the following sections in Standard Extended Standalone Curve SOP Instances as Type 3 data elements.

##### 6.5.1 Private Group GEMS\_GENIE\_1

**TABLE 6-7  
PRIVATE GROUP GEMS GENIE 1**

| Attribute Name                 | Tag         | VR | VM  | Attribute Description and Use |
|--------------------------------|-------------|----|-----|-------------------------------|
| Private Creator Identification | (5001,00xx) | LO | 1   | GEMS_GENIE_1                  |
| Modified                       | (5001,xx01) | SL | 1   | Modified                      |
| Name                           | (5001,xx02) | LO | 1   | Name                          |
| Cid                            | (5001,xx03) | SL | 1   | Cid                           |
| Srid                           | (5001,xx04) | SL | 1   | Srid                          |
| SOPClassUID                    | (5001,xx05) | LO | 1   | Internal Curve SOP Class UID. |
| SOPInstanceUID                 | (5001,xx06) | LO | 1   | Internally Generated          |
| CurveType                      | (5001,xx07) | SL | 1   | CurveType                     |
| GraphType                      | (5001,xx08) | SL | 1   | GraphType                     |
| Legend                         | (5001,xx09) | LO | 1   | Legend                        |
| XUnits                         | (5001,xx0A) | LO | 1   | XUnits                        |
| YUnits                         | (5001,xx0B) | LO | 1   | YUnits                        |
| Edit                           | (5001,xx0C) | SL | 1   | Edit                          |
| Suspend                        | (5001,xx0D) | SL | 1   | Suspend                       |
| StyleLine                      | (5001,xx0E) | SL | 1   | StyleLine                     |
| StyleFill                      | (5001,xx0F) | SL | 1   | StyleFill                     |
| StyleColour                    | (5001,xx10) | LO | 1   | StyleColour                   |
| StyleWidth                     | (5001,xx11) | SL | 1   | StyleWidth                    |
| StylePoint                     | (5001,xx12) | SL | 1   | StylePoint                    |
| StylePColour                   | (5001,xx13) | LO | 1   | StylePColour                  |
| StylePSize                     | (5001,xx14) | SL | 1   | StylePSize                    |
| Segments                       | (5001,xx15) | SL | 1   | Segments                      |
| SegType                        | (5001,xx16) | SL | 1-n | SegType                       |
| SegStart                       | (5001,xx17) | FD | 1-n | SegStart                      |
| SegEnd                         | (5001,xx18) | FD | 1-n | SegEnd                        |
| SegStyleLine                   | (5001,xx19) | SL | 1-n | SegStyleLine                  |
| SegStyleFill                   | (5001,xx1A) | SL | 1-n | SegStyleFill                  |
| SegStyleColour                 | (5001,xx1B) | LO | 1   | SegStyleColour                |
| SegStyleWidth                  | (5001,xx1C) | SL | 1-n | SegStyleWidth                 |

|                     |             |    |     |                     |
|---------------------|-------------|----|-----|---------------------|
| SegStylePoint       | (5001,xx1D) | SL | 1-n | SegStylePoint       |
| SegStylePColour     | (5001,xx1E) | LO | 1   | SegStylePColour     |
| SegStylePSize       | (5001,xx1F) | SL | 1-n | SegStylePSize       |
| SegName             | (5001,xx20) | LO | 1   | SegName             |
| SegAllowDirInt      | (5001,xx21) | SL | 1-n | SegAllowDirInt      |
| TextAnnots          | (5001,xx22) | SL | 1   | TextAnnots          |
| TxtX                | (5001,xx23) | FD | 1-n | TxtX                |
| TxtY                | (5001,xx24) | FD | 1-n | TxtY                |
| TxtText             | (5001,xx25) | LO | 1   | TxtText             |
| TxtName             | (5001,xx26) | LO | 1   | TxtName             |
| ROIName             | (5001,xx30) | LO | 1   | ROIName             |
| DerivedFromImageUID | (5001,xx31) | LO | 1   | DerivedFromImageUID |
| DerivedFromImages   | (5001,xx32) | SL | 1-n | DerivedFromImages   |
| CurveFlags          | (5001,xx33) | UL | 1   | CurveFlags          |
| CurveName           | (5001,xx34) | LO | 1   | CurveName           |
| DatasetName         | (5001,xx35) | LO | 1   | DatasetName         |
| CurveUID            | (5001,xx36) | LO | 1   | CurveUID            |
| ROIArea             | (5001,xx37) | FD | 1-n | ROIArea             |

## 6.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris WS does not support any coded terminology

## 7. STORAGE COMMITMENT PUSH MODEL IMPLEMENTATION

### 7.1 STORAGE COMMITMENT PUSH MODEL INFORMATION OBJECT DEFINITION

Please refer to DICOM Part 3 (Information Object Definitions) for a description of each of the attributes contained within the Storage Commitment Information Object.

The Storage Commitment Information Object is used both for N-ACTION Storage Commitment Requests by the SCU and N-EVENT-REPORT Storage Commitment Notifications by the SCP.

#### 7.1.1 STORAGE COMMITMENT MODULE FOR N-ACTION

**TABLE 7-1  
STORAGE COMMITMENT MODULE FOR N-ACTION**

| Attribute Name               | Tag         | SCU Use   |
|------------------------------|-------------|---|
| Transaction UID              | (0008,1195) | Internally Generated  |
| Storage Media File-Set ID    | (0088,0130) | Not used  |
| Storage Media File-Set UID   | (0088,0140) | Not used  |
| Referenced SOP Sequence      | (0008,1199) | May contain 1 or more items   |
| >Referenced SOP Class UID    | (0008,1150) | Storage SOP classes supported as SCU (see Section 2.3.1)                |
| >Referenced SOP Instance UID | (0008,1155) | SOP Instance UID of the Image which Storage Commitment is required for. |
| >Storage Media File-Set ID   | (0088,0130) | Not used  |
| >Storage Media File-Set UID  | (0088,0140) | Not used  |

#### 7.1.2 STORAGE COMMITMENT MODULE FOR N-EVENT-REPORT

**TABLE 7-2  
STORAGE COMMITMENT MODULE FOR N-EVENT-REPORT**

| Attribute Name               | Tag         | SCU Use  |
|------------------------------|-------------|--|
| Transaction UID              | (0008,1195) | Used to identify the N-ACTION Request which N-EVENT-REPORT is relevant to.                     |
| Retrieve AE Title            | (0008,0054) | Not Used   |
| Storage Media File-Set ID    | (0088,0130) | Not used   |
| Storage Media File-Set UID   | (0088,0140) | Not used   |
| Referenced SOP Sequence      | (0008,1199) | Used to identify the images which storage commitment was successful and mark them as Archived. |
| >Referenced SOP Class UID    | (0008,1150) |  |
| >Referenced SOP Instance UID | (0008,1155) |  |
| >Retrieve AE Title           | (0008,0054) | Not Used   |
| >Storage Media File-Set ID   | (0088,0130) | Not used   |
| >Storage Media File-Set UID  | (0088,0140) | Not used   |

|                              |             |  |
|------------------------------|-------------|--|
| Failed SOP Sequence          | (0008,1198) | Used to identify the images which storage commitment was failed to prevent marking them as Archived. |
| >Referenced SOP Class UID    | (0008,1150) |  |
| >Referenced SOP Instance UID | (0008,1155) |  |
| >Failure Reason              | (0008,1197) | See Section 7.1.2.1 for the list of processed values.  |

#### 7.1.2.1 Processing of Failure Reason when received in a N-Event-Report

When receiving a N-Event-Report request with a Event Type ID equal to 2, meaning that Storage Commitment is complete, but failure exists, following is the set of value that this Storage Commitment SCU AE is able to process:

| <b>Failure Reason</b> | <b>Meaning</b>                     | <b>Application Behavior When Receiving Reason Code</b> |
|-----------------------|------------------------------------|--|
| 0110H                 | Processing failure                 | Error logged   |
| 0112H                 | No such object instance            | Error logged   |
| 0213H                 | Resource limitation                | Error logged   |
| 0122H                 | Referenced SOP Class not supported | Error logged   |
| 0119H                 | Class / Instance conflict          | Error logged   |
| 0131H                 | Duplicate transaction UID          | Error logged   |



## 8. QUERY IMPLEMENTATION

### 8.1 XELERIS WS MAPPING OF DICOM ENTITIES

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

**TABLE 8-1**  
**MAPPING OF DICOM ENTITIES TO XELERIS WS ENTITIES**

| DICOM   | Xeleris WS Entity |
|---------|-------------------|
| Patient | Patient           |
| Study   | Study             |
| Series  | Series            |
| Image   | Dataset           |

### 8.2 INFORMATION MODEL KEYS

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

#### 8.2.1 Common Query Keys

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

**TABLE 8-2**  
**Q/R PATIENT LEVEL COMMON RETRIEVE ATTRIBUTES**

| Attribute Name             | Tag         | Type | SCU Use  | SCP Use  |
|----------------------------|-------------|------|--|--|
| Specific Character Set     | (0008,0005) | -    | See 8.2.1.1.1  | See 8.2.1.1.1  |
| Query Retrieve Level       | (0008,0052) | -    | Set to level of query:<br>STUDY<br>SERIES<br>IMAGE       | Matched to level of query<br>PATIENT<br>STUDY<br>SERIES<br>IMAGE                               |
| Retrieve AE Title          | (0008,0054) | -    | Attribute is not requested.<br>Returned value is ignored | Always returned with AE<br>Title of CIPIC_DICOM<br>Server as defined in<br>DICOM Configuration |
| Storage Media File-set ID  | (0088,0130) | -    | Attribute is not requested.<br>Returned value is ignored | Not Used   |
| Storage Media File-set UID | (0088,0140) | -    | Attribute is not requested.<br>Returned value is ignored | Not Used   |

### 8.2.1.1 Q/R Common Attribute Descriptions

#### 8.2.1.1.1 Specific Character Set

As an SCU, the attribute Specific Character Set (0008,0005) is not sent, unless a patient name is sent with a matching key that includes a non-ASCII character; in that case, the default ISO\_IR 100 (Latin alphabet Number 1 supplementary set) extended character set identifier will be sent. Only non-ASCII characters that may be entered from the console keyboard, as described in Section 2.7, may be included in the matching key value. Query response item text attributes, including patient name, that include non-ASCII characters will be displayed as described in Section 2.7.

As an SCP, Specific Character Set will not be sent in Query responses unless an item text attribute, including patient name, includes a non-ASCII character; in that case, the default ISO\_IR 100 (Latin alphabet Number 1 supplementary set) extended character set identifier will be sent.

### 8.2.2 Patient Level – Patient Root

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

**TABLE 8-3**  
**PATIENT LEVEL ATTRIBUTES FOR THE PATIENT ROOT**  
**QUERY/RETRIEVE INFORMATION MODEL**

| Attribute Name | Tag         | Type | SCP Use   |
|----------------|-------------|------|---|
| Patient's Name | (0010,0010) | R    | Matched. Matching performed without regard to the PN VR individual component values. Wild Card Value matching is supported. |
| Patient ID     | (0010,0020) | U    | Matched. Single Value matching is supported.  |

### 8.2.3 Study Level – Patient Root

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

**TABLE 8-4**  
**STUDY LEVEL ATTRIBUTES FOR THE PATIENT ROOT**  
**QUERY/RETRIEVE INFORMATION MODEL**

| Attribute Name      | Tag         | Type | SCP Use  |
|---------------------|-------------|------|--|
| Study Date          | (0008,0020) | R    | Matched. Range of date matching is supported   |
| Study Time          | (0008,0030) | R    | Returned.  |
| Accession Number    | (0008,0050) | R    | Matched. Single Value and Wildcard Value matching are supported.   |
| Study ID            | (0020,0010) | R    | Matched. Single Value and Wildcard Value matching are supported.   |
| Study Instance UID  | (0020,000D) | U    | Matched. Single Value matching is supported.   |
| Modalities in Study | (0008,0061) | O    | Matched. Single Value and Wildcard Value matching are supported.<br>If contains multiple modalities value, perform Wildcard Value matching . |
| Study Description   | (0008,1030) | O    | Matched. Single Value and Wildcard Value Matching are supported.   |

### 8.2.4 Study Level – Study Root

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

**TABLE 8-5  
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT  
QUERY/RETRIEVE INFORMATION MODEL**

| Attribute Name      | Tag         | Type | SCU Use   | SCP Use  |
|---------------------|-------------|------|---|--|
| Study Date          | (0008,0020) | R    | Matching Key. Range Date matching is available.                     | Matched. Range of date Matching is supported.  |
| Study Time          | (0008,0030) | R    | Requested.  | Returned.  |
| Accession Number    | (0008,0050) | R    | Matching key. Single Value or Wildcard Value may be used.           | Matched. Single Value and Wildcard Value Matching are supported.   |
| Patient's Name      | (0010,0010) | R    | Matching key. Wildcard Value may be used.                           | Matched. Matching performed without regard to the PN VR individual component values. Wildcard Value matching is supported. |
| Patient ID          | (0010,0020) | R    | Matching key. Single Value may be used.                             | Matched. Single Value Matching is supported.   |
| Study ID            | (0020,0010) | R    | Matching key. Single Value or Wildcard Value may be used.           | Matched. Single Value and Wildcard Value Matching are supported.   |
| Study Instance UID  | (0020,000D) | U    | Requested.  | Matched. Single Value Matching is supported.   |
| Modalities in Study | (0008,0061) | R    | Matching Key. Possible query values:<br>"NM", "PT", "CT", "MR", "*" | Matched. Single Value and Wildcard Value Matching are supported.   |
| Study Description   | (0008,1030) | O    | Matching key. Single Value or Wildcard Value may be used.           | Matched. Single Value and Wildcard Value Matching are supported..  |

### 8.2.5 Series Level

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

**TABLE 8-6  
SERIES LEVEL ATTRIBUTES FOR THE  
QUERY/RETRIEVE INFORMATION MODEL**

| Attribute Name      | Tag         | Type | SCU Use   | SCP Use  |
|---------------------|-------------|------|-----------|--|
| Modality            | (0008,0060) | R    | Requested | Matched. Single Value and Wildcard Value Matching are supported. |
| Series Number       | (0020,0011) | R    | Requested | Matched. Single Value Matching is supported.                     |
| Series Instance UID | (0020,000E) | U    | Requested | Matched. Single Value Matching is supported.                     |
| Series Date         | (0008,0021) | O    | Requested | Returned.  |

|                                    |             |   |  |  |
|------------------------------------|-------------|---|--|--|
| Series Time                        | (0008,0031) | O | Requested                                    | Returned.                              |
| Series Description                 | (0008,103E) | O | Requested                                    | Returned.                              |
| Number of Series Related Instances | (0020,1209) | O | Requested                                    | Not Used                               |
| Study Instance UID                 | (0020,000D) | U | Unique key. Single value is used in request. | Returned. Single Key Matching is used. |

### 8.2.6 Image Level

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

**TABLE 8-7**  
**IMAGE LEVEL ATTRIBUTES FOR THE**  
**QUERY/RETRIEVE INFORMATION MODEL**

| Attribute Name              | Tag         | Type | SCU Use   | SCP Use                                      |
|-----------------------------|-------------|------|---|--|
| Image Number                | (0020,0013) | R    | Requested   | Matched. Single Value Matching is supported. |
| SOP Instance UID            | (0008,0018) | U    | Requested   | Matched. Single Value Matching is supported. |
| Image ID                    | (0054,0400) | O    | Requested   | Returned.                                    |
| Image Index                 | (0054,1330) | O    | Requested   | Not Used                                     |
| Image Type                  | (0008,0008) | O    | Attribute is not requested. Returned value is ignored | Returned.                                    |
| Rows                        | (0028,0010) | O    | Requested   | Returned.                                    |
| Columns                     | (0028,0011) | O    | Requested   | Returned.                                    |
| Number of Frames            | (0028,0008) | O    | Requested   | Returned.                                    |
| Completion Flag             | (0040,A491) | O    | Requested if remote system supports Structure Reports | Not Used                                     |
| Verification Flag           | (0040,A493) | O    | Requested if remote system supports Structure Reports | Not Used                                     |
| Verifying Observer Sequence | (0040,A073) | O    | Requested if remote system supports Structure Reports | Not Used                                     |
| >Verification Date Time     | (0040,A030) | O    | Requested if Verifying Observer Sequence is requested | Not Used                                     |
| >Verifying Observer Name    | (0040,A075) | O    | Requested if Verifying Observer Sequence is requested | Not Used                                     |
| Concept Name Code Sequence  | (0040,A043) | O    | Requested if remote system supports Structure Reports | Not Used                                     |
| >Code Value                 | (0008,0100) | O    | Requested if Concept Name Code Sequence is requested  | Not Used                                     |
| >Coding Scheme Designator   | (0008,0102) | O    | Requested if Concept Name Code Sequence is requested  | Not Used                                     |
| Study Instance UID          | (0020,000D) | U    | Unique key. Single value is used in request.          | Returned. Single Key Matching is used.       |
| Series Instance UID         | (0020,000E) | U    | Unique key. Single value is used in request.          | Returned. Single Key Matching is used.       |

## 9. ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION

### 9.1 INTRODUCTION

This section specifies the use of the DICOM Encapsulated PDF IOD to represent the information included in Encapsulated PDF Images produced by this implementation. Corresponding attributes are conveyed using the module construct.

### 9.2 XELERIS WS MAPPING OF DICOM ENTITIES

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

**TABLE 9-1  
MAPPING OF DICOM ENTITIES TO XELERIS WS ENTITIES**

| DICOM IE              | Xeleris WS Entity |
|-----------------------|-------------------|
| Patient               | Patient           |
| Study                 | Study             |
| Series                | Series            |
| Encapsulated Document | Dataset           |

### 9.3 IOD MODULE TABLE

The Encapsulated PDF Information Object Definition comprises the modules of the following table, plus Standard Extended and Private attributes. Standard Extended and Private attributes are described in Section 9.5.

**TABLE 9-2  
ENCAPSULATED PDF IOD MODULES**

| Entity Name           | Module Name                                    | Usage                                 | Reference |
|-----------------------|--|---------------------------------------|-----------|
| Patient               | Patient  | Used (same description as for NM IOD) | 3.4.1.1   |
|                       | Clinical Trial Subject                         | Not Used                              | N/A       |
|                       | Private Patient                                | Used (same description as for NM IOD) | 3.4.1.2   |
| Study                 | General Study                                  | Used (same description as for NM IOD) | 3.4.2.1   |
|                       | Patient Study                                  | Used (same description as for NM IOD) | 3.4.2.2   |
|                       | Private Study                                  | Used (same description as for NM IOD) | 3.4.2.3   |
|                       | Standard Extended Study                        | Used (same description as for NM IOD) | 3.4.2.4   |
|                       | Clinical Trial Study                           | Not Used                              | N/A       |
| Series                | Encapsulated Document Series                   | Used                                  | 9.4.1.1   |
|                       | Clinical Trial Series                          | Not Used                              | N/A       |
|                       | Standard Extended Encapsulated Document Series | Used                                  | 9.4.1.2   |
|                       | Private Encapsulated Document Series           | Used                                  | 9.4.1.3   |
| Equipment             | General Equipment                              | Used (same description as for SC IOD) | 5.4.2.1   |
|                       | SC Equipment                                   | Used (same description as for SC IOD) | 5.4.2.2   |
| Encapsulated Document | Encapsulated Document                          | Used                                  | 9.4.2.1   |
|                       | SOP Common                                     | Used                                  | 9.4.2.2   |
|                       | Standard Enhanced Encapsulated Document        | Used                                  | 9.4.2.3   |
|                       | Private Encapsulated Document                  | Used                                  | 9.4.2.3   |

## 9.4 INFORMATION MODULE DEFINITIONS

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

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes generated by Xeleris WS at time of object creation. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take when generating the instance. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions). Also note that Attributes not present in tables are not supported.

### 9.4.1 Series Entity Modules

#### 9.4.1.1 Encapsulated Document Series Module

**TABLE 9-3  
ENCAPSULATED DOCUMENT SERIES MODULE ATTRIBUTES**

| Attribute Name      | Tag         | Type | Attribute Description  |
|---------------------|-------------|------|--|
| Modality            | (0008,0060) | 1    | The modality appropriate for the encapsulated document.<br>Defined Term used:<br>NM<br>PT            |
| Series Instance UID | (0020,000E) | 1    | Unique identifier of the Series.   |
| Series Number       | (0020,0011) | 1    | Series Number  |
| Protocol Name       | (0018,1030) | 3    | User-defined description of the conditions under which the Series was performed.                     |
| Series Description  | (0008,103E) | 3    | Description of the Series. Always sent.<br>Possible values:<br>“DaTQUANT Report”<br>“Q.Brain Report” |

#### 9.4.1.2 Standard Extended Encapsulated Document Series Module

**TABLE 9-4  
STANDARD EXTENDED ENCAPSULATED DOCUMENT SERIES MODULE ATTRIBUTES**

| Attribute Name | Tag         | Type | Attribute Description    |
|----------------|-------------|------|--------------------------|
| Series Date    | (0008,0021) | 3    | Date the Series started. |
| Series Time    | (0008,0031) | 3    | Time the Series started. |

#### 9.4.1.3 Private Encapsulated Document Series Module

**TABLE 9-5  
PRIVATE ENCAPSULATED DOCUMENT SERIES MODULE ATTRIBUTES**

| Attribute Name     | Tag         | Private Creator ID | Attribute Description               |
|--------------------|-------------|--------------------|-------------------------------------|
| Series Object Name | (0009,xx20) | GEMS_GENIE_1       | Name of the Database Series Object. |
| Series Flags       | (0009,xx21) | GEMS_GENIE_1       | Defines series information          |
| Series Type        | (0011,xx0A) | GEMS_GENIE_1       | Defines type of series.             |

## 9.4.2 Encapsulated Document Entity Modules

### 9.4.2.1 Encapsulated Document Module

**TABLE 9-6  
ENCAPSULATED DOCUMENT MODULE ATTRIBUTES**

| Attribute Name                     | Tag          | Type | Attribute Description  |
|------------------------------------|--------------|------|--|
| Instance Number                    | (0020,0013)  | 1    | A number that identifies this instance.  |
| Content Date                       | (0008,0023)  | 2    | The date the document content creation was started   |
| Content Time                       | (0008,0033)  | 2    | The time the document content creation was started   |
| Acquisition DateTime               | (0008,002A)  | 2    | The date and time that the original generation of the data in the document started.  |
| Derivation Description             | (0008,2111)  | 3    | A text description of how this document was derived.<br>Always sent as "Dicom Embedded PDF"  |
| Burned In Annotation               | (0028, 0301) | 1    | Indicates whether or not the encapsulated document contains sufficient burned in annotation to identify the patient and date the data was acquired.<br>Enumerated Values :<br>NO |
| Source Instance Sequence           | (0042,0013)  | 1C   | Not used.<br>Not derived from DICOM image(s)   |
| Document Title                     | (0042,0010)  | 2    | The title of the document.   |
| Concept Name Code Sequence         | (0040,A043)  | 2    | A coded representation of the document title.<br>Always contains 0 items.  |
| Verification Flag                  | (0040,A493)  | 3    | Indicates whether the Encapsulated Document is Verified.<br>Enumerated Value used:<br>UNVERIFIED   |
| MIME Type of Encapsulated Document | (0042,0012)  | 1    | The type of the encapsulated document stream described using the MIME Media Type.<br>Always sent as "application/pdf"  |
| List of MIME Types                 | (0042,0014)  | 1C   | MIME Types of subcomponents of the encapsulated document.<br>Always sent as "image/jpeg\application/pdf"   |
| Encapsulated Document              | (0042,0011)  | 1    | Encapsulated Document stream, containing a document encoded according to the MIME Type   |

### 9.4.2.2 SOP Common Module

**TABLE 9-7  
SOP COMMON MODULE ATTRIBUTES**

| Attribute Name         | Tag         | Type | Attribute Description   |
|------------------------|-------------|------|---|
| SOP Class UID          | (0008,0016) | 1    | Uniquely identifies the SOP Class.<br>Possible value:<br>"1.2.840.10008.5.1.4.1.1.104.1"                              |
| SOP Instance UID       | (0008,0018) | 1    | Uniquely identifies the SOP Instance. Internally generated.   |
| Specific Character Set | (0008,0005) | 1C   | Not used when the default character set (ISO 646) is used. Set to "ISO_IR 100" when extended character sets are used. |
| Instance Creation Date | (0008,0012) | 3    | Date the SOP Instance was created.  |
| Instance Creation Time | (0008,0013) | 3    | Time the SOP Instance was created.  |
| Instance Creator UID   | (0008,0014) | 3    | Set to the Implementation UID (see Section 2.3.1.1.4)   |
| Instance Number        | (0020,0013) | 3    | A number that identifies this Composite object instance (see 9.4.2.1)   |

### 9.4.2.3 Standard Extended Encapsulated Document Module

**TABLE 9-8  
STANDARD EXTENDED ENCAPSULATED DOCUMENT MODULE ATTRIBUTES**

| Attribute Name            | Tag         | Type | Attribute Description  |
|---------------------------|-------------|------|--|
| Image Type                | (0008,0008) | 3    | Object type. See 9.4.2.3.1   |
| Derivation Description    | (0008,2111) | 3    | A text description of how this document was derived. Always sent as "Dicom Embedded PDF" |
| Image Comments            | (0020,4000) | 3    | User-defined comments about the document.  |
| Date of Secondary Capture | (0018,1012) | 3    | The date the Secondary Object was captured.  |
| Time of Secondary Capture | (0018,1014) | 3    | The time the Secondary Object was captured.  |

#### 9.4.2.3.1 Image Type

The following Enumerated Value of Value 1 is created:

- DERIVED identifies a Derived Image

The following Enumerated Value of Value 2 is created:

- SECONDARY identifies a Secondary Image

### 9.4.2.4 Private Encapsulated Document Module

**TABLE 9-9  
PRIVATE ENCAPSULATED DOCUMENT MODULE ATTRIBUTES**

| Attribute Name                    | Tag         | Private Creator | Attribute Description  |
|-----------------------------------|-------------|-----------------|--|
| Workstation DICOM data Identifier | (0009,xx01) | GEMS_GENIE_1    | Contains always "GEMS_GENIE"   |
| Dataset UID                       | (0009,xx1E) | GEMS_GENIE_1    | Dataset UID.   |
| Dataset Name                      | (0011,xx12) | GEMS_GENIE_1    | Dataset Name.  |
| Dataset Type                      | (0011,xx13) | GEMS_GENIE_1    | Defines type of internal dataset object  |
| Source Translator                 | (0013,xx11) | GEMS_GENIE_1    | Source Translator. Default value = 4.  |
| OrigSOPInstance UID               | (0033,xx07) | GEMS_GENIE_1    | List of SOP UIDs of Xeleris associated datasets encapsulated into the DICOM Encapsulated PDF object. |

## 9.5 STANDARD EXTENDED AND PRIVATE DATA ATTRIBUTES

The Product supports the Standard and Private Attributes defined in the following sections in Standard Extended Encapsulated PDF SOP Instances as Type 3 data elements.

### 9.5.1 Standard Extended Attributes

The Product supports the following attributes, not specified in the Encapsulated PDF IOD, in SOP Instances as Type 3 data elements.



**TABLE 9-10  
STANDARD EXTENDED ATTRIBUTES**

| <b>Information Entity Name</b> | <b>Attribute Name</b>     | <b>Tag</b>  | <b>Use</b>   |
|--------------------------------|---------------------------|-------------|--|
| Series                         | Series Date               | (0008,0021) | Date the Series started.                             |
|                                | Series Time               | (0008,0031) | Time the Series started.                             |
| Encapsulated Document          | Image Type                | (0008,0008) | Object Type  |
|                                | Derivation Description    | (0008,2111) | A text description of how this document was derived. |
|                                | Image Comments            | (0020,4000) | User-defined comments about the document.            |
|                                | Date of Secondary Capture | (0018,1012) | The date the Secondary Object was captured.          |
|                                | Time of Secondary Capture | (0018,1014) | The time the Secondary Object was captured.          |

### 9.5.2 Private Group GEMS\_GENIE\_1

**TABLE 9-11  
PRIVATE GROUP GEMS GENIE 1**

| <b>Attribute Name</b>             | <b>Tag</b>  | <b>VR</b> | <b>VM</b> | <b>Attribute Description</b>  |
|-----------------------------------|-------------|-----------|-----------|---|
| Private Creator Identification    | (0009,00xx) | LO        | 1         | GEMS_GENIE_1  |
| Workstation DICOM data Identifier | (0009,xx01) | SH        | 1         | Contains always "GEMS_GENIE"  |
| Dataset UID                       | (0009,xx1E) | UI        | 1         | Dataset UID   |
| Series Object Name                | (0009,xx20) | LO        | 1         | Name of the Database Series Object.   |
| Series Flags                      | (0009,xx21) | SL        | 1         | Defines series information.   |
| Private Creator Identification    | (0011,00xx) | LO        | 1         | GEMS_GENIE_1  |
| Series Type                       | (0011,xx0A) | SL        | 1         | Defines type of series.   |
| Dataset Name                      | (0011,xx12) | SL        | 1-n       | Dataset Modified Flag   |
| Dataset Type                      | (0011,xx13) | SL        | 1         | Defines type of dataset.  |
| Private Creator Identification    | (0013,00xx) | LO        | 1         | GEMS_GENIE_1  |
| Source Translator                 | (0013,xx11) | SL        | 1         | Source Translator. Default value = 4.   |
| Private Creator Identification    | (0033,00xx) | LO        | 1         | GEMS_GENIE_1  |
| Orig SOP Instance UID             | (0033,xx07) | LO        | 1-n       | List of SOP UIDs of Xeleris associated datasets encapsulated into the DICOM Encapsulated PDF object |

## 9.6 STANDARD EXTENDED AND PRIVATE CONTEXT GROUPS

Xeleris WS does not support any coded terminology

**APPENDIX A: CD PRINTER 5.6.3 DICOM CONFORMANCE  
STATEMENT**



## CD Printer 5.6.3

# DICOM Conformance Statement

|                                    |              |  |
|------------------------------------|--------------|--|
|                                    | <b>Date:</b> | <b>CDP Ltd.</b><br><b>Petach Tikva, Israel</b> |
| <b>Written by:</b> Yael Nuss       | 07/06/2010   |  |
| <b>Reviewed by:</b> Vladimir Zotov | 09/06/2010   |  |
| <b>Approved by:</b> Ofir Sagi      | 10/06/2010   |  |
| <b>Document No.</b> 200-149-007    |              |  |

| <b>Revision History</b> |                    |             |                 |
|-------------------------|--------------------|-------------|-----------------|
| <b>Rev</b>              | <b>Description</b> | <b>Date</b> | <b>Approval</b> |
| 1.0                     | Initial version    | 10/06/2010  | Ofir Sagi       |

## 1. DICOM CONFORMANCE STATEMENT OVERVIEW

The CD Printer system is a DICOM media burning service provider for medical images and other object instances.

The CD Printer provides the following DICOM data exchange features:

- It receives instances sent to it by remote systems (e.g. PACS, workstations or imaging modalities) and stores them in a database.
- It provides additional services for instances distribution.
- It is able to write DICOM CD-ROM disks.
- It is able to write DICOM DVD disks.

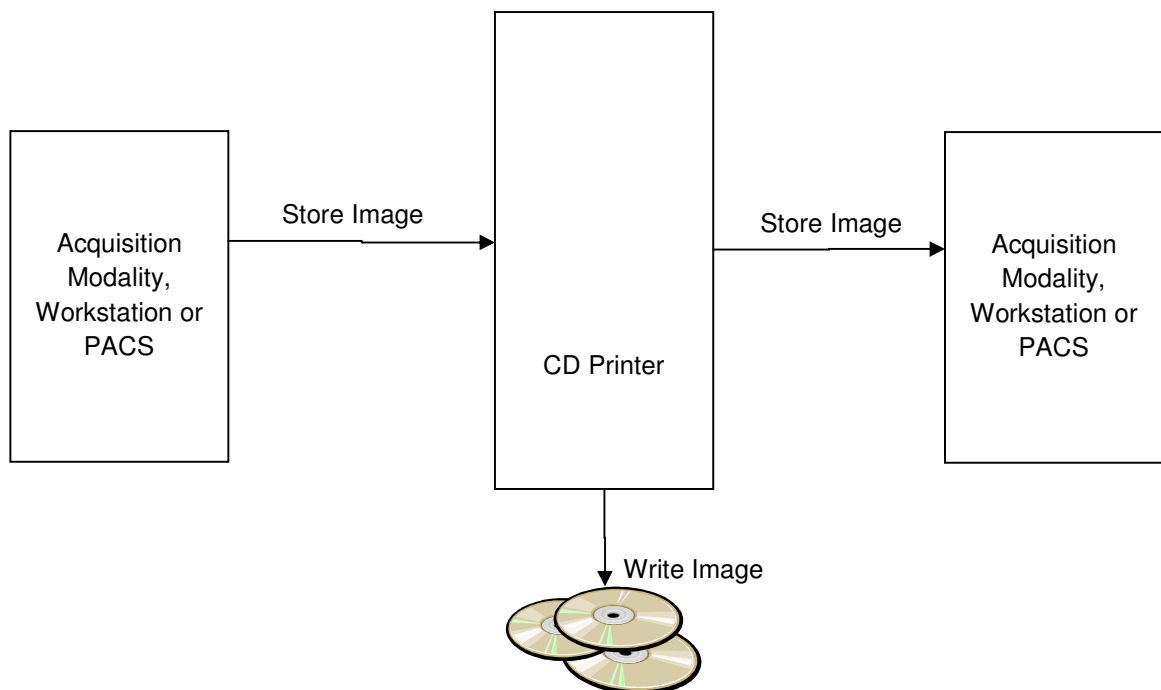


Figure 1: CD Printer in a DICOM Network

CD Printer allows the operator also to monitor queues and burning process of the images received. CD Printer includes DICOM media viewer software in root of each burned media. Some advanced analysis and processing applications are primarily designed for images generated by Philips equipment when sent to the CD Printer. **Table 5** shows limitation for internal viewing option.

This version of DICOM Conformance Statement applies to the CD Printer version 5.6.2.

**Table 1** presents an overview of all network services and the applicable SOP classes as provided by CD Printer.

| SOP Class   |                               | User of Service (SCU) | Provider of Service (SCP) |
|---|-------------------------------|-----------------------|---------------------------|
| Name  | UID                           |                       |                           |
| <b>Storage</b>  |                               |                       |                           |
| Hardcopy Grayscale Image Storage                          | 1.2.840.10008.5.1.1.1.29      | Yes                   | Yes                       |
| Hardcopy Color Image Storage                              | 1.2.840.10008.5.1.1.1.30      | Yes                   | Yes                       |
| Computed Radiography Image Storage                        | 1.2.840.10008.5.1.4.1.1.1     | Yes                   | Yes                       |
| Digital X-Ray Image Storage – For Presentation            | 1.2.840.10008.5.1.4.1.1.1.1   | Yes                   | Yes                       |
| Digital X-Ray Image Storage – For Processing              | 1.2.840.10008.5.1.4.1.1.1.1.1 | Yes                   | Yes                       |
| Digital Mammography Image Storage – For Presentation      | 1.2.840.10008.5.1.4.1.1.1.2   | Yes                   | Yes                       |
| Digital Mammography Image Storage – For Processing        | 1.2.840.10008.5.1.4.1.1.1.2.1 | Yes                   | Yes                       |
| Digital Intra-oral X-Ray Image Storage – For Presentation | 1.2.840.10008.5.1.4.1.1.1.3   | Yes                   | Yes                       |
| Digital Intra-oral X-Ray Image Storage – For Processing   | 1.2.840.10008.5.1.4.1.1.1.3.1 | Yes                   | Yes                       |
| CT Image Storage  | 1.2.840.10008.5.1.4.1.1.2     | Yes                   | Yes                       |
| Enhanced CT Image Storage                                 | 1.2.840.10008.5.1.4.1.1.2.1   | Yes                   | Yes                       |
| Ultrasound Multi-frame Image Storage (Retired)            | 1.2.840.10008.5.1.4.1.1.3     | Yes                   | Yes                       |
| Ultrasound Multi-frame Image Storage                      | 1.2.840.10008.5.1.4.1.1.3.1   | Yes                   | Yes                       |
| MR Image Storage  | 1.2.840.10008.5.1.4.1.1.4     | Yes                   | Yes                       |
| Enhanced MR Image Storage                                 | 1.2.840.10008.5.1.4.1.1.4.1   | Yes                   | Yes                       |
| MR Spectroscopy Storage                                   | 1.2.840.10008.5.1.4.1.1.4.2   | Yes                   | Yes                       |
| Nuclear Medicine Image Storage (Retired)                  | 1.2.840.10008.5.1.4.1.1.5     | Yes                   | Yes                       |
| Ultrasound Image Storage (Retired)                        | 1.2.840.10008.5.1.4.1.1.6     | Yes                   | Yes                       |
| Ultrasound Image Storage                                  | 1.2.840.10008.5.1.4.1.1.6.1   | Yes                   | Yes                       |

|  |                                  |     |     |
|--|----------------------------------|-----|-----|
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7        | Yes | Yes |
| Multi-frame Single Bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1      | Yes | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2      | Yes | Yes |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3      | Yes | Yes |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4      | Yes | Yes |
| Standalone Overlay Storage                                 | 1.2.840.10008.5.1.4.1.1.8        | Yes | Yes |
| Standalone Curve Storage                                   | 1.2.840.10008.5.1.4.1.1.9        | Yes | Yes |
| 12-lead ECG Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.1.1    | Yes | Yes |
| General ECG Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.1.2    | Yes | Yes |
| Ambulatory ECG Waveform Storage                            | 1.2.840.10008.5.1.4.1.1.9.1.3    | Yes | Yes |
| Hemodynamic Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.2.1    | Yes | Yes |
| Cardiac Electrophysiology Waveform Storage                 | 1.2.840.10008.5.1.4.1.1.9.3.1    | Yes | Yes |
| Basic Voice Audio Waveform Storage                         | 1.2.840.10008.5.1.4.1.1.9.4.1    | Yes | Yes |
| Standalone Modality LUT Storage                            | 1.2.840.10008.5.1.4.1.1.10       | Yes | Yes |
| Standalone VOI LUT Storage                                 | 1.2.840.10008.5.1.4.1.1.11       | Yes | Yes |
| Grayscale Softcopy Presentation State Storage              | 1.2.840.10008.5.1.4.1.1.11.1     | Yes | Yes |
| Color Softcopy Presentation State Storage                  | 1.2.840.10008.5.1.4.1.1.11.2     | Yes | Yes |
| Pseudo-Color Softcopy Presentation State Storage           | 1.2.840.10008.5.1.4.1.1.11.3     | Yes | Yes |
| Blending Softcopy Presentation State Storage               | 1.2.840.10008.5.1.4.1.1.11.4     | Yes | Yes |
| X-Ray Angiographic Image Storage                           | 1.2.840.10008.5.1.4.1.1.12.1     | Yes | Yes |
| X-Ray Radio-fluoroscopic Image Storage                     | 1.2.840.10008.5.1.4.1.1.12.2     | Yes | Yes |
| X-Ray Angiographic Bi-Plane Image Storage (Retired)        | 1.2.840.10008.5.1.4.1.1.12.3     | Yes | Yes |
| Nuclear Medicine Image Storage                             | 1.2.840.10008.5.1.4.1.1.20       | Yes | Yes |
| Spatial Registration Storage                               | 1.2.840.10008.5.1.4.1.1.66.1     | Yes | Yes |
| Spatial Fiducials Storage                                  | 1.2.840.10008.5.1.4.1.1.66.2     | Yes | Yes |
| VL Endoscopic Image Storage                                | 1.2.840.10008.5.1.4.1.1.77.1.1   | Yes | Yes |
| Video Endoscopic Image Storage                             | 1.2.840.10008.5.1.4.1.1.77.1.1.1 | Yes | Yes |
| VL Microscopic Image Storage                               | 1.2.840.10008.5.1.4.1.1.77.1.2   | Yes | Yes |

|  |                                  |     |     |
|--|----------------------------------|-----|-----|
| Video Microscopic Image Storage                | 1.2.840.10008.5.1.4.1.1.77.1.2.1 | Yes | Yes |
| VL Slide-Coordinates Microscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.3   | Yes | Yes |
| VL Photographic Image Storage                  | 1.2.840.10008.5.1.4.1.1.77.1.4   | Yes | Yes |
| Video Photographic Image Storage               | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | Yes | Yes |
| Ophthalmic Photography 8 Bit Image Storage     | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | Yes | Yes |
| Ophthalmic Photography 16 Bit Image Storage    | 1.2.840.10008.5.1.4.1.1.77.1.5.2 | Yes | Yes |
| Stereometric Relationship Storage              | 1.2.840.10008.5.1.4.1.1.77.1.5.3 | Yes | Yes |
| Positron Emission Tomography Image Storage     | 1.2.840.10008.5.1.4.1.1.128      | Yes | Yes |
| RT Image Storage                               | 1.2.840.10008.5.1.4.1.1.481.1    | Yes | Yes |
| RT Dose Storage                                | 1.2.840.10008.5.1.4.1.1.481.2    | Yes | Yes |
| RT Structure Set Storage                       | 1.2.840.10008.5.1.4.1.1.481.3    | Yes | Yes |
| RT Beams Treatment Record Storage              | 1.2.840.10008.5.1.4.1.1.481.4    | Yes | Yes |
| RT Plan Storage                                | 1.2.840.10008.5.1.4.1.1.481.5    | Yes | Yes |
| RT Brachy Treatment Record Storage             | 1.2.840.10008.5.1.4.1.1.481.6    | Yes | Yes |
| RT Treatment Summary Record Storage            | 1.2.840.10008.5.1.4.1.1.481.7    | Yes | Yes |
| Structured Reporting                           |                                  |     |     |
| Basic Text SR                                  | 1.2.840.10008.5.1.4.1.1.88.11    | Yes | Yes |
| Enhanced SR                                    | 1.2.840.10008.5.1.4.1.1.88.22    | Yes | Yes |
| Comprehensive SR                               | 1.2.840.10008.5.1.4.1.1.88.33    | Yes | Yes |
| Mammography CAD SR                             | 1.2.840.10008.5.1.4.1.1.88.50    | Yes | Yes |
| Key Object Selection Document                  | 1.2.840.10008.5.1.4.1.1.88.59    | Yes | Yes |
| Chest CAD SR                                   | 1.2.840.10008.5.1.4.1.1.88.65    | Yes | Yes |
| Workflow Management                            |                                  |     |     |
| Verification                                   | 1.2.840.10008.1.1                | No  | Yes |

**Table 1: All Network Services**

**Table 2** lists the Supported Media Storage Application Profiles (with roles).



| Media Storage Application Profile | Roles             |                  |                    | Supported Media       |
|-----------------------------------|-------------------|------------------|--------------------|-----------------------|
|                                   | Write Files (FSC) | Read Files (FSR) | Update Files (FSU) |                       |
| CD – R Disk                       |                   |                  |                    |                       |
| General Purpose CD-R              | Yes               | No               | No                 | CD +R/-R              |
| Private General Purpose CD-DVD    | Yes               | No               | No                 | CD +R/-R              |
| DVD Disk                          |                   |                  |                    |                       |
| General Purpose DVD-JPEG          | Yes               | No               | No                 | DVD +R/-R and +RW/-RW |
| Private General Purpose CD-DVD    | Yes               | No               | No                 | DVD +R/-R and +RW/-RW |

**Table 2: Media Services**

*Note: Private General Purpose CD-DVD Media Storage Application Profile allows creating DICOM CD and DVD without transfer syntax control of writing DICOM Instance files. Usage of Private or Standard Profile is configurable.*

*CD Printer can be configured to not control content and format of distributing on media data. In such case data will be written "as is" (as received from remote DICOM node) and all responsibility for normality of data format and contents shall be borne by the source of the information from which the data was received by CD Printer.*

*CD Printer can be configured explicitly to change format of distributing on media data by system administrator of CD Printer. In such case all responsibility for normality of data format and contents shall be borne by the system administrator.*

The supported Transfer Syntaxes UID's by the CD Printer System for all **Storage** SOP Classes are showed in the **Table 3**.

| Transfer Syntaxes Name  | Transfer Syntaxes UID  |
|---|------------------------|
| Implicit VR Little Endian                                     | 1.2.840.10008.1.2      |
| Explicit VR Little Endian                                     | 1.2.840.10008.1.2.1    |
| JPEG Baseline (Process 1): Lossy JPEG 8 Bit Image Compression | 1.2.840.10008.1.2.4.50 |
| JPEG Extended (Process 2 & 4): Lossy JPEG 12 Bit Compression  | 1.2.840.10008.1.2.4.51 |
| JPEG Lossless Compression (Process 14)                        | 1.2.840.10008.1.2.4.70 |
| RLE Compression   | 1.2.840.10008.1.2.5    |

**Table 3: Transfer Syntaxes for all Storage SOP Classes - Images**

The supported Transfer Syntaxes UID's by the CD Printer System for all NOT Storage SOP Classes as: **Structured Reporting** and **Workflow Management**, are showed in **Table 4**.

| Transfer Syntaxes Name    | Transfer Syntaxes UID |
|---------------------------|-----------------------|
| Implicit VR Little Endian | 1.2.840.10008.1.2     |
| Explicit VR Little Endian | 1.2.840.10008.1.2.1   |

**Table 4: Transfer Syntaxes for all NOT Storage SOP Classes – Non-Images**

**Table 5** gives an overview of the image formats that can be viewed or stored.

| Photometric Interpretation | Storage | Viewing |
|----------------------------|---------|---------|
| MONOCHROME1                | +       | +       |
| MONOCHROME2                | +       | +       |
| RGB                        | +       | +       |
| YBR_FULL                   | +       | -       |
| YBR_FULL_422               | +       | +       |
| YBR_PARTIAL_422            | +       | -       |
| PALETTE COLOR              | +       | +       |
| Other                      | +       | -       |

**Table 5: Support for Photometric Interpretation**

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## 3. INTRODUCTION

### 3.1 INTENDED USE

This DICOM Conformance Statement is intended for:

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

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

### 3.2 REMARKS

The DICOM Conformance Statement is contained in chapter 1 through 8 and follows the contents and structuring requirements of the DICOM Standard PS 3.2.

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

#### **Interoperability**

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

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

#### **Validation**

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

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

### **New versions of the DICOM Standard**

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

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

### **3.3 DEFINITIONS, TERMS AND ABBREVIATIONS**

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

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

The following acronyms and abbreviations may be used in this document.

|          |   |
|----------|---|
| AE       | Application Entity                                  |
| BOT      | Basic Offset Table                                  |
| CD       | Compact Disc  |
| CD-R     | CD-Recordable                                       |
| CT       | Computed Tomography                                 |
| DICOM    | Digital Imaging and Communications in Medicine      |
| DIMSE    | DICOM Message Service Element                       |
| DVD-JPEG | Digital Video Disc – JPEG                           |
| EBE      | DICOM Explicit VR Big Endian                        |
| ELE      | DICOM Explicit VR Little Endian                     |
| FSC      | File-set Creator                                    |
| FSR      | File-set Reader                                     |
| FSU      | File-set Updater                                    |
| GUI      | Graphical User Interface                            |
| HIPAA    | Health Insurance Portability and Accountability Act |
| HASP     | Hardware Security Key                               |

|        |   |
|--------|---|
| ILE    | DICOM Implicit VR Little Endian                 |
| IHE    | Integrating the Healthcare Enterprise           |
| IOD    | Information Object Definition                   |
| JPEG   | Joint Photographic Experts Group                |
| MR     | Magnetic Resonance                              |
| N/A    | Not applicable                                  |
| NEMA   | National Electrical Manufacturers Association   |
| PDU    | Protocol Data Unit                              |
| PMS(N) | Philips Medical Systems (Nederland B.V.)        |
| Q/R    | Query/Retrieve (Service Class)                  |
| RWA    | Real-World Activity                             |
| SC     | Secondary Capture                               |
| SCP    | Service Class Provider                          |
| SCU    | Service Class User                              |
| SOP    | Service Object Pair                             |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| VR     | Value Representation                            |
| UID    | Unique Identifier                               |

### 3.4 REFERENCES

[DICOM] Digital Imaging and Communications in Medicine (DICOM), Part 1 – 18 (NEMA PS 3.1 – PS 3.18), National Electrical Manufacturers Association (NEMA)  
Publication Sales 1300 N. 17th Street, Suite 1847  
Rosslyn, Virginia. 22209, United States of America



## 4. NETWORKING

This section contains networking related services vs. the media related ones in [Chapter 5](#).

### 4.1 IMPLEMENTATION MODEL

The implementation model consists of the following sections:

- The [Application Data Flow](#) Diagram, specifying the relationship between the CD Printer Application Entities and the “external world” or Real-World activities,
- A [functional description of the CD Printer Application Entities](#), and the sequencing constraints among them.

#### 4.1.1 APPLICATION DATA FLOW

The CD Printer communication is based on the DICOM v3.0 standard. This enables the CD Printer to communicate with any DICOM v3.0 compliant products (e.g., modalities, workstations, PACS, hardcopy units). The CD Printer can function both as a server and as a client. Thus it can send DICOM objects to other stations, and other stations can receive from the CD Printer and send DICOM objects to it. The DICOM objects are transferred in the DICOM v3.0 protocol based on TCP/IP as a transport layer.

The CD Printer implements and provides DICOM services using the following Application Entities:

- Storage Provider AE.
- Distribution Manager AE
- Media AE (No Network AE, See [Chapter 5](#)).

**Figure 2** shows the CD Printer application data flow as a functional overview of the CD Printer AE's. As depicted in **Figure 2**, the CD Printer AE's incorporate the following functionality.

- After RWA Request Verification, the Storage Provider AE and Archive-Manager AE act as a C-ECHO SCP it receives a Verification request and responds successfully to the requesting SCU.
- After RWA Storage Data Flow, the Storage Provider AE acts as C-STORE SCP. It receives requests for instance storage from external AE, converts it into assigned destination transfer syntax and collects the instances on its disk.
- After RWA Forward Data Flow, the Distribution Manager AE acts as C-STORE SCU. It provides a non-standard service for dispatching instances that originate in one AE to one or more target AE(s). Once a data collection is ready for distribution, the Distribution Manager AE further checks to see if there are any Forward-Rules defined for the data collection. For each Forward-Rule that

the Distribution Manager AE found, the Distribution Manager AE initiates an association with the target AE and transmits the instances to it.

- Forwarding of received data to the Media AE is performed by the Distribution Manager AE according to special Forward-Rule.

The CD Printer stores received data only temporarily. The data is removed automatically after distribution (forwarding and/or media burning).

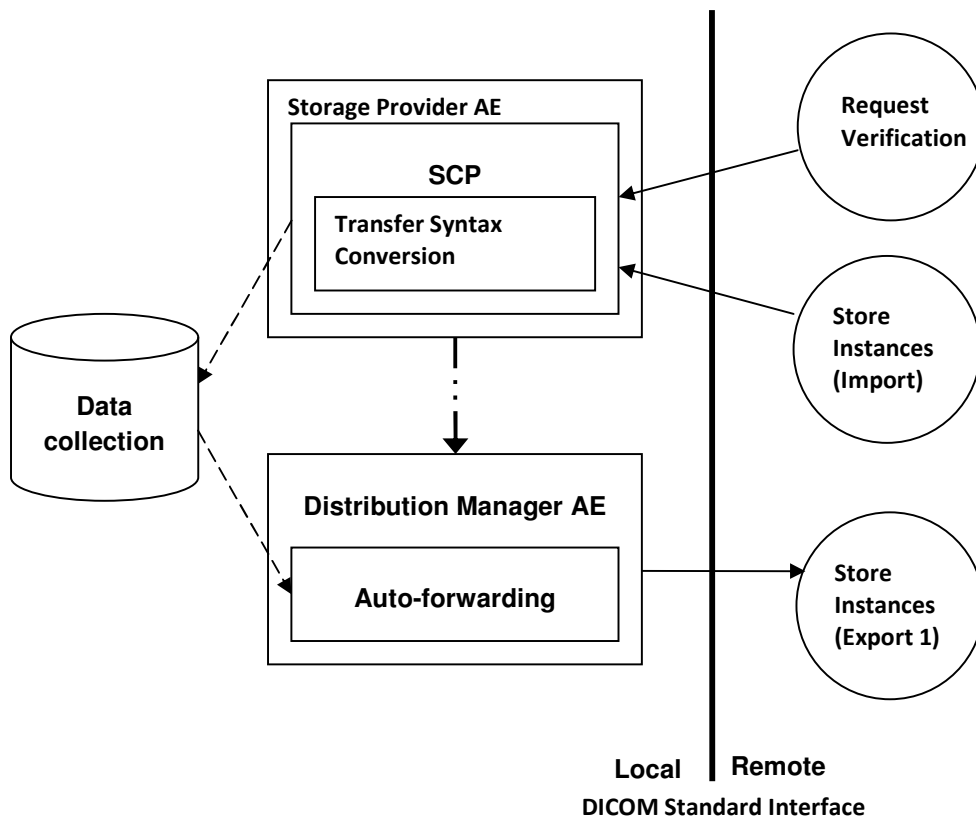


Figure 2: Networking Application Data Flow Diagram

4.1.2 FUNCTIONAL DEFINITION OF AE'S

This section describes in general the functions to be performed by the Application Entities (AE's), and the DICOM services used to accomplish these functions.

---

#### 4.1.2.1 FUNCTIONAL DEFINITION OF STORAGE PROVIDER AE

The Storage Provider constantly waits for association requests from external applications.

For each association it verifies the access privileges that was defined for the requesting AE, decides whether to accept the association runs in a separate thread.

The Storage Provider accepts association for verify connectivity and import instances.

##### Verification Service Class

The Storage Provider AE can perform the Verification service as SCP (RWA Request Verification).

A remote SCU shall request an association with the Storage Provider AE for Verification SOP class. After accepting the association, the AE shall receive and respond to the Verification request to check the network connection to the AE and make sure that the AE is up and running, and release the association when requested successfully.

##### Storage Service Class

The Storage Provider AE waits for incoming associations and can perform the Storage service as SCP (RWA Store Instances, Import).

Incoming associations are approved or rejected according to the settings in the Storage Provider AE control database.

A remote SCU shall request an association with the Storage Provider AE for Storage SOP classes. After accepting the association, the Storage Provider AE shall receive the Storage requests, store the data in the data collection storage, send the applicable Storage responses, and release the association when requested.

The received instances are divided into collections by patient identification for which Patient's Name (0010,0010) and Patient ID (0010,0020) are used.

The division can be passed round by sending of Storage requests to special AE Title that contains MULTIPATIENT key word. In the case all received from one remote SCU AE Title to the same special AE Title data will be collected into one data set. The collection can include examinations of different patients. The data can be sent in one or several associations. The collection will be closed in accordance to defined transmission completion Timeout.

The Storage Provider AE can convert received instances from source transfer syntax into destination transfer syntax, if this is assigned by configuration.

---

#### 4.1.2.2 FUNCTIONAL DEFINITION OF DISTRIBUTION MANAGER AE

The CD Printer provides a unique Forward-Rules feature that enables to use it as a DICOM network hub. When instances are stored, the CD Printer can forward these instances to other AE's according to these Forward-Rules. In this case the CD Printer acts as a C-STORE SCP (Storage Provider AE) and a C-STORE SCU (Distribution Manager AE).

The Distribution Manager AE can forward receive instances to one or more target AE(s).

Once a data collection is ready for distribution, the Distribution Manager AE further checks if there are any Forward-Rules defined for the data collection (for the called AE Title or received objects). For each Forward-Rule that the Distribution Manager AE found, the Distribution Manager AE initiates an association with the target AE and transmits the instances to it.

#### Storage Service Class

The Distribution Manager AE can perform the Storage service as SCU (RWA Store Instances, Export 1) if there are any Forward-Rules defined for the called AE Title or received objects.

The Distribution Manager AE shall request an association with the selected remote SCP for one applicable Storage SOP class. When the association is accepted, the Distribution Manager AE shall send the Storage request, receive the Storage responses and act accordingly, and release the association. Such sequence of actions will be repeated for each instance of the stored data collection.

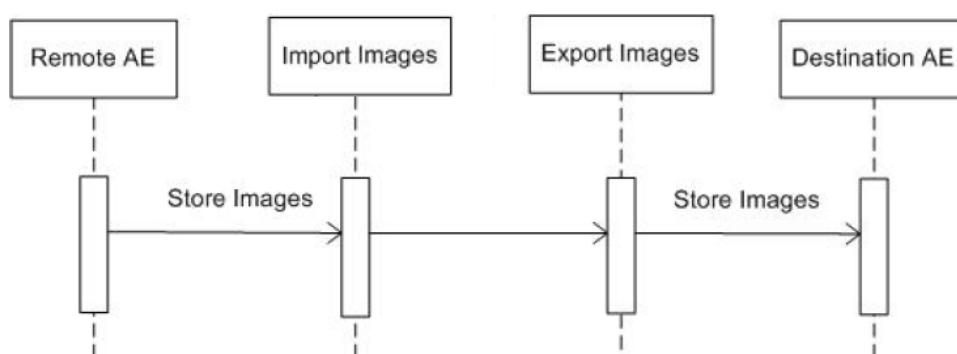
The Distribution Manager AE can forward receive from the Storage Provider AE data to the Media AE for CD producing and to the Archive-Manager AE for processing, populating its local database and storage of the data according to special Forward-Rule.

### 4.1.3 SEQUENCING OF REAL WORLD ACTIVITIES

This section contains a description of specific sequencing as well as potential constraints of Real-World Activities, including any applicable user interactions, as performed by AE-s of the CD Printer.

The CD Printer has no way of knowing when it has a complete study or what constitutes a complete study. If it receives an instance query while also receiving storage requests, the query response may not include all of the instances that are in the study. The completion of receiving data set is controlled by configurable transmission completion Timeout.

*Note: The transmission completion Timeout is not term defined by DICOM standard and is not described in the conformance statement. See CD PRINTER Administrator Guide for full explanation of the setting, it specification and usage.*



**Figure 3: RWA Sequencing for Retrieve Local Instances**

## 4.2 AE SPECIFICATIONS

### 4.2.1 STORAGE PROVIDER AE

Every detail of this specific Application Entity shall be completely specified under this section.

Depending on configuration, the Storage Provider AE may be accessible for remote AE simultaneously under several AE Titles, each representing the one Application Entity.

#### 4.2.1.1 SOP CLASSES

This Application Entity provides extended Standard Conformance to the following SOP classes.

| SOP Class   |                               | User of Service (SCU) | Provider of Service (SCP) |
|---|-------------------------------|-----------------------|---------------------------|
| Name  | UID                           |                       |                           |
| Hardcopy Grayscale Image Storage                          | 1.2.840.10008.5.1.1.29        | No                    | Yes                       |
| Hardcopy Color Image Storage                              | 1.2.840.10008.5.1.1.30        | No                    | Yes                       |
| Computed Radiography Image Storage                        | 1.2.840.10008.5.1.4.1.1.1     | No                    | Yes                       |
| Digital X-Ray Image Storage – For Presentation            | 1.2.840.10008.5.1.4.1.1.1.1   | No                    | Yes                       |
| Digital X-Ray Image Storage – For Processing              | 1.2.840.10008.5.1.4.1.1.1.1.1 | No                    | Yes                       |
| Digital Mammography Image Storage – For Presentation      | 1.2.840.10008.5.1.4.1.1.1.2   | No                    | Yes                       |
| Digital Mammography Image Storage – For Processing        | 1.2.840.10008.5.1.4.1.1.1.2.1 | No                    | Yes                       |
| Digital Intra-oral X-Ray Image Storage – For Presentation | 1.2.840.10008.5.1.4.1.1.1.3   | No                    | Yes                       |
| Digital Intra-oral X-Ray Image Storage – For Processing   | 1.2.840.10008.5.1.4.1.1.1.3.1 | No                    | Yes                       |
| CT Image Storage  | 1.2.840.10008.5.1.4.1.1.2     | No                    | Yes                       |
| Enhanced CT Image Storage                                 | 1.2.840.10008.5.1.4.1.1.2.1   | No                    | Yes                       |
| Ultrasound Multi-frame Image Storage (Retired)            | 1.2.840.10008.5.1.4.1.1.3     | No                    | Yes                       |
| Ultrasound Multi-frame Image Storage                      | 1.2.840.10008.5.1.4.1.1.3.1   | No                    | Yes                       |
| MR Image Storage  | 1.2.840.10008.5.1.4.1.1.4     | No                    | Yes                       |
| Enhanced MR Image Storage                                 | 1.2.840.10008.5.1.4.1.1.4.1   | No                    | Yes                       |
| MR Spectroscopy Storage                                   | 1.2.840.10008.5.1.4.1.1.4.2   | No                    | Yes                       |
| Nuclear Medicine Image Storage (Retired)                  | 1.2.840.10008.5.1.4.1.1.5     | No                    | Yes                       |
| Ultrasound Image Storage (Retired)                        | 1.2.840.10008.5.1.4.1.1.6     | No                    | Yes                       |
| Ultrasound Image Storage                                  | 1.2.840.10008.5.1.4.1.1.6.1   | No                    | Yes                       |

|  |                                  |    |     |
|--|----------------------------------|----|-----|
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7        | No | Yes |
| Multi-frame Single Bit Secondary Capture Image Storage *   | 1.2.840.10008.5.1.4.1.1.7.1      | No | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2      | No | Yes |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3      | No | Yes |
| Multi-frame True Color Secondary Capture Image Storage *   | 1.2.840.10008.5.1.4.1.1.7.4      | No | Yes |
| Standalone Overlay Storage *                               | 1.2.840.10008.5.1.4.1.1.8        | No | Yes |
| Standalone Curve Storage *                                 | 1.2.840.10008.5.1.4.1.1.9        | No | Yes |
| 12-lead ECG Waveform Storage *                             | 1.2.840.10008.5.1.4.1.1.9.1.1    | No | Yes |
| General ECG Waveform Storage *                             | 1.2.840.10008.5.1.4.1.1.9.1.2    | No | Yes |
| Ambulatory ECG Waveform Storage *                          | 1.2.840.10008.5.1.4.1.1.9.1.3    | No | Yes |
| Hemodynamic Waveform Storage *                             | 1.2.840.10008.5.1.4.1.1.9.2.1    | No | Yes |
| Cardiac Electrophysiology Waveform Storage *               | 1.2.840.10008.5.1.4.1.1.9.3.1    | No | Yes |
| Basic Voice Audio Waveform Storage *                       | 1.2.840.10008.5.1.4.1.1.9.4.1    | No | Yes |
| Standalone Modality LUT Storage *                          | 1.2.840.10008.5.1.4.1.1.10       | No | Yes |
| Standalone VOI LUT Storage *                               | 1.2.840.10008.5.1.4.1.1.11       | No | Yes |
| Grayscale Softcopy Presentation State Storage              | 1.2.840.10008.5.1.4.1.1.11.1     | No | Yes |
| Color Softcopy Presentation State Storage                  | 1.2.840.10008.5.1.4.1.1.11.2     | No | Yes |
| Pseudo-Color Softcopy Presentation State Storage           | 1.2.840.10008.5.1.4.1.1.11.3     | No | Yes |
| Blending Softcopy Presentation State Storage               | 1.2.840.10008.5.1.4.1.1.11.4     | No | Yes |
| X-Ray Angiographic Image Storage                           | 1.2.840.10008.5.1.4.1.1.12.1     | No | Yes |
| X-Ray Radio-fluoroscopic Image Storage                     | 1.2.840.10008.5.1.4.1.1.12.2     | No | Yes |
| X-Ray Angiographic Bi-Plane Image Storage (Retired)        | 1.2.840.10008.5.1.4.1.1.12.3     | No | Yes |
| Nuclear Medicine Image Storage                             | 1.2.840.10008.5.1.4.1.1.20       | No | Yes |
| Spatial Registration Storage *                             | 1.2.840.10008.5.1.4.1.1.66.1     | No | Yes |
| Spatial Fiducials Storage *                                | 1.2.840.10008.5.1.4.1.1.66.2     | No | Yes |
| VL Endoscopic Image Storage                                | 1.2.840.10008.5.1.4.1.1.77.1.1   | No | Yes |
| Video Endoscopic Image Storage                             | 1.2.840.10008.5.1.4.1.1.77.1.1.1 | No | Yes |
| VL Microscopic Image Storage                               | 1.2.840.10008.5.1.4.1.1.77.1.2   | No | Yes |
| Video Microscopic Image Storage                            | 1.2.840.10008.5.1.4.1.1.77.1.2.1 | No | Yes |
| VL Slide-Coordinates Microscopic Image Storage             | 1.2.840.10008.5.1.4.1.1.77.1.3   | No | Yes |
| VL Photographic Image Storage                              | 1.2.840.10008.5.1.4.1.1.77.1.4   | No | Yes |

|   |                                  |    |     |
|---|----------------------------------|----|-----|
| Video Photographic Image Storage *          | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | No | Yes |
| Ophthalmic Photography 8 Bit Image Storage  | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | No | Yes |
| Ophthalmic Photography 16 Bit Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.5.2 | No | Yes |
| Stereometric Relationship Storage *         | 1.2.840.10008.5.1.4.1.1.77.1.5.3 | No | Yes |
| Positron Emission Tomography Image Storage  | 1.2.840.10008.5.1.4.1.1.128      | No | Yes |
| RT Image Storage *                          | 1.2.840.10008.5.1.4.1.1.481.1    | No | Yes |
| RT Dose Storage *                           | 1.2.840.10008.5.1.4.1.1.481.2    | No | Yes |
| RT Structure Set Storage *                  | 1.2.840.10008.5.1.4.1.1.481.3    | No | Yes |
| RT Beams Treatment Record Storage *         | 1.2.840.10008.5.1.4.1.1.481.4    | No | Yes |
| RT Plan Storage *                           | 1.2.840.10008.5.1.4.1.1.481.5    | No | Yes |
| RT Brachy Treatment Record Storage *        | 1.2.840.10008.5.1.4.1.1.481.6    | No | Yes |
| RT Treatment Summary Record Storage *       | 1.2.840.10008.5.1.4.1.1.481.7    | No | Yes |
| Basic Text SR *                             | 1.2.840.10008.5.1.4.1.1.88.11    | No | Yes |
| Enhanced SR *                               | 1.2.840.10008.5.1.4.1.1.88.22    | No | Yes |
| Comprehensive SR *                          | 1.2.840.10008.5.1.4.1.1.88.33    | No | Yes |
| Mammography CAD SR *                        | 1.2.840.10008.5.1.4.1.1.88.50    | No | Yes |
| Key Object Selection Document *             | 1.2.840.10008.5.1.4.1.1.88.59    | No | Yes |
| Chest CAD SR *                              | 1.2.840.10008.5.1.4.1.1.88.65    | No | Yes |
| Verification                                | 1.2.840.10008.1.1                | No | Yes |

**Table 6: SOP Classes for Storage Provider AE**

*Note: Any SOP specific behavior is documented later in the Conformance Statement in the applicable SOP specific conformance section.*

*Note: Marked as \* SOP Class instances are not supported for viewing or presentation by DICOM media viewer software, only supported for storage.*

*Note: Enhanced IOD Modules, Synchronization, Cardiac Synchronization, Respiratory Synchronization, Bulk Motion Synchronization, Supplemental Palette Color Lookup Table, Multi-frame Functional Groups, Multi-frame Dimension, MR Pulse Sequence and XA/XRF Multi-frame Presentation are not supported for viewing or presentation, only supported for storage. Some of them are supported partially.*

#### 4.2.1.2 ASSOCIATION POLICIES

This section contains a description of the General Association Establishment and Acceptance policies of the AE.

#### 4.2.1.2.1 GENERAL

---

Storage Provider accepts Associations for the following purposes:

- To allow remote applications to verify application level communication with Storage Provider; refer to [Request Verification](#) section.
- To allow remote applications to store instances in the Storage Provider database (i.e. instance import); refer to [Store Instances \(Import\)](#) section.

The maximum PDU size, which can be received the Storage Provider, is configurable (default value is 16kBytes).

|                          |                       |
|--------------------------|-----------------------|
| Application Context Name | 1.2.840.10008.3.1.1.1 |
|--------------------------|-----------------------|

**Table 7: DICOM Application Context**

#### 4.2.1.2.2 NUMBER OF ASSOCIATIONS

---

The Storage Provider manages an association resources pool. Each incoming association is assigned to one of the pool members. The size of this pool is configurable and the maximum size is limited only by the underlying operating system and by hardware limits (default is 5).

When the maximum number of associations is reached, Storage Provider will reject associations.

|   |              |
|---|--------------|
| Maximum number of simultaneous associations | Configurable |
|---|--------------|

**Table 8: Number of Associations as an Association Acceptor for Storage Provider**

Nevertheless, the number of simultaneous associations shall be limited by the available resources (CPU, memory, disk space).

#### 4.2.1.2.3 ASYNCHRONOUS NATURE

---

Asynchronous communication is not supported.

#### 4.2.1.2.4 IMPLEMENTATION IDENTIFYING INFORMATION

---

Following Implementation Class UID and Version Name are defined.



|                              |                           |
|------------------------------|---------------------------|
| Implementation Class UID     | 1.2.826.0.1.3680043.8.195 |
| Implementation Version Name: | CDP_V3                    |

**Table 9: DICOM Implementation Class and Version for Storage Provider AE**

---

#### 4.2.1.3 ASSOCIATION INITIATION POLICY

Storage Provider never initiates an association.

---

#### 4.2.1.4 ASSOCIATION ACCEPTANCE POLICY

Storage Provider shall accept Associations for the following purposes:

- To allow remote applications to verify application level communication with Storage Provider; refer to [Request Verification](#) section.
- To allow remote applications to store instances in the Storage Provider database (i.e. instance import); refer to [Store Instances \(Import\)](#) section.

The Storage Provider will acknowledge an association from an external AE if the following conditions are met all conditions:

- The association request application context is DICOM,
- The requesting AE title is configured in the Storage Provider control database,
- The requesting AE network node matches the configured node,
- The responding AE title in the association request matches the one of defined Storage Provider AE titles,
- The number of active associations has not reached the maximum concurrent associations limit.

---

#### 4.2.1.4.1 REQUEST VERIFICATION

---

##### 4.2.1.4.1.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

The Storage Provider AE shall accept associations from systems that wish to verify application level communication using the C-ECHO command.

The real-world activity associated with the C-ECHO request is verification activity made by an external AE wishing to verify that the network connection is operating properly and that the Storage Provider is up and running.

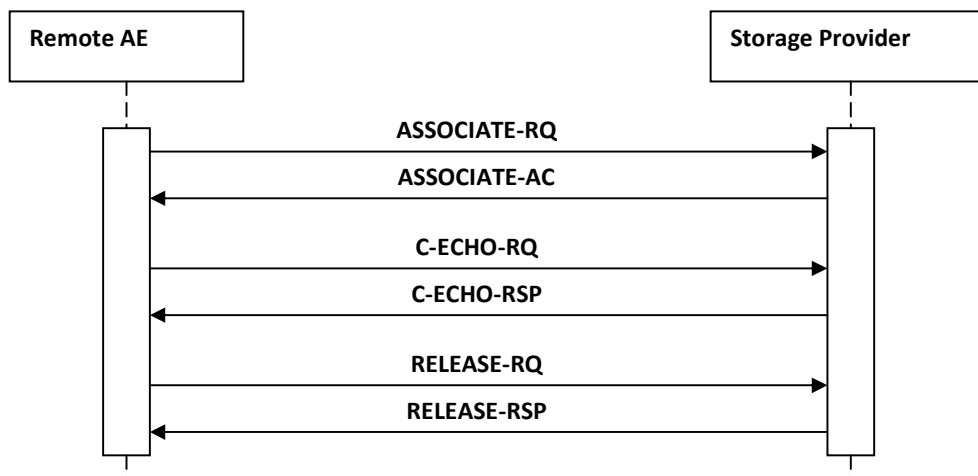


Figure 4: Sequencing of RWA Request Verification

#### 4.2.1.4.1.2 ACCEPTED PRESENTATION CONTEXTS

The Storage Provider will accept any number of Verification SOP classes that are listed in **Table 6**, provided that the requesting application is configured and granted storage access.

The Storage Provider accepts presentation contexts with multiple transfer syntaxes, presentation contexts differing only by their transfer syntax as well as duplicate presentation contexts.

There is no check for duplicate contexts, and these will therefore be accepted.

The Storage Provider does not limit the number of accepted presentation contexts.

In the unlikely event that the Storage Provider runs out of resources while trying to accept multiple presentation contexts, the Storage Provider will gracefully reject the association.

The Storage Provider shall be able to accept the presentation contexts as specified in **Table 10**.

| Presentation Context Table |                   |                 |  |      |                      |
|----------------------------|-------------------|-----------------|--|------|----------------------|
| Abstract Syntax            |                   | Transfer Syntax |  | Role | Extended Negotiation |
| Name                       | UID               | Name List       | UID List                                 |      |                      |
| Verification               | 1.2.840.10008.1.1 | ILE<br>ELE      | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCP  | None                 |

**Table 10: Acceptable Presentation Contexts for Request Verification**

#### 4.2.1.4.1.3 SOP SPECIFIC CONFORMANCE FOR SOP CLASS VERIFICATION

---

The Storage Provider AE provides standard conformance to the Verification service class.

#### 4.2.1.4.2 STORE INSTANCES (IMPORT)

---

##### 4.2.1.4.2.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

---

The Storage Provider AE shall accept associations from systems that wish to store instances in the data collection storage using the C-STORE command to store the instances on the Storage Provider disk.

The instances are divided into collections by patient identification for which Patient's Name (0010,0010) and Patient ID (0010,0020) are used.

The Storage Provider AE will issue a failure status in the following cases:

- The Storage Provider AE is unable to store the instances on the disk.
- The SOP class used for transmission does not match the instance structure and data.

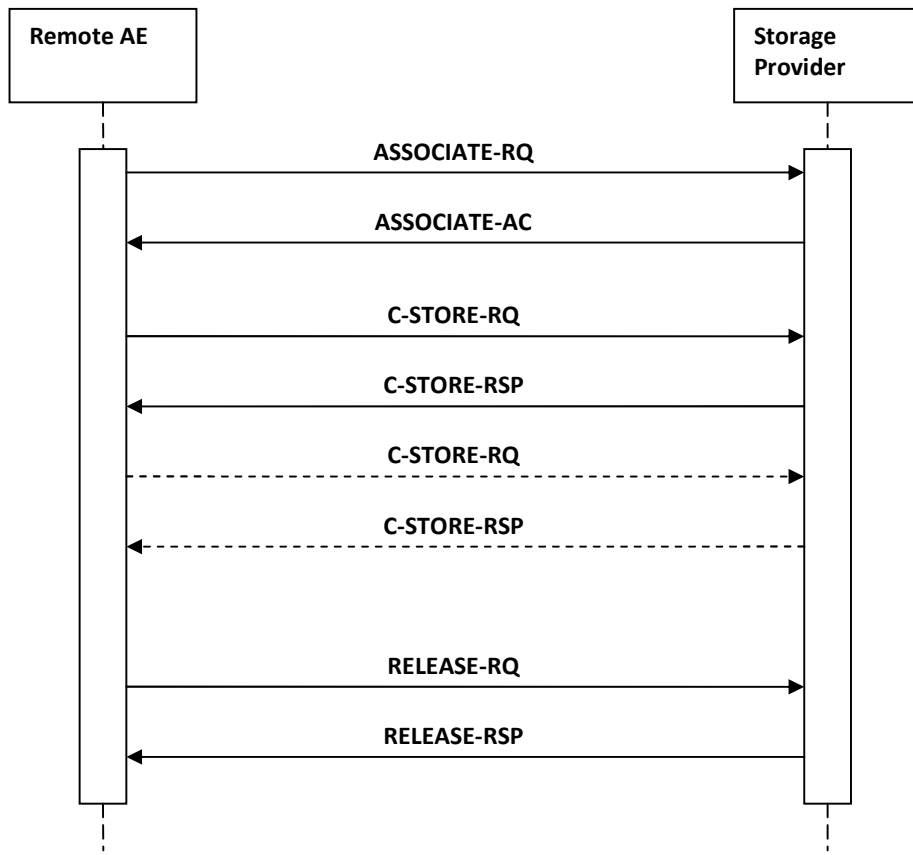


Figure 5: Sequencing of RWA Store Instances (Import)

4.2.1.4.2.2 ACCEPTED PRESENTATION CONTEXTS

The Storage Provider AE will accept any number of Storage SOP Classes that are listed in **Table 11**, provided that the requesting application configured and granted storage access.

| Presentation Context Table                                |                               |   |   |      |                      |
|---|-------------------------------|---|---|------|----------------------|
| Abstract Syntax   |                               | Transfer Syntax                                     |   | Role | Extended Negotiation |
| Name  | UID                           | Name List (note)                                    | UID List  |      |                      |
| Computed Radiography Image Storage                        | 1.2.840.10008.5.1.4.1.1.1     | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| Digital X-Ray Image Storage – for Presentation            | 1.2.840.10008.5.1.4.1.1.1.1   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| Digital X-Ray Image Storage – for Processing              | 1.2.840.10008.5.1.4.1.1.1.1.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| Digital Mammography Image Storage - for Presentation      | 1.2.840.10008.5.1.4.1.1.1.2   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| Digital Mammography Image Storage - for Processing        | 1.2.840.10008.5.1.4.1.1.1.2.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| Digital Intra-oral X-Ray Image Storage - for Presentation | 1.2.840.10008.5.1.4.1.1.1.3   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| Digital Intra-oral X-Ray Image Storage - for Processing   | 1.2.840.10008.5.1.4.1.1.1.3.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP  | None                 |
| CT Image Storage  | 1.2.840.10008.5.1.4.1.1.2     | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP  | None                 |

|  |                             |   |   |     |      |
|--|-----------------------------|---|---|-----|------|
|  |                             | Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE               | 1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5   |     |      |
| Enhanced CT Image Storage                      | 1.2.840.10008.5.1.4.1.1.2.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Ultrasound Multi-frame Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.3   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Ultrasound Multi-frame Image Storage           | 1.2.840.10008.5.1.4.1.1.3.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| MR Image Storage                               | 1.2.840.10008.5.1.4.1.1.4   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Enhanced MR Image Storage                      | 1.2.840.10008.5.1.4.1.1.4.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| MR Spectroscopy Storage                        | 1.2.840.10008.5.1.4.1.1.4.2 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Nuclear Medicine Image Storage (Retired)       | 1.2.840.10008.5.1.4.1.1.5   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Ultrasound Image Storage (Retired)             | 1.2.840.10008.5.1.4.1.1.6   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Ultrasound Image Storage                       | 1.2.840.10008.5.1.4.1.1.6.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12                   | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51  | SCP | None |

|   |                               |   |   |     |      |
|---|-------------------------------|---|---|-----|------|
|   |                               | JPEG LL<br>RLE                                      | 1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5   |     |      |
| Secondary<br>Capture Image<br>Storage                               | 1.2.840.10008.5.1.4.1.1.7     | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Multi-frame Single<br>Bit Secondary<br>Capture Image<br>Storage     | 1.2.840.10008.5.1.4.1.1.7.1   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Multi-frame Single<br>Byte Secondary<br>Capture Image<br>Storage    | 1.2.840.10008.5.1.4.1.1.7.2   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Multi-frame Grayscale<br>Word Secondary<br>Capture Image<br>Storage | 1.2.840.10008.5.1.4.1.1.7.3   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Multi-frame True<br>Color Secondary<br>Capture Image<br>Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Standalone<br>Overlay Storage                                       | 1.2.840.10008.5.1.4.1.1.8     | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Standalone Curve<br>Storage   | 1.2.840.10008.5.1.4.1.1.9     | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| 12-lead ECG<br>Waveform Storage                                     | 1.2.840.10008.5.1.4.1.1.9.1.1 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| General ECG<br>Waveform Storage                                     | 1.2.840.10008.5.1.4.1.1.9.1.2 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Ambulatory ECG<br>Waveform Storage                                  | 1.2.840.10008.5.1.4.1.1.9.1.3 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Hemodynamic<br>ECG Waveform<br>Storage                              | 1.2.840.10008.5.1.4.1.1.9.2.1 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Cardiac<br>Electrophysiology<br>Waveform Storage                    | 1.2.840.10008.5.1.4.1.1.9.3.1 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Basic Voice Audio<br>Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.4.1 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |

|  |                              |   |   |     |      |
|--|------------------------------|---|---|-----|------|
| Standalone modality LUT Storage                  | 1.2.840.10008.5.1.4.1.1.10   | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Standalone VOI LUT Storage                       | 1.2.840.10008.5.1.4.1.1.11   | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Grayscale Softcopy Presentation State Storage    | 1.2.840.10008.5.1.4.1.1.11.1 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Color Softcopy Presentation State Storage        | 1.2.840.10008.5.1.4.1.1.11.2 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Pseudo-Color Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.3 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Blending Softcopy Presentation State Storage     | 1.2.840.10008.5.1.4.1.1.11.4 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| X-Ray Angiographic Image Storage                 | 1.2.840.10008.5.1.4.1.1.12.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| X-Ray Radio-fluoroscopic Image Storage           | 1.2.840.10008.5.1.4.1.1.12.2 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Nuclear Medicine Image Storage                   | 1.2.840.10008.5.1.4.1.1.20   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Hardcopy Grayscale Image Storage                 | 1.2.840.10008.5.1.1.29       | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Hardcopy Color Image Storage                     | 1.2.840.10008.5.1.1.30       | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Spatial Registration Storage                     | 1.2.840.10008.5.1.4.1.1.66.1 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |



|  |                                  |   |   |     |      |
|--|----------------------------------|---|---|-----|------|
| Spatial Fiducials Storage                      | 1.2.840.10008.5.1.4.1.1.66.2     | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| VL Endoscopic Image Storage                    | 1.2.840.10008.5.1.4.1.1.77.1.1   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Video Endoscopic Image Storage                 | 1.2.840.10008.5.1.4.1.1.77.1.1.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| VL Microscopic Image Storage                   | 1.2.840.10008.5.1.4.1.1.77.1.2   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Video Microscopic Image Storage                | 1.2.840.10008.5.1.4.1.1.77.1.2.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| VL Slide-Coordinates Microscopic Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.3   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| VL Photographic Image Storage                  | 1.2.840.10008.5.1.4.1.1.77.1.4   | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Video Photographic Image Storage               | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Ophthalmic Photographic 8 Bit Image Storage    | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| Ophthalmic Photographic 16                     | 1.2.840.10008.5.1.4.1.1.77.1.5.2 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |

|  |                                  |   |   |     |      |
|--|----------------------------------|---|---|-----|------|
| Bit Image Storage                          |                                  | Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE               | 1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5   |     |      |
| Stereometric Relationship Storage          | 1.2.840.10008.5.1.4.1.1.77.1.5.3 | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Positron Emission Tomography Image Storage | 1.2.840.10008.5.1.4.1.1.128      | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| RT Image Storage                           | 1.2.840.10008.5.1.4.1.1.481.1    | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| RT Dose Storage                            | 1.2.840.10008.5.1.4.1.1.481.2    | ILE<br>ELE<br>Lossy 8<br>Lossy 12<br>JPEG LL<br>RLE | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1<br>1.2.840.10008.1.2.4.50<br>1.2.840.10008.1.2.4.51<br>1.2.840.10008.1.2.4.70<br>1.2.840.10008.1.2.5 | SCP | None |
| RT Structure Set Storage                   | 1.2.840.10008.5.1.4.1.1.481.3    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| RT Beams Treatment Record Storage          | 1.2.840.10008.5.1.4.1.1.481.4    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| RT Plan Storage                            | 1.2.840.10008.5.1.4.1.1.481.5    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| RT Brachy Treatment Record Storage         | 1.2.840.10008.5.1.4.1.1.481.6    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| RT Treatment Summary Record Storage        | 1.2.840.10008.5.1.4.1.1.481.7    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Basic Text SR                              | 1.2.840.10008.5.1.4.1.1.88.11    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Enhanced SR                                | 1.2.840.10008.5.1.4.1.1.88.22    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Comprehensive SR                           | 1.2.840.10008.5.1.4.1.1.88.33    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Mammography CAD SR                         | 1.2.840.10008.5.1.4.1.1.88.50    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Key Object Selection Document              | 1.2.840.10008.5.1.4.1.1.88.59    | ILE<br>ELE  | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1  | SCP | None |
| Chest CAD SR                               | 1.2.840.10008.5.1.4.1.1.88.65    | ILE   | 1.2.840.10008.1.2   | SCP | None |

|  |  |     |                     |  |  |
|--|--|-----|---------------------|--|--|
|  |  | ELE | 1.2.840.10008.1.2.1 |  |  |
|--|--|-----|---------------------|--|--|

**Table 11: Acceptable Presentation Contexts for Store Instances (Import)**

*Note: Read for Lossy 8 = JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression.*

*Read for Lossy 12 = JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only).*

*Read for JPEG LL = JPEG Lossless Compression (Process 14).*

*Read for RLE = RLE Compression.*

The Storage Provider accepts presentation contexts with multiple transfer syntaxes, the presentation contexts differing only by their Transfer Syntax as well as duplicate presentation contexts.

There is no check for duplicate contexts, and these will therefore be accepted.

The Storage Provider AE does not limit the number of accepted presentation contexts.

In the unlikely event that the Storage Provider AE runs out of resources while trying to accept multiple presentation contexts, the CD Printer will gracefully reject the association.

The Storage Provider AE supports Transfer Syntaxes for Storage as can be seen in **Table 11**, and supports for all other SOP Classes, other than Storage only the ILE and ELE Transfer Syntaxes, as can be seen in **Table 4**.

On accepting of presentation contexts with multiple transfer syntaxes the Storage Provider selects proposed Transfer Syntax that loads network less (Usually it is *JPEG Extended (Process 2 & 4)* Transfer Syntax). It is responsibility of device specialists for proper configuration of sending DICOM devices to provide DICOM images within lossy, lossless or native format.

#### 4.2.1.4.2.3 SOP SPECIFIC CONFORMANCE FOR STORAGE SOP CLASSES

The DICOM standard does not guarantee that the Storage Provider AE applications can process the received instances. This depends on the presence and consistency of a set of attributes in these instances. The conditions for running the Storage Provider AE applications shall be specified in separate Annexes.

The Storage Provider AE conforms to the SOP's of the Storage Service Class at Level 2 (Full) conformance.

The Storage Provider AE does not attempt any extended negotiation.

The Storage Provider AE does not discard any elements.

The Storage Provider takes no further action in case of warnings or errors in the C-STORE operations. The store response status is saved in the extended log.

After instances receiving Storage Provider AE can convert the transfer syntax according to **Table 12**.

| Transfer Syntax               | Received Source | ILE | ELE | RLE | JPEG Lossless | JPEG Baseline (Process 1) | JPEG Extended (Process 2 & 4) |
|-------------------------------|-----------------|-----|-----|-----|---------------|---------------------------|-------------------------------|
| Stored Destination            |                 |     |     |     |               |                           |                               |
| ILE                           |                 | N/A | +   | +   | +             | +                         | +                             |
| ELE                           |                 | +   | N/A | +   | +             | +                         | +                             |
| RLE                           |                 | +   | +   | N/A | -             | -                         | -                             |
| JPEG Lossless                 |                 | +   | +   | -   | N/A           | +                         | +                             |
| JPEG Baseline (Process 1)     |                 | -   | -   | -   | -             | N/A                       | -                             |
| JPEG Extended (Process 2 & 4) |                 | -   | -   | -   | -             | -                         | N/A                           |

**Table 12: Transfer Syntax Conversion**

*Note: JPEG Lossless, Non-Hierarchical, First-Order Prediction (Process 14 [Selection Value 1]): Default Transfer Syntax for Lossless JPEG Image Compression.*

*JPEG Baseline (Process 1): Default Transfer Syntax for Lossy JPEG 8 Bit Image Compression.*

*JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only).*

**Table 13** gives an overview of the image formats that can be stored.

| Photometric Interpretation | Storage | Viewing |
|----------------------------|---------|---------|
| MONOCHROME1                | +       | N/A     |
| MONOCHROME2                | +       | N/A     |
| RGB                        | +       | N/A     |
| YBR_FULL                   | +       | N/A     |
| YBR_FULL_422               | +       | N/A     |
| PALETTE COLOR              | +       | N/A     |
| Other                      | +       | N/A     |

**Table 13: Support for Photometric Interpretation**

*Note: The Storage Provider AE does not have internal viewing option.*

Following are the details regarding the specific conformance, including response behavior to all applicable status codes, both from an application level and communication errors.

| Service Status | Further Meaning     | Error Code | Behavior  |
|----------------|---------------------|------------|---|
| Success        | Storage is complete | 0000       | The instance(s) shall be stored in the CD Printer database.   |
| Error          | Cannot understand   | C000       | The instance(s) cannot be parsed. Storage Provider shall send a notification, log the condition, and wait next store request. |

**Table 14: DICOM Command Response Status Handling Behavior**

| Exception                | Behavior   |
|--------------------------|--|
| ARTIM Time-out           | The association shall be dropped. Storage Provider waits next association. |
| Association Time-out SCU | The association shall be dropped. Storage Provider waits next association. |
| Association aborted      | The association shall be dropped. Storage Provider waits next association. |

**Table 15: DICOM Command Communication Failure Behavior**

#### 4.2.2 DISTRIBUTION MANAGER AE

Every detail of this specific Application Entity shall be completely specified under this section.

*Note: Configuring of Storage Provider AE to convert format of received data from original Transfer Syntax to Implicit Little Endian is compulsory condition for usage of data distribution via DICOM protocol.*

##### 4.2.2.1 SOP CLASSES

This Application Entity provides Standard Conformance to the following SOP classes.

| SOP Class   |                               | User of Service (SCU) | Provider of Service (SCP) |
|---|-------------------------------|-----------------------|---------------------------|
| Name  | UID                           |                       |                           |
| Hardcopy Grayscale Image Storage                          | 1.2.840.10008.5.1.1.29        | Yes                   | No                        |
| Hardcopy Color Image Storage                              | 1.2.840.10008.5.1.1.30        | Yes                   | No                        |
| Computed Radiography Image Storage                        | 1.2.840.10008.5.1.4.1.1.1     | Yes                   | No                        |
| Digital X-Ray Image Storage – For Presentation            | 1.2.840.10008.5.1.4.1.1.1.1   | Yes                   | No                        |
| Digital X-Ray Image Storage – For Processing              | 1.2.840.10008.5.1.4.1.1.1.1.1 | Yes                   | No                        |
| Digital Mammography Image Storage – For Presentation      | 1.2.840.10008.5.1.4.1.1.1.2   | Yes                   | No                        |
| Digital Mammography Image Storage – For Processing        | 1.2.840.10008.5.1.4.1.1.1.2.1 | Yes                   | No                        |
| Digital Intra-oral X-Ray Image Storage – For Presentation | 1.2.840.10008.5.1.4.1.1.1.3   | Yes                   | No                        |
| Digital Intra-oral X-Ray Image Storage – For Processing   | 1.2.840.10008.5.1.4.1.1.1.3.1 | Yes                   | No                        |

|  |                               |     |    |
|--|-------------------------------|-----|----|
| CT Image Storage   | 1.2.840.10008.5.1.4.1.1.2     | Yes | No |
| Enhanced CT Image Storage                                  | 1.2.840.10008.5.1.4.1.1.2.1   | Yes | No |
| Ultrasound Multi-frame Image Storage (Retired)             | 1.2.840.10008.5.1.4.1.1.3     | Yes | No |
| Ultrasound Multi-frame Image Storage                       | 1.2.840.10008.5.1.4.1.1.3.1   | Yes | No |
| MR Image Storage   | 1.2.840.10008.5.1.4.1.1.4     | Yes | No |
| Enhanced MR Image Storage                                  | 1.2.840.10008.5.1.4.1.1.4.1   | Yes | No |
| MR Spectroscopy Storage                                    | 1.2.840.10008.5.1.4.1.1.4.2   | Yes | No |
| Nuclear Medicine Image Storage (Retired)                   | 1.2.840.10008.5.1.4.1.1.5     | Yes | No |
| Ultrasound Image Storage (Retired)                         | 1.2.840.10008.5.1.4.1.1.6     | Yes | No |
| Ultrasound Image Storage                                   | 1.2.840.10008.5.1.4.1.1.6.1   | Yes | No |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7     | Yes | No |
| Multi-frame Single Bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1   | Yes | No |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2   | Yes | No |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3   | Yes | No |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | Yes | No |
| Standalone Overlay Storage                                 | 1.2.840.10008.5.1.4.1.1.8     | Yes | No |
| Standalone Curve Storage                                   | 1.2.840.10008.5.1.4.1.1.9     | Yes | No |
| 12-lead ECG Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.1.1 | Yes | No |
| General ECG Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.1.2 | Yes | No |
| Ambulatory ECG Waveform Storage                            | 1.2.840.10008.5.1.4.1.1.9.1.3 | Yes | No |
| Hemodynamic Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.2.1 | Yes | No |
| Cardiac Electrophysiology Waveform Storage                 | 1.2.840.10008.5.1.4.1.1.9.3.1 | Yes | No |
| Basic Voice Audio Waveform Storage                         | 1.2.840.10008.5.1.4.1.1.9.4.1 | Yes | No |
| Standalone Modality LUT Storage                            | 1.2.840.10008.5.1.4.1.1.10    | Yes | No |
| Standalone VOI LUT Storage                                 | 1.2.840.10008.5.1.4.1.1.11    | Yes | No |
| Grayscale Softcopy Presentation State Storage              | 1.2.840.10008.5.1.4.1.1.11.1  | Yes | No |
| Color Softcopy Presentation State Storage                  | 1.2.840.10008.5.1.4.1.1.11.2  | Yes | No |
| Pseudo-Color Softcopy Presentation State Storage           | 1.2.840.10008.5.1.4.1.1.11.3  | Yes | No |
| Blending Softcopy Presentation State Storage               | 1.2.840.10008.5.1.4.1.1.11.4  | Yes | No |
| X-Ray Angiographic Image Storage                           | 1.2.840.10008.5.1.4.1.1.12.1  | Yes | No |
| X-Ray Radio-fluoroscopic Image Storage                     | 1.2.840.10008.5.1.4.1.1.12.2  | Yes | No |

|   |                                  |     |    |
|---|----------------------------------|-----|----|
| X-Ray Angiographic Bi-Plane Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.12.3     | Yes | No |
| Nuclear Medicine Image Storage                      | 1.2.840.10008.5.1.4.1.1.20       | Yes | No |
| Spatial Registration Storage                        | 1.2.840.10008.5.1.4.1.1.66.1     | Yes | No |
| Spatial Fiducials Storage                           | 1.2.840.10008.5.1.4.1.1.66.2     | Yes | No |
| VL Endoscopic Image Storage                         | 1.2.840.10008.5.1.4.1.1.77.1.1   | Yes | No |
| Video Endoscopic Image Storage                      | 1.2.840.10008.5.1.4.1.1.77.1.1.1 | Yes | No |
| VL Microscopic Image Storage                        | 1.2.840.10008.5.1.4.1.1.77.1.2   | Yes | No |
| Video Microscopic Image Storage                     | 1.2.840.10008.5.1.4.1.1.77.1.2.1 | Yes | No |
| VL Slide-Coordinates Microscopic Image Storage      | 1.2.840.10008.5.1.4.1.1.77.1.3   | Yes | No |
| VL Photographic Image Storage                       | 1.2.840.10008.5.1.4.1.1.77.1.4   | Yes | No |
| Video Photographic Image Storage                    | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | Yes | No |
| Ophthalmic Photography 8 Bit Image Storage          | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | Yes | No |
| Ophthalmic Photography 16 Bit Image Storage         | 1.2.840.10008.5.1.4.1.1.77.1.5.2 | Yes | No |
| Stereometric Relationship Storage                   | 1.2.840.10008.5.1.4.1.1.77.1.5.3 | Yes | No |
| Positron Emission Tomography Image Storage          | 1.2.840.10008.5.1.4.1.1.128      | Yes | No |
| RT Image Storage                                    | 1.2.840.10008.5.1.4.1.1.481.1    | Yes | No |
| RT Dose Storage                                     | 1.2.840.10008.5.1.4.1.1.481.2    | Yes | No |
| RT Structure Set Storage                            | 1.2.840.10008.5.1.4.1.1.481.3    | Yes | No |
| RT Beams Treatment Record Storage                   | 1.2.840.10008.5.1.4.1.1.481.4    | Yes | No |
| RT Plan Storage                                     | 1.2.840.10008.5.1.4.1.1.481.5    | Yes | No |
| RT Brachy Treatment Record Storage                  | 1.2.840.10008.5.1.4.1.1.481.6    | Yes | No |
| RT Treatment Summary Record Storage                 | 1.2.840.10008.5.1.4.1.1.481.7    | Yes | No |
| Basic Text SR                                       | 1.2.840.10008.5.1.4.1.1.88.11    | Yes | No |
| Enhanced SR   | 1.2.840.10008.5.1.4.1.1.88.22    | Yes | No |
| Comprehensive SR                                    | 1.2.840.10008.5.1.4.1.1.88.33    | Yes | No |
| Mammography CAD SR                                  | 1.2.840.10008.5.1.4.1.1.88.50    | Yes | No |
| Key Object Selection Document                       | 1.2.840.10008.5.1.4.1.1.88.59    | Yes | No |
| Chest CAD SR  | 1.2.840.10008.5.1.4.1.1.88.65    | Yes | No |
| Verification  | 1.2.840.10008.1.1                | Yes | No |

**Table 16: SOP Classes for Distribution Manager AE**

*Note: Any SOP specific behavior is documented later in the Conformance Statement in the applicable SOP specific conformance section.*

#### 4.2.2.2 ASSOCIATION POLICIES

This section contains a description of the General Association Establishment and Acceptance policies of the AE.

##### 4.2.2.2.1 GENERAL

The Distribution Manager AE will initiate associations as a result of Forward-Rules.

The Distribution Manager AE attempts to establish an association once. If this attempt fails or if the association is unexpectedly terminated, the Distribution Manager AE tries to establish an association for next exporting instance. After last instance export attempt the Distribution Manager AE displays a transferring error in the GUI and stops the related activity if only for one instance the store operation fails. The Distribution Manager AE will retry the forwarding operation during the time interval, as written in the Distribution Manager AE configuration file.

The maximum PDU size, which can be transmitted by the CD Printer, is 16kBytes.

|                          |                       |
|--------------------------|-----------------------|
| Application Context Name | 1.2.840.10008.3.1.1.1 |
|--------------------------|-----------------------|

**Table 17: DICOM Application Context**

##### 4.2.2.2.2 NUMBER OF ASSOCIATIONS

The Distribution Manager will not initiate more than one association. The association may be used to issue store request.

|   |   |
|---|---|
| Maximum number of simultaneous associations | 1 |
|---|---|

**Table 18: Number of Associations as an Association Initiator for Distribution Manager**

##### 4.2.2.2.3 ASYNCHRONOUS NATURE

Asynchronous communication is not supported.

##### 4.2.2.2.4 IMPLEMENTATION IDENTIFYING INFORMATION

Following Implementation Class UID and Version Name are defined.

|                              |                             |
|------------------------------|-----------------------------|
| Implementation Class UID     | 1.2.840.113704.7.1.20011113 |
| Implementation Version Name: | CDP_LTD_V1                  |

**Table 19: DICOM Implementation Class and Version for Distribution Manager AE**



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#### 4.2.2.3 ASSOCIATION INITIATION POLICY

Distribution Manager shall initiate associations in the following cases:

- As a result of a received data collection for which there is an active Forward-Rule, the Distribution Manager will attempt to initiate an association to the target AE and transmit the instances to it.
- Multiple Forward-Rules can be defined for a data collection.
- Forward-Rules are processed in sequence post the association termination.

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##### 4.2.2.3.1 STORE INSTANCES (EXPORT 1)

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###### 4.2.2.3.1.1 DESCRIPTION AND SEQUENCING OF ACTIVITIES

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The RWA Store Instances (Export 1) involves the storage of instances from the local Storage Provider data collection storage to a remote system.

The Distribution Manager AE initiates Store Instances (Export 1) after receiving of data collection from an external AE by Storage Provider AE for which collection or data there is one or more active Forward-Rules defined in the Distribution Manager control database.

Forward-Rules make the CD Printer act as a hub in the DICOM applications network. This mechanism enables the distribution of instances that originate from one AE to other AE's.

Once a data collection is render to Distribution Manager AE, the AE checks if there are any active Forward-Rules for the called AE Title or received objects.

For each Forward-Rule that the Distribution Manager AE found, it initiates an association with the target AE stated in that rule and transmits the instances to it.

The associations will be initiated in sequence, one after the other for each instance within data collection.

The sending process will be repeated for each target AE.

If several Forward-Rules direct to Distribution Manager to send one data collection to one target AE, the collection will be sent to the target AE once.

The Distribution Manager AE attempts to forward the instance once. If this attempt fails, the Distribution Manager AE tries to forward the next instance. After last instance export attempt the Distribution Manager AE displays a transferring error in the GUI and stops the related activity if only for a one instance the store operation fails.

The Distribution Manager AE will retry to forward the whole instance collection during the time interval, as written in the Distribution Manager AE configuration file.

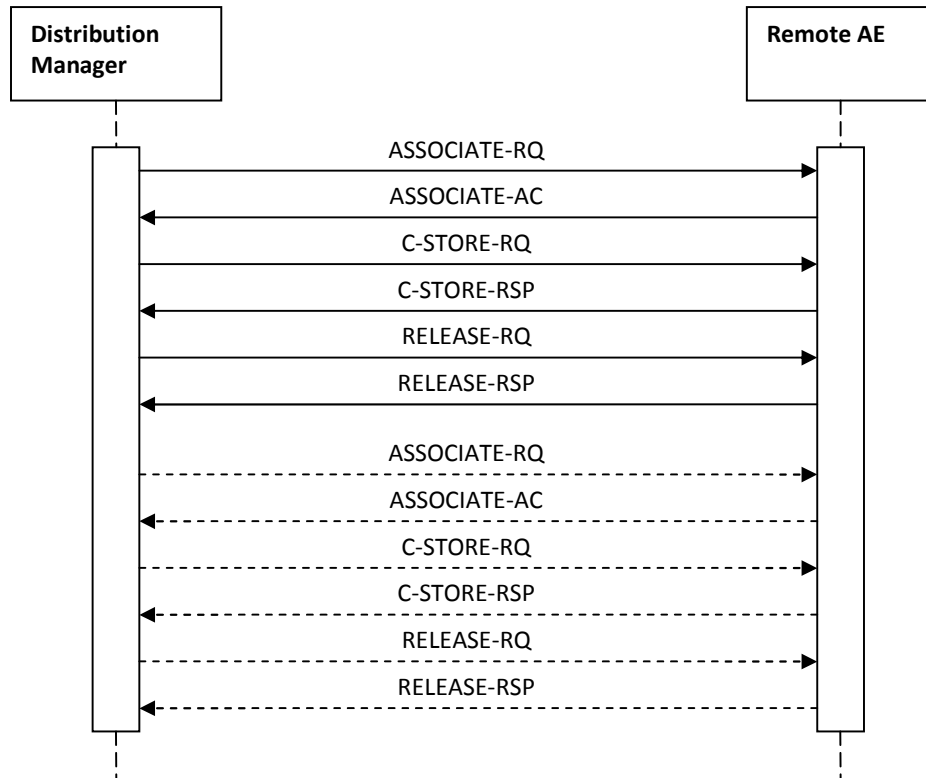


Figure 6: Sequencing of RWA Store Instances (Export 1)

4.2.2.3.1.2 PROPOSED PRESENTATION CONTEXTS

Each time an association is initiated, the association initiator proposes one Presentation Context to be used on that association. The Presentation Contexts proposed by the Distribution Manager AE for export instances are defined in **Table 20**.

| Presentation Context Table                                |                               |                  |                   |      |                      |
|---|-------------------------------|------------------|-------------------|------|----------------------|
| Abstract Syntax   |                               | Transfer Syntax  |                   | Role | Extended Negotiation |
| Name  | UID                           | Name List (note) | UID List          |      |                      |
| Computed Radiography Image Storage                        | 1.2.840.10008.5.1.4.1.1.1     | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Digital X-Ray Image Storage – for Presentation            | 1.2.840.10008.5.1.4.1.1.1.1   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Digital X-Ray Image Storage – for Processing              | 1.2.840.10008.5.1.4.1.1.1.1.1 | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Digital Mammography Image Storage - for Presentation      | 1.2.840.10008.5.1.4.1.1.1.2   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Digital Mammography Image Storage - for Processing        | 1.2.840.10008.5.1.4.1.1.1.2.1 | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Digital Intra-oral X-Ray Image Storage - for Presentation | 1.2.840.10008.5.1.4.1.1.1.3   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Digital Intra-oral X-Ray Image Storage - for Processing   | 1.2.840.10008.5.1.4.1.1.1.3.1 | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| CT Image Storage  | 1.2.840.10008.5.1.4.1.1.2     | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Enhanced CT Image Storage                                 | 1.2.840.10008.5.1.4.1.1.2.1   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Ultrasound Multi-frame Image Storage (Retired)            | 1.2.840.10008.5.1.4.1.1.3     | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Ultrasound Multi-frame Image Storage                      | 1.2.840.10008.5.1.4.1.1.3.1   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| MR Image Storage  | 1.2.840.10008.5.1.4.1.1.4     | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Enhanced MR Image Storage                                 | 1.2.840.10008.5.1.4.1.1.4.1   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| MR Spectroscopy Storage                                   | 1.2.840.10008.5.1.4.1.1.4.2   | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |
| Nuclear Medicine  | 1.2.840.10008.5.1.4.1.1.5     | ILE              | 1.2.840.10008.1.2 | SCU  | None                 |

|  |                               |     |                   |     |      |
|--|-------------------------------|-----|-------------------|-----|------|
| Image Storage (Ret.)                                       |                               |     |                   |     |      |
| Ultrasound Image Storage (Retired)                         | 1.2.840.10008.5.1.4.1.1.6     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Ultrasound Image Storage                                   | 1.2.840.10008.5.1.4.1.1.6.1   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Multi-frame Single Bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Multi-frame Single Byte Secondary Capture Image Storage    | 1.2.840.10008.5.1.4.1.1.7.2   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Standalone Overlay Storage                                 | 1.2.840.10008.5.1.4.1.1.8     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Standalone Curve Storage                                   | 1.2.840.10008.5.1.4.1.1.9     | ILE | 1.2.840.10008.1.2 | SCU | None |
| 12-lead ECG Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.1.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| General ECG Waveform Storage                               | 1.2.840.10008.5.1.4.1.1.9.1.2 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Ambulatory ECG Waveform Storage                            | 1.2.840.10008.5.1.4.1.1.9.1.3 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Hemodynamic ECG Waveform Storage                           | 1.2.840.10008.5.1.4.1.1.9.2.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Cardiac Electrophysiology Waveform Storage                 | 1.2.840.10008.5.1.4.1.1.9.3.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Basic Voice Audio Waveform Storage                         | 1.2.840.10008.5.1.4.1.1.9.4.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Standalone modality LUT Storage                            | 1.2.840.10008.5.1.4.1.1.10    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Standalone VOI LUT Storage                                 | 1.2.840.10008.5.1.4.1.1.11    | ILE | 1.2.840.10008.1.2 | SCU | None |

|  |                                  |     |                   |     |      |
|--|----------------------------------|-----|-------------------|-----|------|
| Grayscale Softcopy Presentation State Storage    | 1.2.840.10008.5.1.4.1.1.11.1     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Color Softcopy Presentation State Storage        | 1.2.840.10008.5.1.4.1.1.11.2     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Pseudo-Color Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.3     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Blending Softcopy Presentation State Storage     | 1.2.840.10008.5.1.4.1.1.11.4     | ILE | 1.2.840.10008.1.2 | SCU | None |
| X-Ray Angiographic Image Storage                 | 1.2.840.10008.5.1.4.1.1.12.1     | ILE | 1.2.840.10008.1.2 | SCU | None |
| X-Ray Radio-fluoroscopic Image Storage           | 1.2.840.10008.5.1.4.1.1.12.2     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Nuclear Medicine Image Storage                   | 1.2.840.10008.5.1.4.1.1.20       | ILE | 1.2.840.10008.1.2 | SCU | None |
| Hardcopy Grayscale Image Storage                 | 1.2.840.10008.5.1.1.29           | ILE | 1.2.840.10008.1.2 | SCU | None |
| Hardcopy Color Image Storage                     | 1.2.840.10008.5.1.1.30           | ILE | 1.2.840.10008.1.2 | SCU | None |
| Spatial Registration Storage                     | 1.2.840.10008.5.1.4.1.1.66.1     | ILE | 1.2.840.10008.1.2 | SCU | None |
| Spatial Fiducials Storage                        | 1.2.840.10008.5.1.4.1.1.66.2     | ILE | 1.2.840.10008.1.2 | SCU | None |
| VL Endoscopic Image Storage                      | 1.2.840.10008.5.1.4.1.1.77.1.1   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Video Endoscopic Image Storage                   | 1.2.840.10008.5.1.4.1.1.77.1.1.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| VL Microscopic Image Storage                     | 1.2.840.10008.5.1.4.1.1.77.1.2   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Video Microscopic Image Storage                  | 1.2.840.10008.5.1.4.1.1.77.1.2.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| VL Slide-Coordinates Microscopic Image Storage   | 1.2.840.10008.5.1.4.1.1.77.1.3   | ILE | 1.2.840.10008.1.2 | SCU | None |
| VL Photographic Image Storage                    | 1.2.840.10008.5.1.4.1.1.77.1.4   | ILE | 1.2.840.10008.1.2 | SCU | None |
| Video Photographic Image Storage                 | 1.2.840.10008.5.1.4.1.1.77.1.4.1 | ILE | 1.2.840.10008.1.2 | SCU | None |

|  |                                  |     |                   |     |      |
|--|----------------------------------|-----|-------------------|-----|------|
| Ophthalmic Photographic 8 Bit Image Storage  | 1.2.840.10008.5.1.4.1.1.77.1.5.1 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Ophthalmic Photographic 16 Bit Image Storage | 1.2.840.10008.5.1.4.1.1.77.1.5.2 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Stereometric Relationship Storage            | 1.2.840.10008.5.1.4.1.1.77.1.5.3 | ILE | 1.2.840.10008.1.2 | SCU | None |
| Positron Emission Tomography Image Storage   | 1.2.840.10008.5.1.4.1.1.128      | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Image Storage                             | 1.2.840.10008.5.1.4.1.1.481.1    | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Dose Storage                              | 1.2.840.10008.5.1.4.1.1.481.2    | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Structure Set Storage                     | 1.2.840.10008.5.1.4.1.1.481.3    | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Beams Treatment Record Storage            | 1.2.840.10008.5.1.4.1.1.481.4    | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Plan Storage                              | 1.2.840.10008.5.1.4.1.1.481.5    | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Brachy Treatment Record Storage           | 1.2.840.10008.5.1.4.1.1.481.6    | ILE | 1.2.840.10008.1.2 | SCU | None |
| RT Treatment Summary Record Storage          | 1.2.840.10008.5.1.4.1.1.481.7    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Basic Text SR                                | 1.2.840.10008.5.1.4.1.1.88.11    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Enhanced SR                                  | 1.2.840.10008.5.1.4.1.1.88.22    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Comprehensive SR                             | 1.2.840.10008.5.1.4.1.1.88.33    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Mammography CAD SR                           | 1.2.840.10008.5.1.4.1.1.88.50    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Key Object Selection Document                | 1.2.840.10008.5.1.4.1.1.88.59    | ILE | 1.2.840.10008.1.2 | SCU | None |
| Chest CAD SR                                 | 1.2.840.10008.5.1.4.1.1.88.65    | ILE | 1.2.840.10008.1.2 | SCU | None |

**Table 20: Proposed Presentation Contexts for Store Instances (Export 1)**

#### 4.2.2.3.1.3 SOP SPECIFIC CONFORMANCE FOR STORAGE SOP CLASSES

##### Important remarks about the exported instances:

- The Distribution Manager does not attempt any extended negotiation.
- The Distribution Manager continues sending the remaining instances after unsuccessful C-STORE responses.

- The Distribution Manager takes no further action in case of warnings or errors in the C-STORE operations during transferring attempt. After finishing of transferring attempt a user error will be displayed in the GUI if only for a one instance the store operation fails.
- The Distribution Manager AE sends the instances using the same transfer syntax as they were stored by the Storage Provider AE.

Configuring of Storage Provider AE to convert format of received data from original Transfer Syntax to Implicit Little Endian is compulsory condition for usage of data distribution via DICOM protocol.

Following are the details regarding the specific conformance, including response behavior to all status codes, both from an application level and communication errors.

| Service Status | Further Meaning                   | Error Code | Behavior   |
|----------------|-----------------------------------|------------|--|
| Success        | Storage is complete               | 0000       | Continues with next store until completed thereafter the store job is marked as completed and the association is released.     |
| Refused        | Out of Resources                  | A7xx       | Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user. |
| Error          | Data set does not match SOP Class | A9xx       | Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user. |
|                | Cannot understand                 | Cxxx       | Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user. |
| Warning        | Coercion of Data Elements         | B000       | Continues with next store until completed thereafter the store job is marked as completed and the association is released.     |
|                | Elements discarded                | B006       | Continues with next store until completed thereafter the store job is marked as completed and the association is released.     |
|                | Data set does not match SOP class | B007       | Continues with next store until completed thereafter the store job is marked as completed and the association is released.     |

**Table 21: DICOM Command Response Status Handling Behavior**

| Exception                | Behavior   |
|--------------------------|--|
| ARTIM Time-out           | Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user. |
| Reply Time-out           | Continues with next store until end of data collection. The store job is marked as failed. The job status is reported to user. |
| Association Time-out SCU | Continues with next store until end of data collection.  |

| Exception           | Behavior  |
|---------------------|---|
|                     | The store job is marked as failed. The job status is reported to user.  |
| Association aborted | Continues with next store until end of data collection.<br>The store job is marked as failed. The job status is reported to user. |

**Table 22: DICOM Command Communication Failure Behavior**


---

#### 4.2.2.4 ASSOCIATION ACCEPTANCE POLICY

Distribution Manager never accepts an association.

### 4.3 NETWORK INTERFACES

---

#### 4.3.1 PHYSICAL NETWORK INTERFACE

The CD Printer applications provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of [DICOM].

CD Printer supports a single network interface: Ethernet ISO.8802-3. With standard supported physical medium include:

- IEEE 802.3 10BASE-TX
- IEEE 802.3 100BASE-TX (Fast Ethernet)
- IEEE 802.3 1000BASE-X (Fiber Optic Gigabit Ethernet).

---

#### 4.3.2 OSI STACK

OSI Stack is not supported

---

#### 4.3.3 TCP/IP

TCP/IP stack is inherited from the Operating System.

The CD Printer is available on Windows 2000 Professional operating system (i.e. the operating system platform).

---

#### 4.3.4 PHYSICAL MEDIA SUPPORT

The CD Printer is indifferent to the physical media over which TCP/IP operates. It inherits the medium from the operating system upon which it executes.



The CD Printer is available on Windows 2000 Professional.

#### 4.3.5 POINT -TO-POINT STACK

Point-to-Point stack is not supported.

### 4.4 CONFIGURATION

The CD Printer uses a centralized control database for configuration.

The CD Printer for Windows 2000 uses InterBase v. 7.5.

CD Printer system is configured by means of a configuration program. This program is accessible during operating of the CD Printer system. It is password protected and intended to be used by Philips Customer Support Engineers only.

The configuration program shall prompt the Customer Support Engineer to enter configuration information as required by the CD Printer applications.

#### 4.4.1 AE TITLE/PRESENTATION ADDRESS MAPPING

AE Title / Presentation-Address mapping is stored in The CD Printer control database and is configured using administration utilities.

How this is performed is described in this section.

##### 4.4.1.1 LOCAL AE TITLES

The local AE title mapping and configuration shall be specified. Default AE titles are listed in **Table 23**.

| Application Entity   | Default AE Title | Default TCP/IP Listening Port |
|----------------------|------------------|-------------------------------|
| Storage Provider     | CDP_PRINTER      | 104                           |
| Distribution Manager | CDP_SENDER       | Not applicable                |

**Table 23: AE Title Configuration Table**

The AE titles in the CD Printer can be changed independently.

Number of defined AE titles for Storage Provider is unlimited.

##### 4.4.1.2 REMOTE AE TITLE/PRESENTATION ADDRESS MAPPING

---

#### 4.4.1.2.1 REMOTE ASSOCIATION INITIATORS

---

All relevant remote applications able to setup a DICOM association towards CD Printer applications must be configured at CD Printer configuration time. The Customer Support Engineer must provide the following information for each remote application:

- The Application Entity Title.
- The host name/IP address on which the remote application resides.

#### 4.4.1.2.2 REMOTE ASSOCIATION ACCEPTORS

---

The following information must be provided for all relevant remote applications that are able to accept DICOM associations from CD Printer:

- The Application Entity Title.
- The host name/IP address on which the remote application resides.
- The port number at which the remote application accepts association requests.

---

#### 4.4.2 PARAMETERS

The specification of important operational parameters, their default value and range (if configurable) is specified here.

The configuration parameters are given in **Table 24**, categorized in the following sections:

- [General Parameters of CD Printer AE's.](#)
- [Local Configurable Parameters of the CD Printer AE's.](#)
- [Remote Configurable Parameters of the CD Printer AE's.](#)

| Parameter   | Configurable | Default Value                              |
|---|--------------|--|
| General Parameters of CD Printer  |              |  |
| Time-out waiting for acceptance or rejection Response to an Association Open Request. (Application Level timeout - ARTIM)   | Yes          | 10 sec.                                    |
| General DIMSE level time-out values   | Yes          | 30 sec.                                    |
| Time-out waiting for response to TCP/IP connect request. (Low-level timeout) <sup>1</sup>   | No           | -  |
| Time-out waiting for acceptance of a TCP/IP message over the network. (Low-level timeout) <sup>1</sup>  | No           | -  |
| Time-out for waiting for data between TCP/IP packets. (Low-level timeout) <sup>1</sup>  | No           | -  |
| Any changes to default TCP/IP settings, such as configurable stack parameters <sup>1</sup>  | No           | -  |
| Local Configurable Parameters of the CD Printer AE  |              |  |
| Size constraint in maximum object size (see note)   | No           | -  |
| Maximum PDU size the AE can receive   | Yes          | 16 kBytes<br>Min 4 kBytes<br>Max 64 kBytes |
| Maximum PDU size the AE can send  | Yes          | 16 kBytes<br>Min 4 kBytes<br>Max 64 kBytes |
| AE specific DIMSE level time-out values   | Yes          | 30 sec.                                    |
| Number of simultaneous associations by Service and/or SOP class   | Yes          | 5  |
| SOP class support   | No           | As listed in the DCS                       |
| Transfer Syntax support <sup>2</sup>  | No           | As listed in the DCS                       |
| Remote Configurable Parameters of the CD Printer AE   |              |  |
| Size constraint in maximum object size (see note)   | No           | -  |
| Maximum PDU size the AE can receive   | No           | No limit                                   |
| Maximum PDU size the AE can send  | No           | No limit                                   |
| AE specific DIMSE level time-out values   | Yes          | 30 sec.                                    |
| Number of simultaneous associations by Service and/or SOP class   | No           | No limit                                   |
| SOP class support   | No           | As listed in the DCS                       |
| Transfer Syntax support   | No           | As listed in the DCS                       |
| Storage Commitment request must be sent after Storage request   | N/A          | -  |
| Storage Commitment time-out (synchronous to asynchronous)   | N/A          | -  |
| Export of pure DICOM instances (i.e. only the standard DICOM attributes as defined in the related IOD) or extended DICOM instances (with additional Standard DICOM, Private and Retired attributes) | No           | allow all attributes                       |

|   |    |   |
|---|----|---|
| Support of overlays for DICOM node not supporting Presentation State objects <sup>3</sup> | No | - |
| Support of overlays for DICOM node supporting Presentation State objects <sup>3</sup>     | No | - |
| Support of overlays for CD <sup>3</sup>   | No | - |

**Table 24: Configuration Parameters table**

*Note 1: The parameters depend on operation system configuration.*

*Note 2: The JPEG Baseline transfer syntax is only supported for monochrome images. The RLE Lossless Image Compression transfer syntax is only supported for RGB; therefore JPEG Baseline may NOT be configured for systems that are capable of handling storage of color images too and RLE Lossless Image Compression may NOT be configured for systems that are capable of handling storage of monochrome images too.*

*Note 3: The CD Printer Copy-tool supports only storing functions for overlays.*

The CD Printer configuration is done using administration utilities. Please refer to Installation Manual and Administration's Manual for complete documentation.

In addition, the CD Printer provides a variety of dynamic application configurations for managing the instances distributing:

- Forward Rules provide a robust mechanism for instances distribution enabling to use the CD Printer as a DICOM network hub.

#### **Important implementation remarks and restrictions:**

Forward-Rules are a set of rules that is used to select the received by Storage Provider AE instances, for the Receiver application (Distribution Manager AE) to send studies to the CD Printer (Media AE), other locations on the network (DICOM), or any combination thereof.

*Note: Configuring of Storage Provider AE to convert format of received data from original Transfer Syntax to Implicit Little Endian is compulsory condition for usage of data distribution via DICOM protocol.*

For complete documentation of the CD Printer Forward-Rules please refer to the CD Printer Administration's Manual.

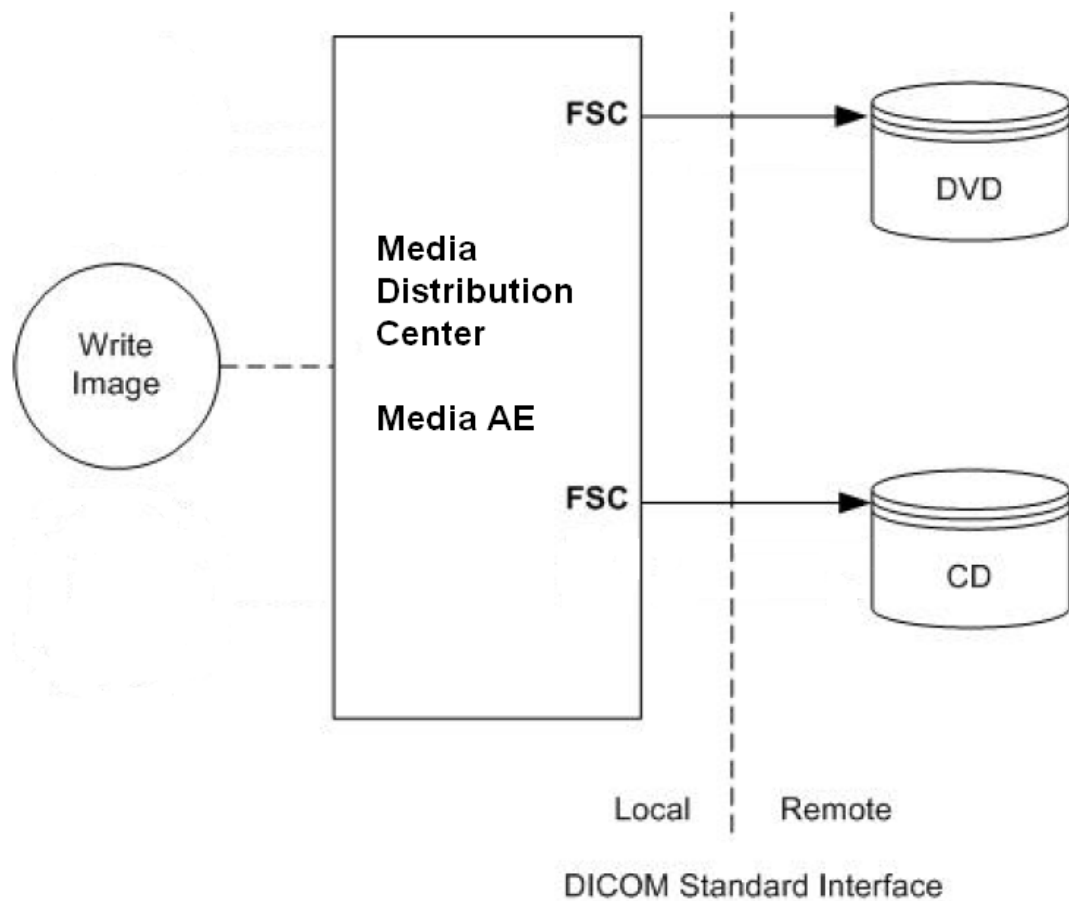
## 5. MEDIA INTERCHANGE

### 5.1 IMPLEMENTATION MODEL

#### 5.1.1 APPLICATION DATA FLOW

The Media AE will act as a FSC for a CD-R and DVD, when writing the selected instances in a data folder onto the medium.

**Figure 7** shows the Media Interchange Application Data Flow as a functional overview of the CD Printer AE for CD-R and DVD.



**Figure 7: Media Interchange Application Data Flow Diagram**

- The Media AE exports DICOM instances (Images, Presentation States, Structured Reports, etc.) to a disk Storage medium. It is associated with local real-world activity "Write Image". "Write Image" is performed upon Distribution Manager AE delivery of DICOM data collection (set of patients, studies, series or instances).

- Throughout this section, the term "Media" refers to any of the media: CD-R, CD-RW, DVD-R, DVD+R, DVD-RW and DVD+RW.

The Media AE can be configured for automatic selection of creating media.

### 5.1.2 FUNCTIONAL DEFINITION OF AE'S

This section describes in general the functions to be performed by the AE, and the DICOM services used to accomplish these functions.

#### 5.1.2.1 FUNCTIONAL DEFINITION OF MEDIA AE

Distribution Manager AE will pass the DICOM data collection to Media AE. Media AE will select appropriate media in accordance to total volume of data collection, target media capacity and allowance of automatic media selection. The data collection will be divided into one or more export jobs in accordance to total volume of data collection and selected media capacity. The contents of each export job will be written to a single media. Executing of export job is performed automatically. Each media is automatically labeled with appropriate information.

*Note: Label content and view are customizable and depend on local needs. For more details see Administrator Guide of the CD Printer.*

The Media AE includes DICOM media viewer software in root of each burned media. The DICOM media viewer software supports images with the following DICOM Photometric Interpretations as shows in **Table 25**.

| Photometric Interpretation | Import | Export | Viewing |
|----------------------------|--------|--------|---------|
| MONOCHROME1                | NO     | YES    | YES     |
| MONOCHROME2                | NO     | YES    | YES     |
| RGB                        | NO     | YES    | YES     |
| YBR_FULL                   | NO     | YES    | NO      |
| YBR_FULL_422               | NO     | YES    | YES     |
| YBR_PARTIAL_422            | NO     | YES    | NO      |
| PALETTE COLOR              | NO     | YES    | YES     |
| YBR_RCT                    | NO     | YES    | NO      |
| YBR_ICT                    | NO     | YES    | NO      |

**Table 25: Photometric interpretations supported by Media AE**

The CD Printer Media AE includes the following service class.

Media Storage Service Class for CD and DVD

The Media AE can perform the CD-R Media Storage service as SCU, with capabilities for RWA Write Instances (as FSC).

For DVD the Media AE can perform the Media Storage service as SCU, with capabilities for RWA Write Instances (as FSC).

5.1.3 SEQUENCING OF REAL WORLD ACTIVITIES

Whenever a CD or DVD has to be written the Media AE first reads required DICOM instances from CD Printer temporary storage and builds the DICOMDIR for the instances set. The Media AE will compile the DICOMDIR, required DICOM instances and unique high quality self-playing image viewing and manipulation program (DiagNET) into a CD or DVD media image; this CD or DVD media image will be written to CD or DVD.

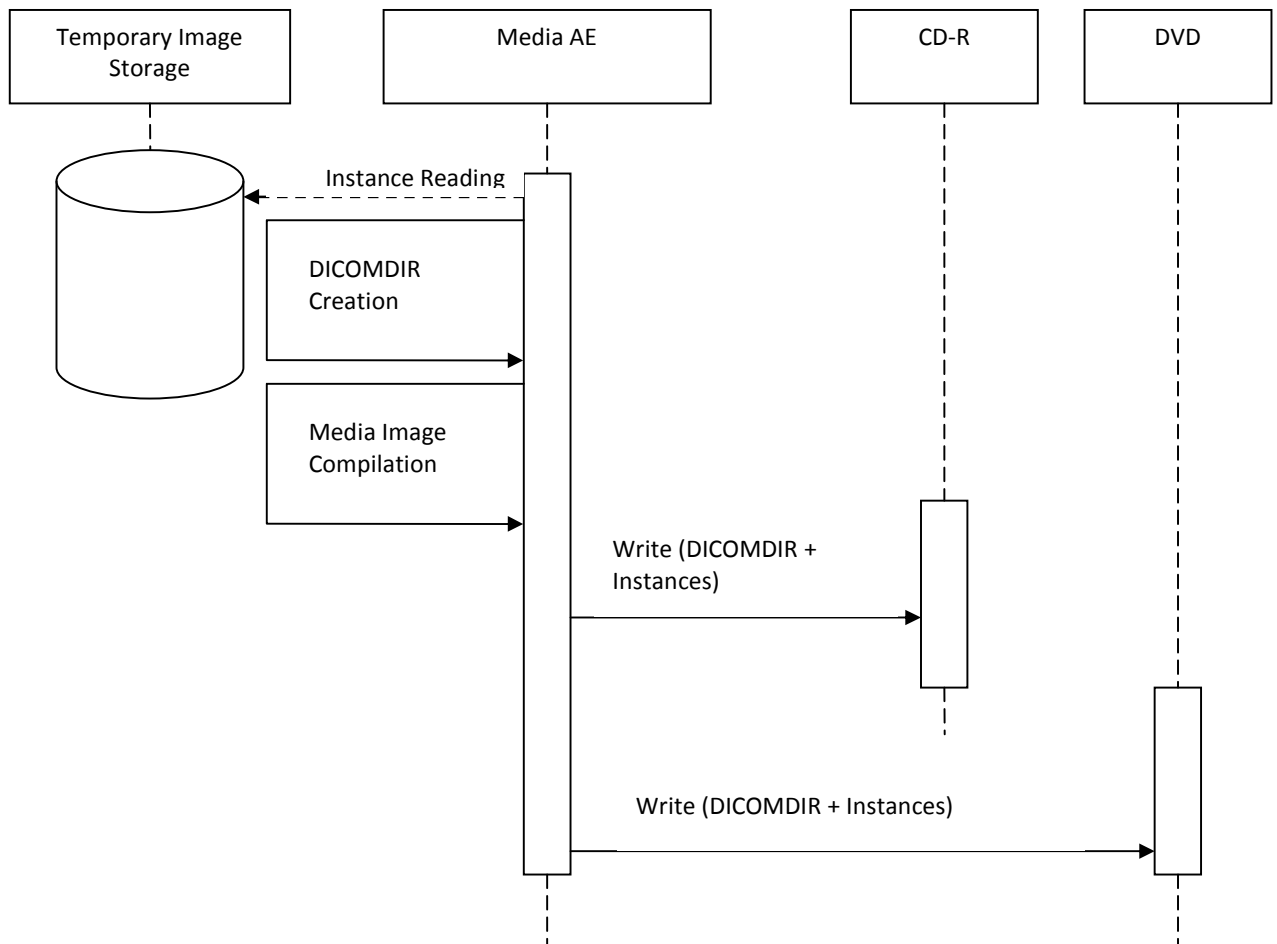


Figure 8: Sequencing of RWA Write Instances

#### 5.1.4 FILE META INFORMATION FOR IMPLEMENTATION CLASS AND VERSION

This section is used to list the values assigned to the File Meta Information attributes (ref. [DICOM] PS 3.10) that pertain to the Implementation Class and Version.

The Implementation Class UID and the Implementation Version Name in the File Meta Header are specified in following table.

|                               |                                      |
|-------------------------------|--------------------------------------|
| File Meta Information Version | 00,01                                |
| Implementation Class UID      | 1.2.826.0.1.3680043.8.195.0.20041017 |
| Implementation Version Name:  | CDP_V3                               |

**Table 26: DICOM Implementation Class and Version for Media AE**

## 5.2 AE SPECIFICATIONS

### 5.2.1 MEDIA AE

The Media AE provides Standard Conformance to the DICOM Media Storage Service and File Format ([DICOM] PS 3.10), the Media Storage Application Profile STD-GEN-CD ([DICOM] PS 3.11) and the Media Storage Application Profile STD-GEN-DVD-JPEG ([DICOM] PS 3.11) and Private Conformance to the Media Storage Application Profile PRI-GEN-CD-DVD (5.3.2 chapter in the document) for Writing.

The supported Application Profiles, their Roles and the Service Class (SC) options, all defined in DICOM terminology, are listed in **Table 27**.

| Supported Application Profile | Real-World Activity | Roles | SC Option   |
|-------------------------------|---------------------|-------|-------------|
| PRI-GEN-CD-DVD                | Write Instances     | FSC   | Interchange |
| STD-GEN-CD                    | Write Instances     | FSC   | Interchange |
| STD-GEN-DVD-JPEG              | Write Instances     | FSC   | Interchange |

**Table 27: AE Related Application Profiles, Real-World Activities, and Roles for CD-R and DVD**

Supported media profiles per media are shown in **Table 28**.

|                            |                             |                                   |
|----------------------------|-----------------------------|-----------------------------------|
| <b>Media</b>               | CD                          | DVD+RW / DVD+R / DVD-R / DVD-RW   |
| <b>Application Profile</b> | STD-GEN-CD / PRI-GEN-CD-DVD | STD-GEN-DVD-JPEG / PRI-GEN-CD-DVD |

**Table 28: Media Profiles supported by Media AE**

*Note: Private General Purpose PRI-GEN-CD-DVD Media Storage Application Profile allows creating DICOM CD and DVD without transfer syntax control of writing DICOM Instance files. Usage of Private or Standard Profile is configurable.*

*The CD Printer can be configured to not control content and format of distributing on media data. In such case data will be written "as is" (as received from remote DICOM node) and all*



*responsibility for normality of data format and contents shall be borne by the source of the information from which the data was received by CD Printer.*

*The CD Printer and/or Media AE can be configured explicitly to change format of distributing on media data by system administrator of The CD Printer. In such case all responsibility for normality of data format and contents shall be borne by the system administrator.*

Media AE supports multi-patient CD-R / DVD disks for Writing.

---

#### 5.2.1.1 FILE META INFORMATION FOR THE MEDIA AE

The Media AE has no specific File Meta Information.

---

#### 5.2.1.2 REAL-WORLD ACTIVITIES

##### 5.2.1.2.1 WRITE INSTANCES

---

When an instance transfer to CD-R or DVD is initiated then the Media AE acts as an FSC using the interchange option to export SOP Instances from the temporary location to a CD-R or DVD medium.

The contents of the export job will be written together with corresponding DICOMDIR and DICOM media viewer software to media. The user can cancel an export job in the job queue and manage the queue by changing priority of the jobs.

##### 5.2.1.2.1.1 MEDIA STORAGE APPLICATION PROFILE

---

As depicted in **Table 27**, the Media AE supports the RWA Write Instances for the STD-GEN-CD, STD-GEN-DVD-JPEG and PRI-GEN-CD-DVD Application Profile.

##### 5.2.1.2.1.1.1 OPTIONS

All existing in received instance Optional, Retired and Private Attributes are kept, stored and exported.

The DICOMDIR file will be created for the whole set of instances during creating of media image. In case some attributes are not present in an instance but are specified as mandatory in the DICOMDIR definition in DICOM Media, a generated value will be filled in.

#### **Implementation remarks and restrictions**

When writing the DICOMDIR records, key values are generated when no value of the corresponding attribute is supplied, according to **Table 29**.

| Key                 | Tag         | Generated Value  |
|---------------------|-------------|--|
| <b>Patient Keys</b> |             |  |
| Patient ID          | (0010,0020) | At import CD Printer creates a value based on the Accession Number, if the Patient ID does not exist or has empty value. If Accession Number attribute does not exist or has empty value, attribute value is created on base of the Study Instance UID for each new study written to the CD-R/ DVD (even if this study belongs to a patient recorded earlier). |
| <b>Study Keys</b>   |             |  |
| Study Date          | (0008,0020) | Current date   |
| Study Time          | (0008,0030) | Current time   |
| Study ID            | (0020,0010) | "UNKNOWN"  |
| <b>Series Keys</b>  |             |  |
| Series Number       | (0020,0011) | 1  |

**Table 29: Generated Keys**

The Media AE writes DICOMDIR using Explicit Little Endian transfer syntax always regardless of applied Media Storage Application Profile.

The Media AE supports all Storage SOP Classes listed in **Table 6**. Put attention to note about SOP Classes supported for presentation (viewing).

The Media AE supports all Transfer Syntaxes represented in list of Acceptable Presentation Contexts for Store Instances (Import) depicted in **Table 11**.

*Note: DICOM instances are exported within Transfer Syntaxes in accordance to configuration.*

CD Printer can write data on volumes of the media.

CD Printer writes next disk if data is spanning over more CD-R / DVD disks.

CD Printer can be configured to automatic selection of appropriate media.

CD Printer will select DVD media for data set that was initially proposed for writing on CD if total volume of exporting data set exceeds CD media capacity.

CD Printer will select CD media for data set that was initially proposed for writing on DVD if total volume of exporting data set is less than CD media capacity.

The unique high quality self-playing image viewing and manipulation program (DiagNET) will be written on each medium.

### 5.3 AUGMENTED AND PRIVATE APPLICATION PROFILES

This section is used for the description of Augmented and Private Application Profiles.

---

### 5.3.1 AUGMENTED APPLICATION PROFILES

None

---

### 5.3.2 PRIVATE APPLICATION PROFILES

---

#### 5.3.2.1 PRIVATE APPLICATION PROFILE PRI-GEN-CD-DVD

---

##### 5.3.2.1.1 PRI-GEN-CD-DVD PRIVATE APPLICATION PROFILE

The Application Profile Class is intended to be used for the interchange of Composite SOP Instances via CD-R and DVD media for general purpose applications. Objects from multiple modalities may be included on the same media.

The Media Storage SOP Class is detailed in **Table 30**.

| Application Profile                        | Identifier     | Description   |
|--|----------------|---|
| Private General Purpose CD-DVD Interchange | PRI-GEN-CD-DVD | Handles interchange of Composite SOP Instances such as Images, Structured Reports, Presentation States and Waveforms, either uncompressed (including Implicit Little Endian format) or with lossless or lossy JPEG. |

**Table 30: AE Related Application Profiles, Real-World Activities, and Roles for CD-R and DVD**

---

##### 5.3.2.1.2 CLINICAL CONTENT

This Application Profile Class facilitates the interchange of images and related data on CD or DVD media. Typical interchange would be between acquisition devices, archives and workstations.

This Application Profile Class facilitates the creation of a multi-modality and multi-patient medium for image interchange, useful for clinical, patient record, teaching and research applications, within and between institutions.

---

##### 5.3.2.1.3 ROLES AND SERVICE CLASS OPTIONS

---

###### 5.3.2.1.3.1 FILE SET CREATOR

File Set Creator generates a File Set under this Interchange Class of Application Profile and generates the Basic Directory SOP Class in the DICOMDIR file with all the subsidiary Directory Records related to the Instance SOP Classes stored in the File Set.

---

##### 5.3.2.1.4 SOP CLASSES AND TRANSFER SYNTAXES

This Application Profile is proposed for support of any Standard, Standard Extended and Private SOP Classes and any Standard Transfer Syntaxes.

*Note: In fact the Media AE receives export jobs that contain data received by Storage Provider AE. So created media will contain only supported by the Storage Provider AE SOP Classes and in format of only supported by the Storage Provider AE Transfer Syntaxes.*

DICOMDIR file (Class UID of the object is 1.2.840.10008.1.3.10) should be coded using Explicit Little Endian transfer syntax.

#### 5.3.2.1.5 PHYSICAL MEDIUM AND MEDIUM FORMAT

---

The PRI-GEN-CD-DVD application profile requires the 120 mm CD-R physical medium with the ISO/IEC 9660 Media Format or the 120 mm DVDRAM medium, as defined in PS 3.12.

#### 5.3.2.1.6 DIRECTORY INFORMATION IN DICOMDIR

---

The PRI-GEN-CD-DVD application profile has the same requirements to DICOMDIR content that General Purpose CD-R and DVD Interchange Profiles have, as defined in PS 3.11 (Annex D) of DICOM Standard.

#### 5.3.2.1.7 OTHER PARAMETERS

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None

#### 5.3.2.1.8 SECURITY PARAMETERS

---

None

### 5.4 MEDIA CONFIGURATION

The Media AE uses initialization file (PRINTER.INI) for configuration.

The Media AE is configured by means of any text editor. This configuration is intended to be made by Philips Customer Support Engineers only.

---

#### 5.4.1 GENERAL PARAMETERS OF MEDIA AE

##### 5.4.1.1 AUTOMATIC SELECTION OF TARGET MEDIA

Distribution Manager AE initiates export to specific media. The Media AE will perform the export to the specified media or will automatically select more appropriate media for the export task.

AutoMediaSelect parameter in [Printer] section defines when such automatic selection will be performed (value shall be equal 1) or will not be performed (value shall be equal 0).

Default value defines operating without automatic media selection (parameter has 0 value).

#### 5.4.1.2 NUMBER OF SUPPORTED MEDIA TYPES

Different configuration of CD Printer can support different media types. This depends on installed hardware and license.

Number of attributes can be specified individually for each media type. The attributes form the so-called configuration set.

MediaCount parameter in [MediaList] section defines a number of such media configuration sets.

Default value defines is 2 (CD-R and DVD).

#### 5.4.2 MEDIA SPECIFIC PARAMETERS OF MEDIA AE

The parameters are specified in [MediaList] section.

The parameters can be specified individually for each media type (CD-R, DVD). The parameter names end by a number of the media type in the list (a number shall be in range from 1 up to value of Number of Supported Media Types parameter). The number is represented by N symbol in explanations below.

The media specific parameters, their default value and range are specified in **Table 31**.

| Parameter  | Default Value for CD-R | Default Value for DVD | Note  |
|--|------------------------|-----------------------|---|
| The type of the media that is recognized by burning software (MediaTypeN parameter)      | CDR                    | DVDR                  | Depends on installed hardware   |
| Capacity in megabytes of data that can be stored to the media (MediaCapacityN parameter) | 650                    | 4000                  | The value is used for data collection splitting to several discs and automatic media selection.<br>The value is typically smaller than the physical capacity of the media allowing additional files (such as DICOMDIR and DiagNET viewer) to be included. |
| Data representation type for regular burning (MediaRepresentationTypeN parameter)        | 2                      | 2                     | Possible values are 0, 1, 2 and 3.<br>See full description below.   |

**Table 31: Configuration Parameters table**

The data representation type parameter specifies representation of data for regular burning and applying Media Storage Application Profile as result from using data representation:

- 0 value defines that received by Media AE data will be stored "as is" without changing of Transfer Syntax. So data can be stored in any Transfer Syntax. The setting dictates usage of PRI-GEN-CD-DVD application profile in media creating.

- 1 value defines that received by Media AE data will be stored within Implicit Little Endian Transfer Syntax. The Transfer Syntax does not correspond to standard application profiles. The setting dictates usage of PRI-GEN-CD-DVD application profile in media creating.
- 2 value defines that received by Media AE data will be stored within Explicit Little Endian Transfer Syntax. The Transfer Syntax corresponds to STD-GEN-CD and STD-GEN-DVD-JPEG standard application profiles. So STD-GEN-CD application profile will be used in CD-R creating and STD-GEN-DVD-JPEG will be used in DVD creating.
- 3 value defines that received by Media AE data will be stored within compression Transfer Syntaxes. The Transfer Syntax corresponds to STD-GEN-DVD-JPEG standard application profile for DVD creating and does not correspond to STD-GEN-CD standard application profile for CD creating. So PRI-GEN-CD-DVD application profile will be used in CD-R creating and STD-GEN-DVD-JPEG will be used in DVD creating.

*Note: The Media AE reserves the right to switch applying application profile in cases of creating media changing via automatic media selection and errors in Transfer Syntax conversion of data and Private SOP Class IOD-s.*

## 6. SUPPORT OF CHARACTER SETS

CD Printer supports All Extended Character Sets.

*Note: If an extended or replacement character set is used in one of the attributes, the attributes will be stored and exported "as is". The CD Printer processes coded part of the attributes as binary data.*

*Note: The CD Printer uses default language character set of operation system for non-Unicode programs. In the reason the attributes, coded with Extended Character Set, may be unreadable in internal applications of CD Printer.*

## 7. SECURITY

### 7.1 SECURITY PROFILES

None supported.

### 7.2 ASSOCIATION LEVEL SECURITY

The CD Printer accepts associations only from known applications or an application whose “calling AE Title” is defined in its configuration file.

The CD Printer will reject association requests from unknown applications, i.e. applications that offer an unknown “calling AE title”. An application entity (AE) is known if – and only if – it is defined during configuration of the CD Printer, which is done via the configuration application.

### 7.3 APPLICATION LEVEL SECURITY

The CD Printer supports security measure for secure authentication of a node.

The CD Printer will reject association requests from applications on unknown nodes, i.e. nodes that offer an unknown “IP Address”. A node is known if – and only if – it is defined during configuration of the CD Printer, which is done via the configuration application.



## 8. ANNEXES

### 8.1 IOD CONTENTS

#### 8.1.1 CREATED SOP INSTANCES

Not applicable.

#### 8.1.2 ATTRIBUTE MAPPING

Not applicable.

#### 8.1.3 COERCED/MODIFIED FIELDS

##### 8.1.3.1 COERCED FIELDS

Coerced fields and conditions for the coercion are listed in **Table 32**.

| Attribute Name | Tag         | Coercion Conditions                    |
|----------------|-------------|--|
| Patient ID     | (0010,0020) | Value is missing in received instance. |
| Study Date     | (0008,0020) | Value is missing in received instance. |
| Study Time     | (0008,0030) | Value is missing in received instance. |
| Study ID       | (0020,0010) | Value is missing in received instance. |
| Series Number  | (0020,0011) | Value is missing in received instance. |

**Table 32: Coerced fields and conditions for the coercion**

##### 8.1.3.2 MODIFIED FIELDS

None

### 8.2 DATA DICTIONARY OF PRIVATE ATTRIBUTES

Not applicable.

### 8.3 CODED TERMINOLOGY AND TEMPLATES

Not applicable.

### 8.4 GRAYSCALE IMAGE CONSISTENCY

The high-resolution display monitor attached to the product must be earlier calibrated by using the device specific tools.

**8.5 STANDARD EXTENDED/SPECIALIZED/PRIVATE SOPS**

Not applicable.

**8.6 PRIVATE TRANSFER SYNTAXES**

None